TENURE AND AGROFORESTRY :
VILLAGE AND HOUSEHOLD STUDIES IN CENTRAL MALI

by

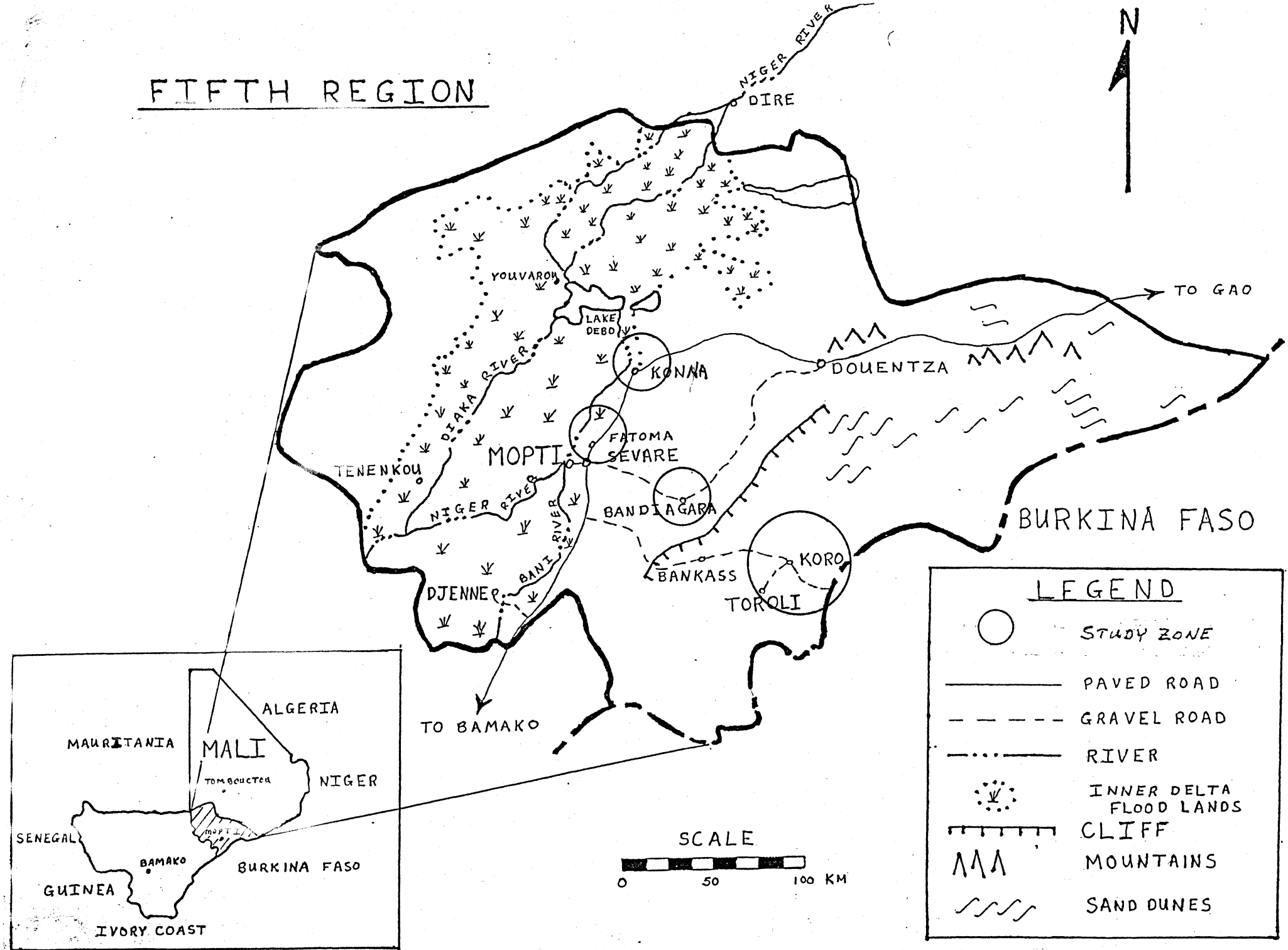
Rebecca J. McLain

Land Tenure Center
University of Wisconsin-Madison

October 1990

CONTENTS

LIST OF FIGURES AND TABLES


FIFTH REGION
N
NIGER RIVER
DIRE
YOUVAROU
LAKE DEBO
DIAKA RIVER
KONNA
TO GAO
DOUENTZA
MOPTI
FATOMA SEVARE
TENENKOU
NIGER RIVER
BANI RIVER
BANDIAGARA
BURKINA FASO
BANKASS
KORO
TOROLI
DJENNE
TO BAMAKO
ALGERIA
MAURITANIA
MALI
TOMBOUCTOU
NIGER
SENEGAL
MOPTI
BAMAKO
BURKINA FASO
GUINEA
IVORY COAST
SCALE
0
50
100 KM
LEGEND
STUDY ZONE
PAVED ROAD
GRAVEL ROAD
RIVER
INNER DELTA FLOOD LANDS
CLIFF
MOUNTAINS
SAND DUNES

TENURE AND AGROFORESTRY :
VILLAGE AND HOUSEHOLD STUDIES IN CENTRAL MALI

by

Rebecca J. McLain

I. INTRODUCTION

A. Research Objective

This is the second of a series of reports produced for the Land Tenure Center's research project on land and tree tenure in Mali's Fifth Region. The project objective is to identify tenure constraints to sustainable natural resource management and to provide data that can help governmental and donor agencies develop policies to foster better use of the region's existing natural resource base. The research, which is financed by the United States Agency for International Development, is part of the Village Reforestation Project (VRP) currently being implemented with the assistance of the Malian Forest Service (Eaux et Forêts) in the Fifth Region.

B. Site Selection

During the first six months of the project, a series of pilot studies were conducted in eleven villages located in the Fifth Region. The pilot studies were designed to provide basic information about a variety of topics, including rights to land, rights to trees, tree management practices, local knowledge of the Forest Code, and local attitudes toward the government forest service.

Four study zones were selected within the Fifth Region: Bandiagara, Fatoma, Koro, and Konna (see figure 1). A list of the villages studied and the major ethnic composition of each village is provided in table 1.

Bandiagara and Fatoma were chosen as the main study sites since VRP activities are concentrated in those areas. Two major ecological zones of the Fifth Region, the Niger floodplain and the Bandiagara plateau, are represented by these study sites. Villages in the Cercle of Koro were included because of the existence of a long-term forest extension project funded by CARE and managed jointly by a CARE representative and the Chef

TABLE 1

Pilot Study Villages

STUDY ZONE	VILLAGE	ETHNIC GROUPS	MAIN ACTIVITIES
Bandiagara (Central Arrondissement)	Doukombo	Dogon	farming
	Kalibombo	Dogon	farming
	Songho	Dogon	farming
Fatoma (Fatoma Arrondissement)	Daka-Womina	Bozo	fishing
	Missira	Peulh/Rimaïbe	herding
	Tiroguel	Rimaïbe	farming
Koro (Central Arrondissement, Toroli Arrondissement)	Bondo	Dogon	farming
	Sengé-Bengé	Dogon	farming
	Tagari-Peulh	Peulh	herding
Konna (Konna Arrondissement)	Djeninkore	Malinke/Bozo	farming/fishing
	Bogo	Malinke/ Rimaïbe/Bozo	farming/fishing

de Cantonnement Forestier of Koro. In addition, the Koro area represents another major ecological zone, the Seno plain, found in the Fifth Region. In Konna, the fourth study zone, no major forestry projects have been implemented. The Konna study zone encompasses both seasonally inundated and uninundated portions of the Niger floodplain.

The first part of this report outlines the land tenure characteristics of the pilot study villages. Part two discusses the tree tenure rules identified during the study and analyzes the relationship between land access and rights to trees. Part three summarizes tree management and soil conservation behavior in the region. The relationship between land use management and rights to land and trees is analyzed in the same section. Part four addresses the question of how villagers interact with Eaux et Forêts; the major sources of conflict between villagers and agents are identified, and the types of contacts villagers have with forest agents are analyzed. The final section of the report identifies the land and tree tenure characteristics most likely to constrain natural resource management projects in the study area. Strategies for overcoming these constraints are proposed.

Detailed descriptions of the land and tree tenure systems present in the study villages in Fatoma, Koro, and Konna are provided the appendix. In addition, a description of land and tree tenure in the Central Arrondissement of Bandiagara was published in an earlier report. Copies of the Bandiagara report can be obtained by contacting the Livestock Project Office at the USAID mission in Bamako.

C. Data Collection Methodology

Information-gathering sessions were held with village men in all eleven villages. In addition, group interviews were held with village women in eight of the villages (Kalibombo, Daka-Womina, Tiroguel, Missira, Sengé-Bengé, Tagari-Peuhl, Djeninkore, and Bogo). In nine of the villages (all but Songho and Bondo), individual farmers were interviewed as well.

The village group meetings were attended by a variety of villagers rather than just the village leaders. In villages composed of several ethnic groups, representatives of each group were asked to be present at the group meetings. Each village was also asked to select two or three individuals to participate in in-depth interviews. The villages were provided with a list of criteria for selecting individuals so that a range of socioeconomic classes, age groups, ethnic groups, and religions would be represented. A total of twenty-one individuals were interviewed (six in the Fatoma zone, and five in each of the other three study zones).

A series of open-ended questions was developed to gather information from the village groups. Topics covered in the villagewide meetings included: environmental and socioeconomic characteristics of the village, land tenure rules, tree tenure rules, traditional and current tree planting and maintenance practices, uses of trees and tree products, knowledge of forest regulations, and attitudes toward Eaux et Forêts.

Both closed and open-ended questions were asked during the three-stage individual interviews. During the initial interview, each farmer provided information about his or her household's socioeconomic characteristics, production system, landholdings, and use of trees and tree products. The first interview was followed by visits to each parcel of land owned or managed by the farmer in order to obtain information about type of tenure, rights to trees and tree products, land uses, and conservation practices. At the same time, direct observations were taken on each parcel's environmental characteristics and tree cover. During the final interview session, the individuals were asked about their contacts with the Eaux et Forêts agents, their knowledge of the Forest Code, and their attitudes toward Eaux et Forêts.

II. ENVIRONMENTAL SETTING

The study area encompasses three distinct ecological zones: the Niger River floodplain, the Bandiagara plateau, and the Seno plain. The villages in the Fatoma study zone (Daka-Womina, Tiroguel, and Missira) and the Konna study zone (Djeninkore, and Bogo) are located either on the seasonally flooded Niger floodplain or on the sandy river terrace that borders the floodplain. The inhabitants of these two zones have access to both seasonally flooded rice fields and drier soils suitable for growing millet and sorghum. In contrast, millet and sorghum are the dominant crops in both the plateau and the Seno. Gardening is also an important activity in villages with adequate water during the dry season, particularly in the plateau and Seno.

All four study zones fall into the Sudano-Sahelian climate zone. The average annual rainfall varies from 400 to 600 millimeters per year. The short rainy season usually begins in June and ends in early October. However, the rains tend to be very unevenly distributed both spatially and temporally.

The ethnic diversity that characterizes the Fifth Region is reflected in the four study zones. In the plateau, the Dogon culture predominates. The Dogons are primarily farmers known for their ability to grow crops in a very unfavorable environment. The three villages in the Bandiagara study zone are inhabited mostly by Dogons.

In the Koro study zone, the major ethnic groups present are Dogons and Peulh. The Peulh are primarily livestock raisers, though many also own agricultural land. A symbiotic relationship between the Dogon farmers and the Peulh herders has developed in many parts of Koro Cercle. The three study villages in the Koro Cercle include two Dogon villages and one Peulh village.

In the Niger delta, the economy is based on three main activities: fishing, herding, and farming. For the most part, each ethnic group specializes in one of the region's three activities, but individuals often supplement their income by participating in one or both of the other activities as a sideline. The study villages in the Fatoma zone include Daka-Womina, a Bozo fishing village; Tiroguel, a Rimaïbe farming village; and Missira, a Peulh herding village. In Konna, two villages composed primarily of Malinke farmers and a few Bozo fishers were selected for study.

III. LAND TENURE IN THE STUDY ZONES

A. Levels of Control over Land Use Decision Making

Despite the ethnic diversity that characterizes the Fifth Region, certain land tenure characteristics are common throughout the four study zones. Control over land resources is exerted at four societal levels: state, village, extended family or lineage, and household or individual. Rights to land are defined both by the juridical system of laws and regulations promulgated by the Malian State and by the customary law at the village level. However, few families or individuals in the study zones have formalized their claims to land according to the process outlined in Malian Land Code. Except under unusual circumstances, land disputes tend to be settled at the village level according to customary procedures.

Customary rights to land operate at three levels: the village, the lineage or extended family, and the household or individual. Rights to use resources within a given geographic area are exercised at each level.

1. Village Rights to Land

Each of the pilot study villages has a certain geographical space, or "terroir," in which rights to land and other resources have been allocated to various members of the village and outsiders. However, not all villages exercise the same degree of control over the resources within their "terroir." A system of dependent, semidependent, and dominating villages exists. The dominant villages claim ownership of vast areas of land, including land occupied by other villages. Their claims may be based on the right of conquest or on the right of first settlement in the area.

Over time many villages have ceded to other villages the right to exploit the land and natural resources on parts of their territory. In some cases the dominant village still exercises considerable control over the ceded territory, while in other cases the dominant village has relinquished "de facto" its rights to the territory.

The tenure situation is further complicated by the existence of simultaneous but noncompeting claims by villages to different types of natural resources within certain spatial units. Thus one village may control the agricultural land in an area while a second village controls grazing rights and yet a third village controls fishing rights in the same space.

Among the eleven study villages, five villages (Doukombo, Kalibombo, Tagari-Peulh, Sengé-Bengé, and Bondo) have clear claims to their terroirs. Their claims are all based on the right of first settlement. Songho is largely independent but obtains a portion of its territory from Doukombo. Although Bogo also claims the right of first settlement, its claims were

weakened when the region was taken over by the Fulani clans. Djeninkore occupies territory under the control of the ruling family of Konza-Peulh. Daka-Womina, Tiroguel, and Missira all occupy land that is partially controlled by the neighboring village of Manako. In addition, the state entity, Opération Riz Mopti, has pre-empted traditional claims to much of the land situated within the territory occupied by these three villages.

Control over the village terroir is vested in the hands of the village headman or the village council. The headman, often acting in concert with the village council, allocates land not already distributed to families or individuals; settles land-resource disputes; and decides how village fields, forests, fishing grounds, and grazing lands will be utilized.

Five of the villages (Daka-Womina, Tagari-Peulh, Songho, Doukombo, and Kalibombo) have some land set aside for use as village fields. In Songho, Doukombo, and Kalibombo, the village fields are controlled by the village headman, who is in charge of making all land-use decisions. The fields are farmed by members of each family on a collective basis, and the produce is placed into a village granary. The product from the village fields is used to help needy families or to pay for villagewide needs.

In Tagari-Peulh, the village field is farmed collectively by members of the Comité des Jeunes. The Secrétaire Générale of the Comité makes

TABLE 2

Levels of Control over Land Use Decision Making

TYPE OF LAND	DECISION MAKER	FARMING OR USE UNIT
Village field	village headman or his designated representatives	farmed by villagers on a collective basis; crops used for village's needs
Lineage field	eldest male in the lineage	farmed on a collective basis by the lineage or lineage segment; crops used to satisfy lineage's needs
Household field	eldest male in the household	farmed on a collective basis by the household; crops used to satisfy household needs
Individual fields	individual farming the land	farmed by an individual; crops used to satisfy individual needs

agricultural decisions. The harvest is placed into a collective granary, and the proceeds from the sale of the crop are used to provide credit or to help pay for village needs.

The village field in Daka-Womina is farmed in a very different manner. All the families in the village have the right to farm a portion of the field, which is a small irrigated rice perimeter. Each family is responsible for its own plot of land. Each family pays a fixed amount of each harvest to the Comité de Gestion, which is charged with allocating water and with the maintenance of the motor pump that supplies the field with water.

2. Lineage, Household, and Individual Rights to Agricultural Land

Extended Family or Lineage Fields. Whether independent or dependent, each village has a system for allocating agricultural land to groups and individuals within the village and to outsiders. Villages of similar ethnic origin tend to have similar land allocation mechanisms, though differences may occur depending on whether the supply of land is plentiful or not. As a general rule, specific portions of the village terroir are allocated to the lineages or lineage segments that constitute the village. In all of the villages we studied, at least some of the lineage land is farmed on a collective basis by the members of the extended family that makes up the lineage or lineage segment. Land-use decisions are vested in the head of the lineage, usually the oldest male or his representative. Crops grown collectively are placed in the granary of the extended family, whose members generally eat together.

In four of the Dogon villages (Sengé-Bengé, Bondo, Doukombo, and Songho), the quartiers (neighborhoods) that make up the villages also control some cropland. The quartier fields are essentially supralineage fields since quartiers tend to be formed on lineage lines in these four villages. The phenomenon of quartier fields was found only among the Dogon villages. The fifth Dogon village, Kalibombo, has abandoned the quartier field system.

Household or Individual Fields. In most of the villages, the lineage or lineage segments temporarily allocate certain portions of the lineage land to specific households or to individuals who may or may not be members of the lineage. In addition, the lineage may allocate permanent use rights to individuals and households that make up the lineage or lineage segment. In such cases, the land is no longer farmed on a collective basis by the members of the lineage, and control over the land devolves to the individual or household level. Individuals can also obtain temporary use rights to farmland from other individuals or households.

Agricultural decisions for land farmed on a household basis are made by the head of the household, usually the oldest male member, while land-use decisions for land farmed on an individual basis (that is, by a woman or an unmarried man) are made by the individual. Crops grown on plots

farmed by the household are placed in a household granary, while crops grown by individuals within the household are placed in individual granaries.

In ten of the villages, it is possible for a person to farm both lineage land and household or individual land. The one exception is Daka-Womina, where the lineage land is divided if an individual decides to construct his own granary and farm his own fields. The system of dual access to land is also quite weak in the two Malinke villages, Bogo and Djeninkore.

Although men generally make decisions for land held by the lineage or the household, women make agricultural decisions on the plots they farm individually. Women commonly farm their own plots in the five Dogon villages and in Tiroguel, which is inhabited by former Peulh captives. Women in Daka-Womina (a Bozo fishing village), Tagari-Peulh (a Peulh herder village), and Djeninkore (a Malinke village) rarely farm their own plots. In Missira (a Peulh herder village) and Bogo (a Malinke village), only the Rimaïbe women farm their own fields.

3. Common Lands

Within most village terroirs, there are some lands that are managed by the village for nonagricultural purposes. Most of these lands are forests, scrublands, or grasslands and are used for pasturing animals or as a source of wild foods and raw materials. In some cases, the village traditionally had the right to exclude nonvillagers from using the village forest for certain purposes. Frequently rights to clear the land, harvest valuable fruits, and cut valuable tree species were reserved for villagers. Village control over such forests was disrupted by the French colonial administration, which set up a system of colonywide forest regulations and trained a police force to enforce the rules. Local control of forest resources was even further weakened with the passage and implementation of the Malian Forest Code.

All five Dogon villages in the sample had a tradition of regulated access to village forests, as did the Peulh villages of Missira and Tagari. Over time the ability of these villages to exclude outsiders from cutting in these forests has nearly disappeared. Tiroguel has historically had access to forest resources controlled by the neighboring village of Manako, which also has lost the ability to exclude outsiders. Neither Bogo, Djeninkore, and Daka-Womina has its own forests, and villagers in those settlements either purchase tree products or harvest products in forests belonging to other villages or in areas which were not traditionally regulated by other villages.

B. Methods of Acquiring Land

The following methods for acquiring agricultural land were identified during the village interviews: inheritances, borrowing arrangements, inter vivos gifts, state leases, sharecropping, rental arrangements, pledging,

and purchases. Table 3 shows the relative frequency of each access type in the study zones. People can inherit and borrow land in all eleven villages, and gifts of land occur in all villages but two (Tiroguel and Kalibombo). Gifts of land are theoretically possible even in Tiroguel and Kalibombo, but the scarcity of land has created a reluctance to give land away. Gifts of land are also rare in Doukombo, Missira, and Tagari-Peulh.

TABLE 3

Distribution of Possible Land Access Types in the Study Villages

ACCESS TYPE	# OF VILLAGES	% OF VILLAGES
Inheritance	11	100
Borrowing	11	100
Gift	9	82
Opération Riz lease (Fatoma area only)	3	27
Purchase (Tiroguel, Bogo, and Djeninkore)	3	27
Sharecropping (Daka-Womina and Tiroguel)	2	18
Rentals (Daka-Womina and Tiroguel)	2	18
Land pledges (Tiroguel and Doukombo)	2	18

Villagers in the Fatoma study zone (Daka-Womina, Tiroguel, and Missira) acquire significant amounts of land through state leases on the rice perimeters administered by Opération Riz Mopti. Daka-Wominans also have access to a small irrigated perimeter, which is managed by a village committee but is divided into parcels farmed by individuals or families.

Land purchases were reported in three of the eleven villages (Tiroguel, Bogo, and Djeninkore). However, villagers stated that purchases are rare. Land is generally sold only when most of the members of a large family have left a community, leaving the remaining members with an unmanageable area of land. Sharecropping and land rentals were reported in only two villages (Daka-Womina and Tiroguel), and even there such arrangements are said to be rare.

The variety of land access types was more limited among the individual informants. As indicated in table 4, over three-quarters of the informants had inherited at least one plot of land, one-third had borrowed land, and nearly one-quarter had received land as a gift. In addition, about one-quarter has access to land through agreements with Opération Riz Mopti. None of the informants sharecropped, rented, or pledged land, nor had any of the informants sold or purchased land.

1. Inheritances

Only men can inherit land. The heirs can choose either to farm the inherited land together or to divide it up. If the land is divided, the eldest heir is allowed to choose the first parcel. If the land is farmed as a unit, the eldest male of the family unit becomes the new decision maker.

TABLE 4

Land Access Types among the Study Informants

ACCESS TYPE	# OF PARCELS (n=89)	# OF INDIVIDUALS (n=21)
Inheritance	52 (58%)	16 (76%)
Borrowed	19 (21%)	7 (33%)
Gift	11 (12%)	5 (24%)
Opération Riz Mopti	7 (8%)	5 (24%)
Total	89 (100%)	*

* Total exceeds 100% since individuals may have several different types of access to land.

2. Gifts

If someone gives another person land as a permanent gift, all rights to the land, including the right to name heirs, are transferred to the receiver. Land gifts can be taken back only if the receiver commits a serious offense against the giver or against the village if the receiver is from another village. Women cannot receive permanent gifts of land in any of the study villages.

It is customary for the beneficiary to give his benefactor a portion of whatever he harvests from the land. However, only one of the five receivers of land gifts among our informants reported giving an annual payment to his benefactors.

3. Borrowing Arrangements

Borrowing land is a common method used by villagers to gain access to more or better land. Loans vary from very short term (one cropping season) to very long term (several generations). Although the length of the loan can be fixed, it is more likely to be left open. Among the nineteen parcels of borrowed land in our sample, none had been borrowed for a fixed period. The length of the loans ranged from two years to more than thirty years. Over half (68 percent) had been borrowed for more than ten years. Two informants borrowed additional plots on a seasonal basis only.

The lender has the option of taking back the land at any time after the crops have been removed. In theory, borrowed land cannot be inherited by the borrower's heirs. In practice, however, the borrower's heirs often continue the borrowing arrangement with the landowner. In our sample, two of the borrowers had inherited borrowing arrangements from their parents.

The distinction between a gift and a loan is difficult to determine if the loan rests in the same family for several generations. The main distinction is that in theory, the loan can always be taken back by the owner or his descendants, whereas land gifts cannot be taken back. However, if a loan continues through several generations, it may become difficult, if not impossible, for the owner's descendants to regain control of the land.

TABLE 5

Types of Payment for Rights to Use Borrowed Land

TYPE OF PAYMENT	# OF PARCELS	% OF PARCELS
No payment	10	52.6
Fixed payment	5	26.3
Unfixed payments	3	15.8
One-time fee	1	5.3
Total	19	100.0

In theory, borrowers are supposed to give the lender a token payment to acknowledge the lender-borrower relationship. In practice, however, borrowers rarely give a fixed payment and often give nothing at all. Among our informants, no payment was given for over half the parcels (52.6 percent), fixed payments were provided for 26.3 percent of the parcels, an unfixed amount was given for 15.8 percent of the parcels, and a one-time token fee was given for 5.3 percent of the parcels (see table 5).

The high percentage of no-fee loans is probably due in part to the fact that many women borrow land from close family members (husbands and brothers) and in part because land is relatively plentiful in some villages.

In the villages where women manage their own parcels, borrowing arrangements are the means by which women gain access to land. Generally women borrow from their husbands or, if they are from the village, from their father or brothers. However, women also borrow from nonhousehold members.

4. Acquisition of Land by Outsiders

In all four study zones, outsiders usually gain access to land through either gifts or loans of land. The rules governing land given to outsiders are the same as for villagers. In general, the newcomer obtains a gift of land from the village headman so that he can build a house. He often acquires cropland from the headman, though he may also borrow land from land-rich families in the village. If the outsider wishes to borrow land belonging to residents of another village, the headman of the host village will often intercede on his behalf. Land borrowed from the headman is generally considered more secure, as it may become a gift if the outsider marries and has children in the village.

IV. RIGHTS TO TREES

A. Inherited Land

Tree ownership is closely linked to landownership in the four study zones. Thus the person who owns the land also owns the trees on the land and could in theory exclude others from using the trees. The one exception we encountered to this rule was in Daka-Womina, where the person who plants a tree is considered the tree owner regardless of the tenure status of the land. Since tree planting in Daka-Womina occurs primarily within the confines of the village, it is not clear whether the tree-planter-as-tree-owner rule is actually applied on agricultural land.

In many West African countries, tree renting, tree pledging, and tree sharecropping are practiced. However, no such arrangements were reported in any of the study villages in the Fifth Region.

With the exception of landowners in Daka-Womina, a landowner theoretically has exclusive rights to plant, cut down, and prune trees on his land. In addition, he also has exclusive rights to harvest fruits on and off the trees as well as branches that have fallen to the ground. In practice, however, exclusive rights only to plant and to cut down trees are regularly enforced in the four study zones. The enforcement of pruning and harvesting rights varies according to the species, the size of the branches, the size of the tree, and the quantity of fruit on the tree. The owner's interest in using the tree himself or in having the tree on the land also affects the level of enforcement. For example, Rimaïbe farmers in Tiroguel do not approve of herders' cutting the Acacia albida trees in their millet fields because they consider the tree to be good for the crop. Yet they are willing to have the herders cut down the Acacia albida in their rice fields since they believe that the trees attract birds to the rice.

Some trees are considered more valuable than others, and rights to the valuable species are generally more strictly enforced than are rights to less important tree species. The important species vary according to the location and needs of each village, but in general the exotic fruit and less common local species that produce fruit or leaves used for human consumption are considered valuable in all the study villages. The following species were most frequently cited as valuable trees: tamarind, néré, baobab, karité, Vitex doniana, raffia palm, Lannea microcarpa, and all exotic fruit trees. As a rule, the tree owner reserves the right to cut or trim these trees. Even tree owners generally refrain from cutting highly valued trees, since the trees provide food and raw materials each year. Family members can usually harvest the fruit, but they sometimes need to get the household or family head's approval beforehand.

The landowner's rights to less valuable fruits are rarely enforced, provided that only small quantities are gathered. Nonfamily members are

generally discouraged from cutting live branches, particularly large ones. Fallen fruits and branches of most species are generally open to any passerby. Table 6 provides a summary of rights to trees on land inherited by the twenty-one informants and farmed by the owners themselves.

TABLE 6

Rights to Trees on Inherited Parcels Farmed by Landowners

RIGHTS TO TREES*	LOWEST LEVEL OF CONTROL			
	Owner	Owner's Family	Passersby	Total
Planting (n=42)	31 (74%)	11 (26%)	0 (0%)	42 (100%)
Cut down (n=37)	35 (95%)	1 (3%)	1 (3%)	37 (101%)
Lop branches (n=37)	27 (73%)	6 (16%)	4 (11%)	37 (100%)
Harvest valuable fruit (n=18)	9 (50%)	6 (33%)	3 (17%)	18 (100%)
Harvest non-valuable fruit (n=25)	1 (4%)	2 (08%)	22 (88%)	25 (100%)
Gather fallen fruit (n=29)	2 (7%)	4 (14%)	23 (79%)	29 (100%)
Gather fallen branches (n=34)	1 (3%)	9 (26%)	24 (71%)	34 (100%)

* Calculations do not include five parcels in Bandiagara on which we had no information about specific tree rights, nor an additional five parcels in other study zones which are not farmed by the owners.

1. Includes only parcels with trees.
2. Includes only parcels with "valuable" fruit trees.
3. Includes only parcels with "non-valuable" fruit trees.
4. Includes parcels with both valuable and nonvaluable fruit trees.
5. Parcels with only small saplings were excluded.

B. Borrowed Land

In all eleven villages, land borrowers theoretically do not have the right to plant trees without asking the owner's permission. Many landowners claim borrowers will use tree as evidence that the land belongs to them and not to the lender. In three of the villages (Missira, Tiroguel, and Daka-Womina), owners very rarely give permission for borrowers to plant trees on the grounds that a conflict over rights to the tree may arise if the owner decides to take back the land. The rule requiring owner authorization to plant trees on borrowed land appears to hold true in practice: on 79 percent of the borrowed parcels identified in the study, borrowers were required to get permission to plant trees. In two cases, the borrowers could plant any trees except fruit trees.

In theory, borrowers are also supposed to get permission from the landowner before cutting down any trees on the land. However, this rule is generally adhered to only when valuable species are concerned. Owners can also reserve cutting rights for themselves, but this is also fairly uncommon. Out of the seventeen borrowed parcels with trees on them, owners had reserved cutting rights to six of the parcels. Five parcels were borrowed by women whose husbands or fathers had retained cutting rights, and the sixth parcel was a garden whose owner had retained cutting rights to the fruit trees.

In most villages, borrowers are given the right to trim branches without getting the owner's authorization. Among our informants, the owner had retained trimming rights on only four parcels (21 percent).

The borrower usually has rights to harvest the fruits, though sometimes the owner will claim a portion of any highly valued fruits. As on inherited land, less important fruits, fallen fruits, and fallen branches can usually be gathered by anyone.

C. Gift Land

Rights to trees on gift land are transferred to the receiver. The receiver may plant trees on the land without asking permission from the giver. In addition, the receiver usually assumes the right to cut mature trees and gather important fruits.

An exception to this rule was found in Daka-Womina, where tree planters are tree owners. In Daka-Womina, givers of land sometimes reserve rights to both planted and naturally occurring trees. However, the receiver can plant trees on the land. Trees planted by the receiver belong to him and not to the giver.

Only eleven cases of land gifts were encountered among our informants. None included full rights to the trees on the land as part of the gift. The two other parcels are a special case that underlines the impact tree and land tenure rights can have on a farmer's willingness to

plant or protect trees. Both parcels were given to a man who moved to the village more than thirty years ago. Several years ago, a quarrel developed between the newcomer and one of the village leaders. The latter wished to take back the two parcels but was finally persuaded to let the matter drop. Nonetheless, the newcomer is afraid to plant any trees on the parcel for fear that the village council will take the parcel back.

D. Other Access Types

The landowner reserves rights to trees on sharecropped, rented, and pledged land. No cases were recorded among our informants.

When land is sold, all rights to the trees are transferred to the new owner. Again, no cases of land purchases or sales were recorded in our study.

E. Women's Rights to Trees

The trees located on a woman's field belong to the person who lends the woman the land. However, the woman has the right to use the trees and can trim small branches, gather fruits, and gather dead branches without getting permission from the landowner. Women can plant trees, but the trees revert to the owner if the owner decides to take back the land or if the woman leaves the area or dies. The owner usually reserves cutting rights to mature trees.

V. TREE PLANTING AND TREE PROTECTION IN THE FOUR STUDY ZONES

A. Tree Planting Behavior

The data obtained during the pilot study phase provide some indications about current levels of villager participation in tree planting and natural regeneration protection activities. As indicated in table 7, nineteen out of twenty-one farmers (91 percent) had planted

TABLE 7

Tree Planting and Protection of Regeneration in the Study Villages

A. Farmer Involvement in Planting and Protection of Trees

	# OF INFORMANTS (n=21)	% OF INFORMANTS
Farmers who plant trees	19	91
Farmers who plant trees in fields	12	57
Farmers who plant trees in concessions	18	86
Farmers who protect regeneration	18	86

B. Parcels and Fields Affected by Planting and Protection Activities

	# OF PARCELS/FIELDS	% OF CONCESSIONS/FIELDS
Concessions with planted trees (n=22)	19	86
Fields with planted trees (n=67)	22	33
Fields with regeneration (n=67)	50	75

trees on at least one parcel of land. There is, however, a strong tendency for farmers to plant trees in and around their concessions rather than in their fields. Only twelve of the twenty-one farmers (57 percent) had planted trees in fields compared to eighteen who had planted trees in concessions. Farmers had planted trees on nineteen of the twenty-two concessions (86 percent). In contrast, only twenty-two of the sixty-seven fields (33 percent) had had trees planted on them.

Although most of the farmers had planted some trees somewhere, the actual numbers of trees planted were quite small. Of the nineteen farmers who planted trees, eleven (58 percent) had planted fewer than five trees. Only twelve of the parcels (13 percent) had had more than five trees planted on them.

Tree-planting behavior varies considerably between the four study zones. The Dogon farmers in the Bandiagara plateau are much more active tree planters than either their Dogon and their Peulh neighbors in the Seno or the inhabitants of the Niger floodplain. Trees had been planted on eleven of the thirteen (85 percent) fields visited in Bandiagara. In contrast, only 29 percent of the fields in Konna, 19 percent in Koro, and 12 percent in Fatoma had had trees planted on them.

Transplanting seedlings was the propagation method most frequently used by our informants (see table 8). Direct seeding was also quite common. Only two of the farmers (11 percent) had grown trees from cuttings, and only one had ever done any grafting. One woman seeded trees indirectly by spreading compost which she knew contained baobab and Lannea microcarpa seeds on her fields. Only five farmers (26 percent) produced trees in mininurseries. The species produced in the mininurseries were neem, baobab and mangoes.

TABLE 8

Tree Propagation Methods Used by the Study Informants

PROPAGATION METHOD	# OF INFORMANTS (n=21)	% OF INFORMANTS
Transplanting	15	79
Direct seeding	9	47
Cuttings	2	11
Indirect seeding	1	5
Grafting	1	5

Neem, which was planted by 81 percent of the farmers, is by far the favorite species. The next most commonly planted species were baobab (33 percent), raffia palm (29 percent), and date palm (19 percent). Although neem was the most common tree planted in concessions, baobab and raffia palms were the species most commonly planted in fields.

When asked why they had planted trees on their concessions, the majority of people cited the desire for shade as a motivating factor. The second most common reason was to gain access to leaves used for treating illnesses. The high frequency for this response is probably due to the fact that neem, which is planted for its shade, has leaves that are used to treat malaria. The third most common reason given by informants for planting trees in concessions was to obtain access to food, mainly fruits.

TABLE 9

Reasons Given for Planting Trees in Concessions

REASONS FOR PLANTING TREES IN CONCESSIONS	# OF INFORMANTS (n=18)	% OF INFORMANTS
Shade	15	83
Medicine	11	73
Food	5	33
Wood	2	13
No information	1	7

The reasons for planting trees in fields differ considerably from the reasons for planting trees in concessions. The vast majority (92 percent) of the farmers who planted trees in fields planted them in order to get fruit or leaves for human consumption. The tree's value as a source of raw materials (leaves for mats, branches for furniture, bark for ropes, and the like) was cited as a motivating factor for planting trees by half of the informants. The third most common reason given was to improve soil fertility while shade ranked a poor fourth.

TABLE 10

Reasons for Planting Trees in Fields

REASONS FOR PLANTING TREES IN FIELDS	# OF INFORMANTS (n=12)	% OF INFORMANTS
Food	11	92
Craft materials	6	50
Soil improvement	5	42
Shade	3	25
Medicine	2	17
Live fencing	2	17
Windbreak	2	17
Delimit boundaries	2	17
Fencing materials	2	17
Fodder	1	8
Construction wood	1	8

The interest in planting trees for their food value is also reflected in the types of trees that farmers wish to plant in the future. Seventeen of the informants were interested in planting exotic fruit trees (mostly mango, papaya, and guava trees), and twelve were interested in planting local fruit trees (baobab, karité, raffia palm, néré, and tamarind). Ten farmers were interested in planting other exotics (neem and eucalyptus), but only three expressed an interest in planting local non-food species such as Acacia albida.

Nearly all of the informants had at least one field on which they did not plant any trees. The most common reason farmers gave for not planting trees in a field was that the trees would bother the crops either by making it more difficult to work the field or by competing for light and moisture. Too much water and not enough available labor were cited as reasons by three farmers. Farmers with fields in the floodplain said that too much water was a problem.

B. Encouragement of Natural Regeneration

Many farmers allow certain species to regenerate in their fields. The species most commonly allowed to regenerate were Acacia albida, Balanites aegyptica, Sclerocarya birrea, Combretum glutinosum, and Zizyphus mauritania. Acacia albida is valued for its pods and leaves which serve as fodder, for its soil-enhancing qualities, and for its thorny branches which are used for fencing. Balanites is also valued for its thorny branches; its leaves are used for fodder, its fruits are eaten, and the wood is used to make tool handles. Combretum is valued primarily as a shade tree in fields. Sclerocarya is valued for its fruits, while Zizyphus is desired both for its fruits and its branches, which are used as fencing material.

Protection techniques include: (1) avoiding trees when clearing or working fields, (2) weeding around saplings, (3) digging a water catchment at the base of the tree, (4) adding manure to the soil near the tree, (5) constructing protective fences, and (6) using poles to support young saplings.

Avoidance was practiced by all eighteen farmers who protected trees. However, only ten (56 percent) weeded around the tree base, and only five (28 percent) dug water catchments for trees. Three farmers protected regeneration with a fence or provided supports to keep the tree from bending too much. Ten of the farmers both avoided killing saplings and weeded around the tree. However, only five farmers avoided saplings, weeded, and built catchment basins. Four of the five farmers who used more than one protection technique were Dogons (two in Bandiagara, and two in Koro), while the fifth farmer was a Dimadio in Fatoma.

TABLE 11

Methods Used to Encourage Natural Regeneration

METHOD OF ENCOURAGEMENT	# OF INFORMANTS (n=18)	% OF INFORMANTS
Avoidance	18	100
Weeding	10	56
Water catchments	5	28
Supports	3	17
Fences	3	17

Natural regeneration was encouraged on fifty out of sixty-seven fields (75 percent). Balanites aegyptica and Acacia albida were the most likely to be protected, followed by Sclerocarya birrea, Combretum glutinosum, Zizyphus mauritania, and Acacia nilotica. Acacia albida was protected on 52 percent of the fields; Balanites, on 37 percent; and Sclerocarya, on 28 percent.

Sixteen of the eighteen villagers who encourage natural regeneration in their fields state that they were interested in the trees for their food value. The desire for shade was equally important. Other reasons cited for encouraging natural regeneration were, in order of frequency: fodder, fencing, construction wood, medicine, fuelwood, soil improvement, craft materials, and boundary markers.

TABLE 12

Reasons for Encouraging Natural Regeneration

REASONS FOR ENCOURAGING NATURAL REGENERATION	# OF INFORMANTS (n=18)	% OF INFORMANTS
Food	16	89)
Shade	16	89)
Fodder	11	61)
Fencing	10	56)
Construction wood	9	50)
Medicine	7	39)
Fuelwood	6	33)
Soil improvement	6	33)
Craft materials	4	22)
Boundary markers	1	6

C. Land Access Categories and Tree Planting Behavior

Table 13 summarizes land users' rights to plant and harvest trees on inherited, gifted, and borrowed land. However, these are general rules that may not hold true for all individuals. As a rule, farmers working

TABLE 13

Land Access and Rights to Trees

RIGHTS	INHERITED	GIFT	LONG-TERM LOAN	SHORT-TERM LOAN
Can designate heirs	yes	yes	yes	no
Risk of losing land	very low	low	low to moderate	moderate to high
Has right to plant trees	yes	yes	sometimes	usually requires owner's permission
Has right to cut trees	yes	yes	sometimes	sometimes
Has right to trim trees	yes	yes	yes	yes
Has rights to "valuable" fruits	yes	yes	yes	sometimes
Has rights to less valuable fruits	yes	yes	yes	yes
Can gather fallen branches and fruit	yes	yes	yes	yes

inherited fields have the right to plant trees without asking anyone's permission. Users of gift land have the right to plant trees without getting authorization from the giver. However, farmers working borrowed fields often need to get the owner's permission before they can plant trees. In addition, they sometimes need to get the owner's permission to cut, prune, or harvest the trees they plant. Given the reduced control that borrowers have to trees on the land they farm, one would expect borrowers to be less inclined to plant trees than nonborrowers.

Indeed, a comparison of the incidence of tree planting on different land access types indicates that borrowers are less likely to plant trees. Trees were planted on only 42 percent of the borrowed parcels compared to 50 percent of the inherited parcels and 64 percent of the gift parcels. The incidence of tree planting is highest on gift land, perhaps because tree planting helps the receiver solidify his claim to the land.

Among the farmers who had inherited land, 87 percent had planted trees on at least one such parcel. In contrast, only 42.8 percent of the farmers with borrowed land had planted trees on at least one of their

TABLE 14

Incidence of Tree Planting and Protection

ACCESS TYPE	# PARCELS WITH PLANTED TREES	# FIELDS WITH NATURAL REGENERATION
Inheritance	26 (50%) (n=52)	29 (78%) (n=37)
Borrowed	8 (42%) (n=19)	13 (81%) (n=16)
Gift	7 (64%) (n=11)	6 (86%) (n=7)
Other (Opération Riz-Mopti leases)	0 (0%) (n=7)	1 (14%) (n=7)

borrowed parcels. All of the farmers who had received land as gifts had planted trees on at least one of the parcel.

Natural regeneration was least likely to be encouraged on inherited parcels (78 percent) and most likely to be encouraged on gift parcels (86 percent). The relatively low percentage of natural regeneration on inherited land may be due to the fact that a higher proportion of rice parcels are inherited. Trees are less likely to be protected on rice lands because of the belief that trees attract birds to the rice.

D. Soil Conservation Techniques

The study informants employ a number of techniques to prevent soil erosion and to improve soil fertility. All twenty-one farmers allow animals to graze in their fields during the off-season. The only parcels, other than concessions, where animals are not permitted are gardens and the irrigated rice plots in Daka-Womina. Thirteen of the farmers (62 percent) applied manure to their fields. Manure was applied to twenty-seven of the sixty-one fields (44 percent) for which information on soil conservation was available. In addition, two farmers in the Konna area used a variation of the "zais" technique to improve soil fertility in their fields.

Eleven (52 percent) of the informants let entire fields or portions of fields lie fallow to restore soil fertility. Some fields had been in fallow more than five years, but a twoor three-year fallow was more

common. Nine of the farmers (43 percent) constructed either rock, earthen, or grass dikes across their fields to slow down water flow. The type of material used varies by zone: in Bandiagara, where rocks are plentiful, most farmers construct rock dikes; whereas in Fatoma and Konna, the main dike construction materials are earth and dead vegetation. Only seven (33 percent) of the farmers planted or protected trees in order to improve soil fertility. The tree most commonly used to improve soil fertility was Acacia albida.

TABLE 15

Soil Conservation Techniques Used by Study Informants

CONSERVATION TECHNIQUES	# OF INFORMANTS (n=21)	% OF INFORMANTS
Passive manuring	21	100
Intensive manuring	13	62
Fallowing	11	52
Dikes	9	43
Trees	7	33
Zais	2	10

VI. KNOWLEDGE OF THE FOREST CODE AND ATTITUDES ABOUT EAUX ET FORETS

The data presented above indicate that customary rights to land and trees affect how people use trees and influence their willingness to invest time and energy in planting and protecting trees. Another set of rules governing tree use and management, those set forth in the Malian Forest Code and enforced by agents of the Service des Eaux et Forêts, also affect how villagers use and care for trees both in their fields and in nearby forests.

The average Malian villager learns about the provisions of the Forest Code through word of mouth from messages passed on to village leaders by the local authorities, from the agents passing through the villages, or from friends and neighbors who have been fined for the illegal use of forest products. Villagers rarely have a copy of the Forest Code, and even if they did, few of them could read it. The opportunities for misunderstanding or being ignorant of the Code's provisions are plentiful. One of the objectives of our interviews was to determine what rights villagers think they have to tree products, both on their fields and in the surrounding forests. In addition, we wished to identify the major sources of conflict between villagers and the Service des Eaux et Forêts in the four study zones.

A. Learning about the Code

During the group interviews, each group was asked to explain how its members learned about laws restricting the use of trees and brush fires and requirements for cutting permits, improved wood stoves, and fishing permits. No information was obtained from the villages of Songho and Kalibombo.

In all nine villages, the village headman attends meetings at the arrondissement level where changes to the Forest Code are discussed. The headman then holds a village meeting to transmit the information to the rest of the villagers. Women are rarely present at the village meetings and usually learn about forest laws through their husbands. Agents passing through the villages on police missions occasionally discuss the law with village leaders or individuals, but this type of information exchange appears to sporadic rather than systematic.

Of the nineteen informants who provided information about how they learned about forest regulations, eleven said that they received their information from the village leaders (see table 16). Five received information directly from agents, three had heard of the rules by word of mouth, two attended the arrondissement meetings, and one had learned about the law from radio messages. A few individuals said that they had learned about the forest laws through more than one source.

TABLE 16

Sources of Information on Forest Regulations

SOURCES OF INFORMATION	# OF INFORMANTS* (n=10)	% OF INFORMANTS
Village leaders	11	58
Forest agents	5	26
Word of mouth	2	11
Arrondissement meetings	2	11
Radio messages	1	5

* Multiple responses possible.

The systematic delivery of information by agents was strongest in the cercle of Koro, where four of the five informants reported having heard about the regulations through meetings with an Eaux et Forêts agent. The only other informant who had received information directly from an agent was a resident of Daka-Womina.

B. Knowledge of the Code

Virtually everyone we talked to was aware that restrictions on tree cutting, de-branching, and tree mutilation exist. They also knew that brush fires are illegal, that wood stoves are required, and that governmental authorities have to approve the clearing of new farmland. All the informants knew where to get use permits, and many of the men were aware of the rates for the different types of permits and taxes. The women informants were aware of the broad provisions of the law, but were less likely to know how much individual cutting permits cost. However, further questioning revealed that many points of the Forest Code were not clearly understood and that there is a strong tendency to assume that all tree cutting and branch cutting is illegal. The following section summarizes how villagers perceive their rights to trees under the Malian Forest Code.

1. De-branching Regulations

The data collected during group interviews suggest that villagers believe that the cutting of all branches on live trees is against the law, regardless of the species, the size of the tree, the location of the branch on the tree, or the purpose for which the branch is cut.

TABLE 17

Villager Perceptions of Rights to Trees
(group responses)

ACTIVITY	YES	NO	UNSURE	NO RESPONSE	TOTAL
Branch cutting is illegal					
- in fields	17	0	1	0	18
- in forests	17	0	1	0	18
Cutting bark and roots is illegal	11	6	0	1	18
Permit is required to cut dead wood					
- for home use	4	14	0	0	18
- for sale	17	0	1	0	18
Permit is required to cut live trees					
- for home use	17	0	1	0	18
- for sale	17	0	1	0	18
Permit is required to cut live trees					
- in compounds	13	4	1	0	18
- in fields	17	0	1	0	18
- in forests	17	0	1	0	18
Permit is required to cut protected trees in fields	15	0	1	2	18
Permit is required to cut planted trees					
- in fields	9	5	3	1	18
- in compounds	7	7	3	1	18

Information on branch cutting was collected from eighteen groups (men's and women's groups in Kalibombo, Daka-Womina, Tiroguel, Missira, Sengé-Bengé, Tagari-Peulh, Bogo, and Djeninkore; and men's groups in Doukombo and Bondo). Seventeen of the groups believed that the cutting of branches for forage, fencing, construction, or other uses was forbidden both in fields and in the forest. The eighteenth group was unwilling to give a definitive response.

Most of the villagers stated that agents would fine people caught pruning branches that get in the way of their crops. However, one group felt that it was permissible to trim branches in household compounds, and another group stated that one could trim branches on trees that were over 2 meters high. Most villagers said that agents rarely fined people for cutting very small branches or for cutting small bushes or saplings.

2. Cutting Dead Trees

Fourteen of the eighteen village groups stated that it was legal to cut dead wood without a permit, provided that only a small quantity of wood was cut and provided that the wood was not sold in the market. The general feeling was that if an agent saw someone going home with a head-load of dead wood, he would not fine the person, but if he caught someone with a cartload, he would impose a fine. One case was cited of a villager who was fined for transporting one dead branch in a cart. The villager claimed that he had collected it after transporting manure to his field and was taking it home for firewood. Of the four groups which said that agents would fine people for cutting dead wood for home consumption, all were in areas where women collect firewood to sell in nearby towns. Seventeen of the village groups believed it was illegal to cut dead wood for sale without a permit. The remaining group was unsure.

3. Cutting Live Trees

Seventeen of the village groups believed that it was illegal to cut live trees without first getting a permit, regardless if the wood was for sale or home consumption. The remaining group was unsure about the regulations governing the cutting of live trees.

Seventeen of the groups felt that it was illegal to cut live trees in fields and in the forests. Four groups believed that trees in household compounds could be cut without a permit. The other groups believed that a person would be fined if he cut a tree in their compound without first getting a permit from Eaux et Forêts. One group cited an example of a resident who had been fined for cutting branches of a Balanites tree growing in his compound. According to the villagers, a child had fallen from the tree and broken his leg. The tree owner was cutting the branches to prevent more accidents when he was apprehended by a passing Eaux et Forêts agent.

4. Harvesting Bark and Roots

Eleven of the groups said that it was illegal to cut bark or roots. Six groups stated that it was legal to cut bark and roots, and the remaining group provided no response. Several groups added that a person could be fined just for carrying an axe. However, all of the villagers said that they continue to collect bark and roots secretly, since they need them for medicines, dyes, and crafts.

5. Harvesting Trees on Private Land

The data indicate that many villagers believe that a permit is necessary to cut or trim a tree, dead or alive, on their own land. One man cited a case of a neighbor who was fined for cutting a dead raffia palm in his compound. Another man said that he was afraid to cut dead raffia palms in his field because he did not have the money to pay for a cutting permit.

Eighteen informants answered questions about the need for cutting permits for trees located in their own fields. All eighteen stated that a permit was required to cut trees in their fields. One farmer, however, believed that one could trim certain trees, such as neems, without first getting a permit. A farmer in Konna expressed the general attitude about rights to trees on private land in the following words: "If I cut a tree in my field, they [Eaux et Forêts] will say that I stole it." Two informants stated that it was possible to get free permits to cut trees in one's own field, but that the tree cutter had to pay for the agent's transport to inspect the cutting site.

In general, the informants felt that agents were unlikely actively to seek out violations within the limits of the village, but that they would fine people if they happened to catch them in the act. In contrast,

TABLE 18

Perceptions of Rights to Trees
(individual informants)

ACTIVITY	YES (fee)	YES (no fee)	NO	UNSURE	TOTAL
Permit is required to cut trees in fields	16 (89)	2 (11)	0 (0)	0 (0)	18 (100)
Permit is required to cut trees you planted	11 (61)	3 (17)	1 (6)	3 (17)	18 (101)

most of the informants stated that agents would frequently fine field owners for branches or trees that had been cut in their fields, even if the agent had not seen the tree-cutter. The latter fines are felt to be very arbitrary since in many cases the field owner is not the culprit.

6. Harvesting Planted or Protected Trees

The Eaux et Forêts has initiated programs to encourage people to plant and protect trees in their fields and villages. However, our interviews indicate that villagers are very unsure of their rights to such trees. Seven of the village groups stated that a permit was required to cut trees they had planted. Two felt that a permit was not required for trees planted in compounds but was required for trees planted in fields. Five groups said that no permit was required, regardless of where the tree had been planted. Three groups were unsure, and one group gave no response.

Of the nine groups which stated that a permit was required to cut planted trees, only two believed that a free permit could be obtained. One group representative summed up the general feeling about free permits: "With Eaux et Forêts, there is no such thing as a free permit."

Fourteen of the eighteen individuals who answered the question about permits for planted trees felt that a permit was needed even if the tree cutter had planted the tree himself. Three individuals were unsure if a permit was needed, and only one felt that you could cut a planted tree without first going to Eaux et Forêts. Again there was a difference according to study zones. Three of the farmers in Koro were unsure if a permit was needed to cut planted trees, and one felt that a permit was unnecessary. All of the informants in the other study zones believed that a permit was required.

Eleven individuals stated that permits to cut planted trees were not free. Three individuals believed that permits to cut planted trees were free of charge. However, only one of the informants had ever actually received a free permit.

The villagers believed that cutting restrictions held true even if the tree cutter had permitted the trees to regenerate in his fields. Fifteen of the village groups stated that a permit was required to cut trees you had protected in your fields. One group was unsure if a permit was required, and no information was available from the remaining groups. Only one village group felt that it was possible to get a free permit to cut trees that had been protected.

Not only are farmers unsure of their rights to harvest trees that they protect or plant, but they are also unsure of their responsibilities for the seedlings provided by Eaux et Forêts. One farmer said that his neighbors were afraid that they would be fined if the seedlings they obtained from Eaux et Forêts died: "When they called us to get the young plants, the others refused to go. Everyone said that they were the

State's plants, and that if they died, we would be fined. But I got one anyway. I was one of the first." Until such doubts are resolved, villagers are unlikely to take part in reforestation efforts.

Similarly, rights to harvest collective woodlots are also not clearly defined in the minds of many villagers. Villagers in one group expressed their uncertainty about their rights to trees in their woodlot in the following way: "We have never used any on those plants. We don't even know what they are good for. We wouldn't even think of cutting any of their branches. We are too afraid of Eaux et Forêts."

C. Fines and Permits

1. Fines

An analysis of the number of types of fines imposed by agents can help identify the major sources of conflict between village needs and forest regulations. During the group interviews, the villagers were asked to cite examples of fines that agents impose on residents. The thirty cases cited fell into the categories listed below.

Sixty percent of the fines (18) involved branch cutting, an activity that is not necessarily harmful to the tree. Only three of the eighteen fines were imposed for commercial activities.

REASON FOR FINE	# OF CASES
Cutting branches for fencing	5
Cutting branches for fodder	5
Cutting branches for fuelwood (home)	5
Cutting trees for construction (home)	3
Clearing fields without a permit	3
Burning fields without a permit	3
Pruning trees	2
Cutting wood for sale	2
Cutting branches for check dams	1
Selling fish without a permit	1
Total	30

The individual informants were also asked to provide information about fines they had paid to forest agents. Only six of the twenty-one informants (29 percent) admitted to having been apprehended by forest agents. The following ten violations were cited:

REASON FOR FINE	# OF CASES
Cutting branches for fodder	4
Cutting branches for fencing	2
Cutting firewood (for home consumption)*	2
Setting a wild fire while clearing fields	1
Selling fish without a permit	1

* Note that both offenses involved the use of carts for transporting wood.

In all of the cases cited, the informants had been caught "en flagrant délit." Over half (60 percent) of the fines involved branch cutting. In only one case was the offender using forest or water resources for commercial purposes.

The amount paid for these offenses ranged from 1,000 CFA to 7,500 CFA. Seven of the fines were for less than 2,500 CFA, one was for 5,000 CFA, and two were for 7,500 CFA. Two of the informants had been fined more than once, and one informant had been fined three times for cutting branches. Ironically, the man who had been fined three times for cutting branches has personally planted over one hundred raffia palms as well as a large number of local and exotic fruit trees. He also protects Acacia albida saplings in all of his fields.

2. Permits

Only five of the twenty-one individuals had ever obtained individual use permits from Eaux et Forêts. Individuals had obtained permits for the activities listed in table 19.

TABLE 19

Types of Use Permits Obtained by the Study Informants

	# OF INFORMANTS	FREQUENCY
Cutting permit for animal corrals	1	often
Cutting permit for fish dams	2	yearly
Cutting permit for construction wood	2	often
Fishing permit	2	yearly

Of the sixteen informants who did not get individual use permits, eight said that they did not get permits because they were too expensive, six said that they did not cut enough wood to make a permit worthwhile, and two were absent from the village most of the year. One man who said that permits were too expensive also felt that the permit system was designed mainly to get money from people rather than to protect the forest resources: "The permits are just a way to exploit people. I'm not convinced that they are useful for protecting the forest."

3. Collective Permits

Five of the villages also have collective use permits that are available to village residents willing to share the cost of the permit. Bondo, Sengé-Bengé, Djeninkore, and Kalibombo have collective permits that allow villagers to cut and transport large quantities of firewood for home consumption or sale. In Kalibombo, the collective permit is issued to the village women, who have long had a firewood cutting association. The women are authorized to cut live wood, which they transport in headloads to the Bandiagara market.

In Djeninkore, the collective permits are issued to men belonging to village woodcutting or cart-driver associations. The men cut firewood in distant forest areas and transport it back to the village, where it is either sold or stocked for home consumption. In Sengé-Bengé and Bondo, the women contribute toward collective permits which authorize them to cut wood in distant forests and to transport it by cart to their villages. The wood is then stocked for home use during the rainy season.

Doukombo has a collective permit which allows contributors to cut branches for fencing during the gardening season.

Several other villages pay for short-term collective use permits. For example, the villagers of Missira purchased a collective permit to build an animal corral and another that authorized them to cut construction wood for a school building. Similarly, the residents of Bogo have purchased several short-term collective permits to build animal corrals. The villagers of Tagari-Peulh stated that they would be willing to pay for a collective permit to cut branches for animal forage but that so far, they have not been given that option.

When asked why so few people get individual permits, six village groups said that the permits were too expensive for most people. Three of the women's groups said that since the women cut very little wood, it is not worth their while to get a permit. One group said that the Eaux et Forêts office is too far away and that it is not worth the effort to go there only to discover that the agent is gone for the day.

One man noted that the only villagers who get permits are people whose activities are visible to the Eaux et Forêts agents: "People prefer to take the risk of being fined rather than pay for a permit. Only those whose work is visible are unwilling to take the risk." Thus people who

make fences, animal corrals, or fish dams, or who transport large amounts of wood are the most likely to get permits.

D. Villager Perceptions of Eaux et Forêts Agents

1. Perceived Changes in Eaux et Forêts Agents

Since the early 1980s, the Eaux et Forêts has become increasingly interested in extension forestry rather than focusing solely on forest regulation. To determine whether villagers' attitudes have been affected by this change in focus, we asked nineteen of the informants if their relations with the forest agents had changed during the last ten years. Twelve (63 percent) said that relations with the agents had gotten worse over time, four (21 percent) said that things were better now, and two (11 percent) said they were the same. One informant was not sure if relations were better or worse.

TABLE 20

Perceived Changes in Relations with Forest Agents

PERCEIVED CHANGE	# OF INFORMANTS (n=19)	% OF INFORMANTS
Relations are worse	12	63
Relations are better	4	21
Relations are unchanged	2	11
Not sure	1	5
Total	19	100

Among those who felt that the relations with agents had worsened, nine felt that agents asked for larger fines, seven said that there were more agents in the field so that the likelihood of being caught was higher, and seven said that agents were less likely to overlook small offenses now.

Of the four people who felt relations had improved, two said that agents fine people less often now, and two said that the agents ask for less money when they fine offenders.

TABLE 21

Reasons Cited for Worse Relations with Agents

REASONS CITED FOR WORSE RELATIONS	# OF INFORMANTS* (n=12)	% OF INFORMANTS
Fines are larger	9	75
Agents come more often	7	58
Agents less likely to overlook small offenses	7	58

* Multiple responses were cited by many respondents.

2. Perceptions of the Role of Eaux et Forêts Agents

During the course of the research, it became increasingly apparent that most villagers believed that the agent's only role is to enforce restrictions on tree cutting and fishing. Very few of the villagers talked of the agents in ways that would lead one to believe that agents provide advice and assistance on the proper use of natural resources. To gain a better understanding of what people think the Eaux et Forêt agent's role is, we asked eleven of the informants to explain their view of Eaux et Forêt's purpose. The responses fell into four major categories:

PURPOSE	# OF INFORMANTS* (n=11)	% OF INFORMANTS
To protect the forest	5	46
To make money/fine people	4	36
To make aware or teach	3	27
Don't see what use they are	3	27

* Note that some respondents cited several roles.

Of those who felt that agents were here to protect the forest, three added that while agents were good in theory, they abused their power. One farmer summarized this ambivalent attitude in the following words: "The Eaux et Forêts agent is here to maintain and protect trees and to teach

farmers how to protect trees. I feel they are useful in theory, but the way in which they do their work is not good. They need to be more sensitive and less repression."

Another farmer noted the discrepancy between what forestry agents should do and what they actually do: "What they should do is protect trees and teach people how to plant trees. But they don't. If it is their responsibility to protect trees, they shouldn't give permits that let people cut whatever amount of wood they want. Certain trees need to be forbidden, and the amount you can cut needs to be limited."

Eight village groups were also asked what they felt the role of Eaux et Forêts was. The responses fell into the categories listed on the following page.

Most of the groups felt that the agents were here to protect trees, but that they frequently abused their power and were ineffective protectors. This attitude was summarized by one representative: "They aren't effective; they don't really watch the forest. They only come out if they need money. But if they did their work, things would be worse for us because they would be in the field more often."

ROLE OF THE AGENTS	# OF RESPONDENTS* (n=8)	% OF RESPONDENTS
To protect the forest	7	88
To make money/fine people	5	63
To help people get wood	1	13
To make aware/teach	1	13
Don't know what purpose they serve	3	38

* Note that multiple responses were cited.

One group that had participated in phase I of the Village Reforestation Project in Bandiagara expressed a desire to have agents take up a greater teaching role: "In the past they came more often. They came to explain how to plant trees and to explain the importance of trees. They talked about caring for plants and how to cut wood. Now we no longer have these visits. We liked these sessions because we could see uses for trees we had never seen before."

3. Nonrepressive Contacts with Eaux et Forêts Agents

Information about nonrepressive contacts with Eaux et Forêts agents was gathered from nineteen informants. The types of contacts informants had with forest agents working in an extension capacity are summarized in table 22.

TABLE 22

Nonrepressive Contacts With Forest Agents

TYPE OF CONTACT	# AND % OF INDIVIDUALS (all zones) (n=19)	# AND % OF INDIVIDUALS (Koro only)* (n=5)	# AND % OF INDIVIDUALS (all other zones) (n=14)
Received inputs	11 (58%)	5 (100%)	6 (43%)
Planting advice	8 (42%)	5 (100%)	3 (21%)
Conservation advice	7 (37%)	5 (100%)	2 (14%)
Nursery advice	7 (37%)	5 (100%)	2 (14%)
No extension contacts	5 (26%)	0 (0%)	5 (36%)

* Multiple responses were possible.

Slightly more than half of the individual informants had received either seeds or seedlings from Eaux et Forêts agents, though some of the respondents had gone to get the seedlings themselves from central nurseries. Forty-two percent had received some advice on how to plant and care for trees. Only 37 percent of the informants had received advice about soil conservation and mininurseries. Extension contacts are concentrated in the Koro area, where all five informants had received inputs as well as advice on tree care, soil conservation, and nurseries.

With the exception of the informants in Koro Cercle, the informants had only limited contact with agents working in an extension capacity. Twenty-six percent of the informants stated that they had never had contact with agents working in an extension capacity, 47 percent had had infrequent contacts, and only 26 percent had had frequent contacts with extension agents. The five informants who had had frequent contacts with agents were all located in areas targeted by Eaux et Forêts agents working with the CARE/Koro project.

FREQUENCY OF CONTACTS	# OF INFORMANTS	% OF INFORMANTS
None	5	26
Infrequent (less than 5 times per year)	9	47
Frequent*	5	26
Total	19	99

* All five respondents were located in Koro Cercle.

4. Villager Perceptions of Alternatives to Eaux et Forêts

Although villagers frequently voiced their discontent with the current forest regulation system, many felt that if Eaux et Forêts were removed and nothing put in its place, the trees and forests would rapidly disappear. Fifteen of the informants were asked if they believed their villages could control abusive cutting if the Eaux et Forêts agents were not present. Seven of the informants felt that cutting could not be controlled, six felt that cutting could be controlled, and two believed that their villages could control cutting in the fields but not in the forest. Of those who felt that cutting could be controlled, five felt that rules could be enforced within the current village system, with the village headman placed in charge of fining offenders. The sixth person believed that his village would need more power to enforce cutting rules.

Some informants believed that self-interest, combined with enforcement at the village level, would be sufficient to prevent abusive cutting. This view was summarized by one young man: "People don't protect trees for Eaux et Forêts; they do it for themselves. Even if we got rid of Eaux et Forêts, people would protect the trees. Why do I say this? The Dogon doesn't cut trees that are useful to him. He can watch his fields but not the forest. But the Dogon wouldn't cut in the forest anyway. Even the Peulh wouldn't abuse the forest--they only cut branches to feed their animals."

One man believed that his village would have to be given greater authority from the arrondissement authorities in order to control cutting by strangers: "If Eaux et Forêts weren't here, we could guard our forest if we received authorization from the Chef d'Arrondissement. If he told us: 'Here is your forest, watch it yourself, protect it against abusive cutting', then we would have the power needed to enforce the rules. At the present time, we don't have this kind of power."

On the other side were those who felt that the villages no longer have the ability to supervise their forest resources adequately. One old woman stated the problem quite succinctly: "The villagers wouldn't be able to control tree cutting. We have Eaux et Forêts now, and people still cut trees in the fields. So if they went away, people would surely cut more, both in the fields and in the forest."

One woman informant felt that enforcement would be difficult since the village elders had lost their power: "In the past we had no Eaux et Forêts but the elders forbade the cutting of fruit trees and other useful trees. There is now no one here to advise and control. Cutting would have to be self-controlled if there were no Eaux et Forêts."

Part of the problem is that many forest areas have no clearly recognized "owner" with authority over the forest resources. At the present time, Eaux et Forêts regulates such areas. However, if Eaux et Forêts were removed, there would be no village that could legitimately assume control. This belief was expressed by a resident of Tiroguel, a village

which has never had any exclusive authority over the resources within its territory: "The villagers cannot control cutting in the forest. We are all equal; each is free to do as he wills. This applies to all trees. If there were no Eaux et Forêts, there would be no forest."

VII. Implications for Natural Resource Management Projects

The data collected during the village group and individual interviews indicate that both land and tree tenure rules influence the manner in which villagers in the four study zones use and manage trees. Natural resource managers for private and public organizations need to be aware of the tenure constraints likely to occur in the region in order to program activities and develop policies which take these constraints into account. The following section discusses the main tenure constraints identified during the study. Suggestions for overcoming or working within these constraints are provided.

Tenure constraints in the study zones fall into two major categories: (1) constraints posed by the customary land and tree tenure rules, and (2) constraints posed by the Malian Forest Code.

A. Customary Constraints

1. Village Level

At the village level, project staff need to be aware that there may be overlapping claims to land and forest resources within a given village's territory. Thus the villagers farming the land or using the resources may not be able to exclude certain outsiders from utilizing resources, and their right to use land for certain purposes may be limited by villages with superior claims. The types of agroforestry strategy that can work in a village will depend in part upon how strongly that village controls its land and tree resources. For example, projects that focus on encouraging collective actions are likely to encounter considerable difficulties in villages which depend on other villages for the right to cultivate land. The dominant village may feel that by planting trees, the users will strengthen their claims and eventually take complete control of the land. Alternatively, the dominant villagers may decide to take back land that has been made more productive through the application of agroforestry and soil conservation practices. Collective actions are also difficult to implement in dependent villages since such villages may have insufficient land to set aside for collective use.

The implementation of collective actions in dependent villages requires careful negotiation with both the dependent village and the dominant village leaders so that the rights of each village are made clear. In some instances it may not be possible to reach a mutually agreeable solution, in which case project efforts would be better spent encouraging individual actions.

The implementation of village forest management schemes, in which villages are given greater responsibility for forest resources in their territories, may also be more difficult in dependent villages, which may

never have had the right to exclude external users from those resources or to develop internal institutions capable of enforcing forest regulations. Even villages with reasonably strong control over forests within their territories may not have had the right to exclude certain outside users. In both cases, the different users of the forest need to be identified, and their rights to use the resources need to be clearly defined if villages are to be given greater control over forest resources. At the same time, all land-use decision makers, particularly the representatives of the technical services (that is, Eaux et Forêts, ODEM, and so on) and the local administrative authorities, need to be implicated in the development of village territory-management schemes. The participation of these authorities is crucial if one wishes to avoid undermining the village's newly gained authority over its resources. Thus, for example, the Chef de Cantonnement Forestier will be in a position to avoid delivering cutting permits to nonvillagers who wish to cut wood in the area covered by the management scheme.

2. Constraints at Family, Household, and Individual Level

A comparison of the incidence of tree planting on the different types of land indicates that families, households, and individuals farming borrowed land are the least likely to plant trees on the land they farm. In some cases the borrower simply does not have the right to plant trees; in other instances he or she can plant trees but loses all rights to the trees if the owner takes back the land. Certain segments of the population are more likely to farm borrowed land, notably women, young unmarried men, and immigrants, and are thus less likely to be interested in certain types of agroforestry action. The participation of women in agroforestry projects is particularly problematic, since their access to land appears to depend almost exclusively on borrowing arrangements.

To encourage borrowers to participate in agroforestry and conservation activities, one can adopt several strategies. One option is to negotiate an arrangement with both the borrower and the landowner that allows the borrower to benefit from the trees he or she plants without jeopardizing the landowner's claim to the land. Such arrangements are already made informally in some villages. Even if the owner does not object to the borrower planting trees, it is prudent to make a formal agreement (verbal or written) outlining the borrower's rights to the trees, so that conflicts will be avoided when the trees are ready for harvest.

Another option is to suggest technologies that provide benefits in the short term rather than strategies that presuppose long-term access to the land. The use of zais (holes dug in fields and filled with manure or compost), for example, can provide the farmer with a noticeable increase in production in just one season and thus is an appropriate strategy for people farming borrowed land. Windbreaks, woodlots, and living hedges, which yield benefits only in the long term, would be more appropriate for people farming inherited land. Actions most likely to be adopted by women would require only a minimum of investment in terms of time and labor would not depend upon long-term access to land.

From the standpoint of encouraging borrowers to plant trees, project staff should take advantage of the fact that not all trees are equally valuable. Thus landowners who object to borrowers' planting some types of trees may be amenable to other species or plantation configurations. Our data indicate that landowners are most likely to object to borrowers' planting exotic fruit species or local fruit species that are considered "orchard" trees. In contrast, trees that commonly occur in fields are more likely to be accepted. Thus one borrower in Doukombo cannot plant mango or papaya trees on the garden plot he borrows every dry season, but he is allowed to plant baobabs. The forester can also take advantage of the fact that bushes may be perfectly acceptable where trees are not. For example, a land borrower in Bogo has got permission to plant a live fence of Euphorbia and Parkinsonia around his garden plot, even though the owner will not allow him to plant fruit trees in the garden.

When selecting appropriate technologies for land borrowers, it is important to recognize that some borrowing arrangements are more secure than others. For example, a woman who comes from another village and borrows land from her husband or his brothers may feel less secure than a native woman who borrows land from her father or brothers. If the non-native woman divorces her husband, she usually returns to her own village and loses rights both to the land and to any trees she may have planted on the land. On the other hand, the chances are high that the native woman farming land belonging to her own relatives will continue to farm the land even if she divorces her husband and thus will retain certain rights to the trees on the land.

Similarly both male and female borrowers who have been farming the same plot for only a few years may be more reluctant to invest a lot of time and energy in planting trees or constructing soil conservation structures than borrowers who have used the same plot for thirty or forty years.

When trying to select appropriate agroforestry technologies to use on borrowed land, it is useful first to identify the rights that both owner and borrower have to the land and the trees. Does the borrower have the right to plant trees? If yes, what species and what configurations are acceptable to the owner? Does the borrower have the right to cut down trees? If yes, what species can he or she cut and under what circumstances? Does the borrower have the right to cut branches off the trees? If yes, what species and what size of branches? What rights does the borrower have to fruits on the trees? How long has the borrower been farming the land and how likely is it that he or she will continue farming the parcel in the future? Have there been any previous conflicts over the borrower's rights to trees on the land that might jeopardize any new plantations that he or she wishes to undertake? Once the rights of both parties have been determined, it will be easier to select technologies that are appropriate for the degree of control which the borrower has over the land and the trees.

B. Constraints at the State Level

The control which the Malian State exerts over forest resources also influences the willingness of villagers to adopt certain agroforestry techniques. Most villagers we talked with both fear and mistrust the forest agents, whom they view as repressive agents of the state and as interested primarily in how much money they can get for themselves. Their dislike of the agents is aggravated by the tendency of agents to interpret the restrictions on tree cutting very broadly.

Fines imposed for branch cutting appear to be the major source of conflict between villagers and forest agents. Although the cutting of branches is permitted under the Forest Code, provided that certain cutting methods are followed, the evidence indicates that foresters have a tendency to fine people for all branch-cutting activities. As a result, certain types of fodder, fencing materials, and construction materials can be obtained only at the risk of being fined. Legitimate tree-pruning activities to facilitate tree growth or to decrease tree-crop competition in fields are equally likely to engender fines. Yet if properly done, branch cutting does not destroy trees and in fact may be beneficial to the tree.

The need to pay for a permit to cut trees or branches that will be used for noncommercial purposes is another major source of conflict between agents and villagers. From the villagers' standpoint, the costs of the permits are too high relative to the benefits they receive from these products. At the same time, the risk of being fined for cutting small quantities is relatively low. Even if the villager is apprehended, the amount he pays to the forest agent is likely to be less than the cost of a permit.

The more frequently a villager cuts wood and the more visible his actions are, the more likely he is to pay for a permit, particularly if he is cutting wood for sale. Since the agents are unable adequately to control the quantities cut, a situation is created in which commercial woodcutters, who cut large quantities of wood, are given virtual carte blanche to cut trees, while tree cutting by home consumers, who generally cut only small quantities of wood, is highly restricted.

Villagers are not completely opposed to the idea of paying a fee to cut trees in the forest for firewood and construction materials they plan to sell in local markets. Their main objection to the permits is that the permits cost more than they can afford or are willing to pay.

The inability to cut trees, even dead trees, in one's own field is another major source of dissatisfaction among villagers. One village leader expressed this attitude in the following words: "You don't even have the right to cut a dead tree in your field. And it may have been you that planted the tree."

The fact that most villagers believe that they have very limited control over trees they have planted is very discouraging from the standpoint of encouraging greater participation in agroforestry activities. The tendency to plant trees in concessions rather than fields is probably due in part to the widespread belief that agents are less likely to fine people for cutting or trimming such trees. In contrast, most villagers feel they must pay for a cutting permit to cut or trim trees which they plant in their fields. Similarly, the overwhelming interest in planting fruit trees may be in part due to the fact that villagers know they can harvest the fruits without any authorization from Eaux et Forêts. In contrast, permits need to be obtained to realize any benefits from trees planted for their wood.

Even worse from an ecological standpoint is the fact that villagers believe that they have virtually no control over trees that they allow to regenerate in their fields. Villagers believe that authorization is required from Eaux et Forêts before they can cut down or even trim trees that have grown naturally in their fields. Many villagers observed that forest agents would not fine people for cutting or trimming back very small trees, but that they would fine villagers caught cutting larger branches, even if the branches were being cut to decrease tree-crop competition or to encourage the tree to grow more rapidly. From an agroforestry standpoint, in which one objective is to encourage activities that integrate crops and trees, such restrictions on branch cutting make no sense. Worse yet, the restrictions encourage farmers to remove young trees before the plants reach the stage where the farmer risks a fine for trimming them back.

The research conducted in the cercles of Mopti, Bandiagara, and Koro suggests that, in effect, villagers are required to get authorization from Eaux et Forêts legally to cut or trim any trees. This restriction of individual rights to trees does little to encourage either the planting of trees or the protection of natural regeneration on cultivated land. The villagers are being given a contradictory message: On the one hand, the forester demands that the villager plant trees, and, on the other, hand he fines the villager for using the trees he has planted.

To give people a greater incentive to plant trees, CARE/Koro and the Cantonnement Forestier of Koro have made a point of letting villagers know that they are entitled to a free permit to cut trees that they have planted. The Cantonnement Forestier of Djenne, working in conjunction with CARE/Djenne, has recently instituted a system of free permits that allow villagers to prune or cut trees which they regenerate in their fields.

In theory, the free-permit system appears to offer an easy solution to the problem of giving people the incentive to plant and protect trees while avoiding the massive cutting that many foresters feel would occur if individuals could cut or trim trees on their own land without authorization. However, the problems of a free-permit system are considerable.

First, very few people seem to be aware that free permits are available. The tendency is to assume that if a permit is required, one has to pay for it.

Second, it is not clear that the permits are in fact really free. The villagers who said that free permits could be obtained noted that the villager requesting the permit was responsible for paying the agent's transport costs to inspect the cutting site. Given the cost of fuel and the distances between most villages and the Eaux et Forêts posts, transport costs are likely to amount to at least several hundred francs. At the same time, the villager has to take the time and effort to locate the agent, not always an easy task since agents frequently go on police missions for several days at a time.

Third, for the free-permit system to work, farmers would need to be able to get the permits reasonably quickly. Unfortunately, the need for farmers to trim branches is great while the number of agents is quite small. At current staffing levels, the forest agents are unable properly to supervise regular permit users. To expect them to deliver a significant number of free permits, in addition to their other duties, is completely unrealistic.

The idea that a permit system is required for people to cut or trim trees on their own land presupposes that villagers do not recognize the usefulness of having trees on their land. Our research indicates that the opposite is true. Without exception, all of the informants cited a long list of uses for both local and exotic species. Most of the informants deliberately allowed certain species to regenerate in their fields because of their desire to have ready access to a number of tree products. In addition, certain trees are kept for their shade and others are valued for their ability to improve soil fertility. Trees such as Balanites aegyptica and Acacia albida, which compete very little with crops while providing many desirable materials, are allowed to grow in many fields. Even a certain number of trees that compete with crops for light and water but that also provide highly valued fruits or leaves are encouraged by farmers. The integration of trees and crops is particularly evident in the Bandiagara plateau, where the Dogon farmers actively plant and protect trees in their fields and gardens.

The following statement made by one of our Dogon informants points to a possible solution to the problem of regulating tree cutting on fields: "The Dogon doesn't cut trees that are useful to him. He can watch his fields but not the forest." Though the above statement referred to Dogons, the information gathered in Peulh, Rimaïbe, Malinke, and Bozo villages suggests that the statement applies as well to other ethnic groups. In every village we visited, certain tree species were considered valuable enough to warrant protection. In general, the highly valued trees were fruit trees, though other trees such as Acacia albida and Acacia nilotica were valued in some villages.

Several of the villages had once had a traditional forest police system, which regulated the cutting of certain species in both field and forest areas. Most of the villages still have some type of internal system for regulating tree use-conflicts among villagers and between outsiders and villagers. The information collected on tree rights also suggests that most villagers are likely to enforce their customary rights to cut and trim trees in their fields as much as they can. Thus the evidence indicates that people are willing to protect and plant trees, provided that they consider the tree useful.

The task of the forester is thus to demonstrate convincingly that trees in fields are useful. To demonstrate this, foresters will need to do more than merely explain why trees are useful. Most villagers already know that trees are useful. One of the biggest problems is that the way in which the Forest Code is applied tends to make otherwise useful trees a nuisance.

At the same time that foresters restrict the benefits that villagers can enjoy from the trees in their fields, they fail to provide adequate advice on how to produce, manage, and harvest trees. For example, few villagers receive any advice on what trees to plant and how to plant them. Even fewer people receive any advice on how to protect naturally occurring trees or how to prune trees properly. Very few of the villagers are aware that free permits can be issued for harvesting trees that they have planted. To be effective, the forester needs to show villagers how to integrate trees and crops more closely and, equally important, needs to apply the law in ways that permit villagers to benefit from their efforts.

VIII. Additional Research Activities

During the pilot study phase, a great deal of information was collected about land and tree tenure, tree use, and tree management. Information was also gathered about the types of contact villagers have with forest agents and the villagers' perceptions of their rights and responsibilities according to the Malian Forest Code. To determine the extent to which the case study information is representative of the study zones, a sample survey was conducted in each zone during the months of August and September 1990.

The sample survey data will be analyzed to see whether the patterns identified by the case studies are present at a more general level. In addition, the larger sample will enable us to make more accurate comparisons between land and tree use behavior in the different zones. The information will also be used to compare the differences in tree planting and protection behavior for villagers who reside in areas targeted by the VRP and CARE/Koro and villagers who live in areas with no substantial extension component in the forestry sector.

The information about villager perceptions of the Forest Code and their relations with Eaux et Forêts agents will be complemented by a survey of the Eaux et Forêts staff working in the study zones. The data from the Eaux et Forêts survey will provide the forester's viewpoint of the difficulties of applying the law, the major sources of conflicts between agents and villagers, and suggestions for encouraging more intensive use of agroforestry techniques.

APPENDIX

Description of Research Areas:

Fatoma Arrondissement, Koro Cercle, Konna Arrondissement

PART I. ARRONDISSEMENT OF FATOMA

A. Description of the Research Area

1. Study Sites

The pilot studies in the Fatoma Arrondissement took place in the villages of Daka-Womina, Missira, and Tiroguel. All three villages have participated to some extent in government-sponsored reforestation activities. From a socioeconomic standpoint, the villages represent the three main production systems found in the arrondissement: Daka-Womina is inhabited primarily by Bozo fishermen; Missira is inhabited mainly by Peulh herders; and Tiroguel is inhabited exclusively by Rimaïbe farmers. A brief discussion of the geographical setting for these three villages follows.

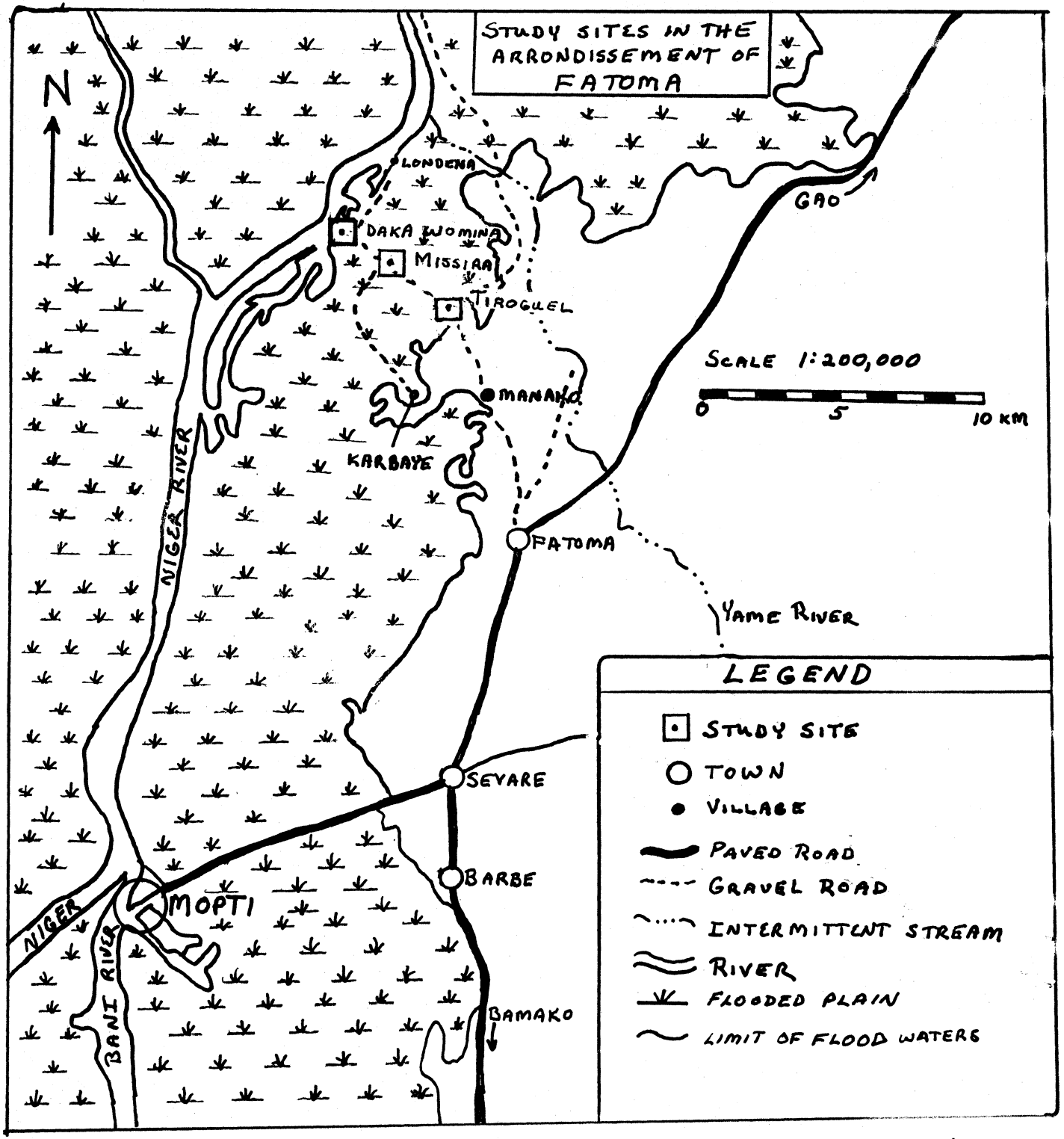
2. Physical Geography

The Fatoma Arrondissement is located along the eastern bank of the Niger River, just north of the confluence of the Bani and the Niger rivers. Three major landforms are found in the arrondissement: the seasonally inundated floodplain adjacent to the Niger River, the noninundated plain above the flood level, and the western edge of the sandstone escarpment known as the Bandiagara plateau.

The flat topography of the inundated plain is broken by occasional small hills, or toggere, that remain above the floodwaters. Year-round villages and seasonal encampments in the seasonally inundated plain are concentrated on or near the toggere. Except for the sandy soils of the toggere, the soils on the floodplain are predominantly silty clays. Flooded rice is the predominant agricultural crop in the area, though millet is planted in the sandy zones above the flood level. The river and the seasonal ponds are rich in fish resources. During the dry season, the floodplain grasses are an important food source for livestock. Two of the study villages, Daka-Womina and Missira, are located in the seasonally inundated zone.

To the east of Missira and Daka-Womina lies the dry river terrace that forms a buffer zone between the inner delta and the Bandiagara plateau. Intermittent watercourses, notably the Yame River and its tributaries, break up the mostly level terrace. Lateritic clay soils are interspersed among the predominantly sandy soils found on the terrace. Millet and sorghum are the predominant cereal crops in the terrace zone. A variety of other crops, including cowpeas, peanuts, and hibiscus, is grown for home consumption and sale. Settlements in the arrondissement are concentrated in this terrace zone. Tiroguel, the third study village, is located on the edge of the dry river terrace.

The Fatoma Arrondissement is located in the Sudanian climatic zone and has an average rainfall of between 500 and 600 millimeters per year.


STUDY SITES IN THE ARRONDISSEMENT OF FATOMA
N
LONDENA
DAKA WOMINA
MISSIRA
TIROGUEL
GAO
SCALE 1:200,000
0
5
10 KM
MANAKO
KARBAYE
NIGER RIVER
FATOMA
YAME RIVER
LEGEND
STUDY SITE
TOWN
VILLAGE
PAVED ROAD
GRAVEL ROAD
INTERMITTENT STREAM
RIVER
FLOODED PLAIN
LIMIT OF FLOOD WATERS
SEVARE
BARBE
MOPTI
NIGER
BANI RIVER
BAMAKO

The rainy season begins in June and normally ends in September. The uneven distribution of rainfall causes great variation in yields from year to year. The presence of the seasonally flooded river plain, which extends the otherwise four-month cropping season to six months, enables the area to support relatively more people than would otherwise be possible.

In recent years, however, the area has experienced a decrease in the height of the floodwaters as well as periodic drought. As a result, much land that was formerly planted in rice is no longer cultivated at all. At the same time, the size of the animal herds declined drastically during the drought of the mid-1980s, and the fish harvest has declined with the water level of the Niger.

The tree cover found in and adjacent to the villages varies considerably. Virtually no trees are found on land subject to seasonal flooding. Residents typically remove all woody vegetation when preparing the rice fields. The farmers feel that trees and bushes attract birds, which then consume large quantities of rice before it can be harvested. Rice lands left in fallow support a sparse cover of naturally regenerated Acacia species, Calotropis procera, and Zizyphus mauritania.

In contrast to the almost bare fields near Daka-Womina and Missira, the millet fields near Tiroguel support stands of Acacia albida and Balanites aegyptica. Scattered Tamarindus indica, Ficus gnaphalocarpa, Ficus platyphylla, Acacia nilotica, and Acacia seyal are present as well. Two small "forests" separate the villages of Missira and Tiroguel. The main species in these forests are Diospyros mespiliformis, Landolphia, Zizyphus mauritania, Tamarindus indica, and Borassus aethiopum.

3. Cultural Geography

The arrondissement capital is Fatoma, a large village located approximately 10 kilometers south of Tiroguel. Fatoma is the most easily accessible market center to the three villages, and most villagers attend the weekly market to sell their crops, livestock, and handicrafts and to purchase food and dry goods unavailable in the village. Most of the fish caught in Daka-Womina are sent by bush taxi to the fish market in Mopti, 20 kilometers to the south. All three villages are linked to Fatoma by a gravel road that is passable year-round. Representatives of the major government services, including ODEM, Eaux et Forêts, and the SDA, have offices in Fatoma.

From a cultural standpoint, the Fatoma Arrondissement is quite diverse. Peulh speakers, including "true" Peulh and their former Rimaïbe slaves, predominate, but there are substantial numbers of Bozo fishermen as well as scattered settlements of Marka, Bambara, and Dogon farmers. Since the 1984/85 drought, a number of nomads (Tuareg, Sonrhai, and Maures) have settled permanently in the area, and groups of Bozos, Bellas, and Peulhs continue to migrate into the area on a seasonal basis.

All three villages have strong links to the nearby village of Manako, the canton capital under the French. Tiroguel is considered a quartier

of Manako, though it is geographically and culturally distinct from the larger village. Daka-Womina is officially composed of three settlements: Daka-Womina, Daka-Londena, and Missira. Although Missira is now officially considered to be a quartier of Daka-Womina, in the past it was an independent entity and remains geographically and culturally distinct.

4. Economic Activities

The three major economic activities of the inner delta--fishing, herding, and farming--are fully represented in the Fatoma area. For the most part, each ethnic group specializes in one of the three activities while supplementing its income by participating in one or both of the others as a sideline.

The Bozos of Daka-Womina make their living by fishing both on the Niger River and in the seasonally flooded ponds that appear during the rainy season. Many Daka-Wominans also grow rice and vegetables to supplement their food supply and income. The relative importance of rice farming has increased considerably since the successful development of a year-round irrigated rice perimeter north of the village. Wealthier residents own livestock but generally leave the animals in the care of their Fulani neighbors at Missira.

In contrast to their Bozo neighbors, residents of the Rimaïbe village of Tiroguel rely on farming for food and income. Millet and sorghum are the major crops. Rice was the primary crop in the past, but the declining high water levels have caused many Tiroguellians to abandon their rice fields. As in Daka-Womina, the wealthier residents also raise livestock. The sheep and goats are kept by a village herder, but the cattle are generally cared for by Peulh herders from Missira. Only a few residents fish on more than a sporadic basis. Remittances from migrant workers are an important source of income to local villagers. Most of the young males take part in the dry season exodus to Segou, Bamako, and Abidjan.

For the Fulani residents of Missira, livestock raising is by far the most important economic activity. Women specialize in sheep raising, while men raise cattle and goats. The younger men take part in the yearly transhumant trek with the village cattle. The sheep and goats remain in the village vicinity year-round. Most families in Missira also grow millet but on a relatively small scale. Milk is often exchanged for grain and fish. Missirans also take part in the collective fishing activities controlled by the Daka-Wominans, and some individuals fish the small seasonal ponds during February and March.

5. Women's Economic Contribution

In all three villages, women contribute substantially to the family's food supply and income. Aside from the usual women's activities of child care, firewood gathering, and water hauling, most women also participate to some extent in their village's economic specialization. Women in Daka-Womina not only catch their own fish in fish traps but also smoke and sell both their own and their husbands' fish. Although the bulk of

the rice farming is done by men in Daka-Womina, Bozo women both help their husbands in the fields and plant, weed, and harvest their own vegetable gardens.

In Tiroguel, most women help their husbands in the family fields and also work their own individual fields. Because of the high out-migration rate among adult males, many women must now clear and prepare fields, tasks that were traditionally reserved for males. Women also supplement the family grain supply by gathering and processing wild rice found in the swampy lowlands between Womina and Londena. The processed rice is then sold in Fatoma, and the money is used to buy fish and fruit. Women also gather firewood to barter for fish in Daka-Womina.

Except for the women of the village's two Rimaïbe families, the women in Missira do not take part in agricultural activities. The production of cotton and woolen thread is the main economic activity for the Fulani women. Women with access to milk cows sell or barter the milk in neighboring villages. Women in the wealthier families also raise sheep.

Unlike their Dogon counterparts in the Bandiagara plateau, the women of these three villages rarely collect fruits and other tree products for sale. The women of Tiroguel used to sell firewood in Mopti, but there is no longer a large enough supply in the area to make commercial firewood gathering a viable economic activity.

6. Land Tenure Systems in the Fatoma Pilot-Study Villages

Historical Tenure Relations. Each of the study villages has its own internal land tenure system governing the allocation of land to village residents and outsiders. However, access to land is heavily restricted by superior rights on the part of the nearby village of Manako and the Malian State.

The three villages occupy land that was historically under the control of the village chief of Manako. In the past, the three villages paid tribute to the leaders of Manako for the right to farm the land. At present, the tribute payments are largely token payments, which serve as a reminder of the true ownership of the land. Fishing rights to the seasonal ponds, however, were vested in and continue to be controlled by the chief of Daka Womina. Grazing rights to the bourgoutières in the immediate area were controlled by the chief of Missira. Of the three villages, Tiroguel had the least control over local resources since the villagers had access to land, fishing ponds, and grazing areas only through arrangements with third parties.

The Shift from Private to State Control of Land Resources. The traditional relationship of villagers vis-à-vis the land was drastically changed in the 1970s when the government of Mali asserted its control over the majority of the land between the national highway and the right bank of the Niger River. In 1972, Opération Riz Mopti was given a mandate to develop a controlled irrigation scheme along the right bank of the

Niger. The state exercised its right of eminent domain to take over land once under the control of local village chiefs and the Fulbe clans. After building a series of dikes and gates to control the level of water entering and leaving the perimeters, the state divided the land into 1-hectare plots. A land-leasing system was developed, with surrounding villages being given preferential access to the irrigated plots in their area. Farmers unable or unwilling to pay the annual "redevance" or use fee of 12,500 CFA per hectare lose their rights to the land. Villagers have noted a tendency for the best lands to become concentrated in the hands of civil servants and wealthy merchants who can afford to pay the redevance each year, even if yields are poor.

The decline in the Niger River's flood level has adversely affected land productivity and thus the value of the land in much of the study area. Land close to the river continues to be highly productive and is highly sought after. However, more distant rice fields receive little if any water and are left in fallow since the soils are not appropriate for other crops. Most of the dry fields are still registered to villagers, though the users need not pay the redevance if water does not enter the fields.

A large plot of land no longer subjected to flooding has been transferred to ODEM (Opération de Développement d'Elevage à Mopti), a government agency charged with improving pastures and herding practices in the Fifth Region. ODEM seeds the area with forage grasses with the help of nearby villagers. ODEM regulates grazing on the area and charges users a daily use fee for the right to pasture animals on the parcel. In effect, ODEM has taken over the grazing rights that once belonged to the village of Missira, while ORM has assumed the land allocation functions formerly carried out by the leaders of Manako.

B. Tenure Systems in Daka-Womina, a Bozo Fishing Village

1. Land Tenure

The most important characteristic of the land tenure system in Daka-Womina is that either the state or more powerful neighbors exercise superior claims to all agricultural land. Land located within the dikes built by ORM is controlled by the state while land located outside the dikes belongs to the village of Manako. The potential insecurity of the tenure system is, however, not as great as one might suppose at first, since land borrowed from Manako can be passed on to one's heirs. Similarly, ORM has a policy of transferring parcels to the deceased's eldest heir.

Three basic categories of land are present in Daka-Womina: land that is used and controlled by the village as a whole, land that is used and controlled by families, and land that is used and controlled by individuals.

Village Land (PPIV, Petit Perimètre Irrigué Villageois). The village-held land of Daka-Womina is a relatively recent introduction. The land is a small irrigated rice perimeter developed with technical assistance and funding from Opération Riz Mopti. A small motor pump is used to supply the field with water on a year-round basis. The perimeter was started in 1987 and has proved quite successful. At the present time, the villagers pay no fee to ORM for the right to use the land.

Originally the project had called for the collective farming of the land within the perimeter. However, the villagers opted instead to divide the land into small individual plots. Each user must give 100 kilograms of rice to the village management committee after each harvest. Any excess production belongs to the individual in charge of the plot.

Financial and water allocation decisions are made by a village management committee with the help of an ORM technician stationed in the village. Canal and dike maintenance is performed on a collective basis. Each household head in the village is allocated 0.1 hectare for each working male member of the household, with a maximum holding per household of 1 hectare.

In theory, only men have access rights to the parcel. However, the village headman's wife currently farms 0.5 hectare for herself (the land is registered in the name of her two sons, both of whom are "en exode"). Rice is the major crop grown in the PPIV. Holders also grow manioc, corn, and garden vegetables in small quantities.

Villagers are not permitted to plant trees on the plots within the perimeter. However, the village as a whole has planted several rows of eucalyptus trees around the perimeter to serve as a windbreak. Once the trees are large enough to harvest, the wood will be sold and the profits deposited in the perimeter's treasury. The eucalyptus leaves can be collected by anyone, as can the fallen branches. The perimeter management committee must be consulted before any branches can be cut.

Family Fields. Most fields located outside the small perimeter are managed on an extended family basis. Control of these fields lies in the hands of the head of the extended family. He either makes use decisions himself or delegates decision making to another family member. The land is farmed on a collective basis by the extended family, and the crops are placed in a family granary, which is controlled by the family head.

Individually Farmed Land. Rice fields are rarely farmed on a purely individual basis, or even on a nuclear family basis, unless a severe quarrel forces the families apart. Unlike the Dogons, who frequently have both an extended family and an individual household granary, Daka-Wominans have one or the other but not both. In contrast, vegetable gardens are often managed by individuals, who are then free to dispose of the produce as they wish.

2. Land Acquisition by Native Daka-Wominans

Inheritance (Khen). Family-held land is passed onto the deceased's surviving brothers and sons. Normally the eldest male assumes control of the land. Any individually held fields or gardens are passed onto the deceased's sons. If the deceased has no grown children, his wife usually assumes control of the land until the children are old enough to manage the land themselves.

If the deceased's heirs decide to divide the family holding, the land is divided equally among the male members of the family. However, the eldest male is allowed to choose the first parcel.

Gifts (Donkoro). Inter vivos gifts of land are sometimes made. Gifts of land cannot be taken back except under exceptional circumstances. The person receiving the gift assumes all of the giver's decision-making authority over the land. Upon the receiver's death, the donkoro is passed on to his heirs. Generally the beneficiary of a land gift is not required to provide any payment for the right to manage the land. However, it is customary for the beneficiary to give his benefactor a portion of whatever he harvests from the land. The beneficiary's heirs will often continue to give token presents to the benefactor's descendants.

Loans (Khaliba). Land is loaned to both men and women. The length of the loan can vary from one season to many years. The loan period is usually fixed in advance, and most loans can be renewed once the original term is finished. In theory, borrowed land cannot be inherited by the borrower's heirs. In practice, however, the borrower's heirs often continue the borrowing arrangement with the landowner.

The line between donkoro and khaliba becomes very fuzzy if the khaliba rests in the same family for several generations. The main distinction is that in theory, the khaliba can always be taken back by the owner or his descendants, whereas the donkoro cannot be taken back. However, if a khaliba continues through several generations, it may become difficult, if not impossible, for the owner's descendants to regain control of the land.

Unlike the donkoro, where payment is not required for the right to manage the land, the khaliba is subject to a yearly payment. The exact amount is generally unfixed, but something is required. A borrower who fails to render the token payment risks having the land taken away.

Sharecropping (Kemema). A form of sharecropping also occurs among the Daka-Wominans. Under the kemema arrangement, a person with excess land will give another villager land to farm. The user provides all inputs and splits the harvest with the owner on a fifty-fifty basis.

Other Types of Land Access. In rare cases, a person in need of money will rent his land to another villager. Rentals are done on a yearly basis only. Land is rented out only as a last resort, because

renting is considered a shameful practice. No instances of land pledging or sales were encountered in the village.

3. Land Acquisition by Outsiders

Newcomers to the Daka-Womina area can obtain land in two ways: through gifts, or through loans. An outsider is supposed to approach the village headman in order to obtain land controlled by the headman or other village residents. The headman will also intercede on the outsider's behalf if he wishes to use land belonging to residents of another village. If the outsider decides to become an official village resident by inscribing his name on the village tax rolls, land lent to him by the chef is considered a gift instead of a loan.

Daka-Womina has no village forest or community pastureland. Consequently, the villagers' control over forest and grazing resources in the area is very limited.

4. Rights to Trees in Daka-Womina

In Daka-Womina, control over land does not necessarily entail control over the trees on the land. On inherited land, the person who plants a tree is considered the owner of the tree. If the land is later divided up, rights to cut the tree and collect its fruit belong to the planter or his heirs. Women can also own trees and leave the trees they plant to their children.

Naturally occurring trees belong to the owner of the land unless the owner chooses to cede those rights to someone else. Tree ownership in the sense of control over cutting and gathering rights is generally restricted to introduced species that are considered valuable, such as mangoes, guavas, citrus trees, papayas, neem, and eucalyptus, or to highly valued native species, such as karité, néré, Vitex doniana, raffia palms, and date palms. The right to trim branches is also reserved for the tree owner. If the tree is located on household managed land, other family members are allowed to gather leaves, bark, and fallen branches without first asking permission of the tree owner.

The rules governing rights to naturally occurring trees that are considered less valuable (trees that do not produce food for human consumption as well as very common fruit trees, such as Zizyphus mauritania and Balanites aegyptica) are much less restrictive. In practice, less valuable trees located outside the concession can be used or cut by villagers and nonvillagers alike without permission from the landowner. Whether this rule applies to the cutting of mature trees on fields is unclear, since the only mature trees observed were either in compounds or in garden plots near the village.

Givers of land can choose to reserve the rights to the trees on the land as well as rights to any natural regeneration. However, a person who has received land as a gift is entitled to plant trees on the land.

Any trees planted by the receiver of the land belong to him rather than to the giver.

In the case of khaliba land, the borrower normally has rights only to the land and not the trees. Again, only valuable species are included in this restriction. If the borrower wants to cut a valuable tree or harvest its fruits, he must first ask the permission of the landowner. If a borrower plants a tree without prior permission from the landowner, he risks losing the tree if the land is taken back. Occasionally landowners will agree in advance that a borrower can plant trees on the land. In such cases, the trees planted by the borrower belong to his heirs rather than to the landowner.

Persons leaving the village sometimes lend others the right to harvest valuable fruit trees. Sometimes the tree borrower is given the right to the entire harvest; in other cases a portion of the harvest is reserved for the tree owner.

No cases of tree renting, pledging, or selling (other than trees to be cut down immediately) were reported by the villagers. The village has no tradition of village-based regulation of tree cutting or fruit harvesting.

5. Tree Use and Management

Major Uses of Tree Products. Trees play a much less important role in the Daka-Wominan economy than in the Dogon villages in Bandiagara. Locally cut or harvested trees are used as a source of fuelwood for household cooking and smoking fish for export, as a source of raw materials to build the fish reefs used to attract fish to the fishing grounds, and as a source of sauce-flavoring ingredients. Medicines are also obtained from local and introduced species (mostly neem and eucalyptus). A few families also feed native tree leaves to their livestock, but this practice is minimal since most animals are cared for by herders in Missira. With the exception of fuelwood, fish reef wood, and medicinal products, most tree products are purchased rather than gathered. For example, wooden fishing canoes, fish traps, construction materials, and fruits are usually bought in Fatoma or Mopti.

Tree Planting Practices. Both men and women plant trees. Tree planting is carried out almost exclusively in the household compound or in garden plots near the village. A variety of planting techniques are practiced. People grow some species (mango, date palm, guava, and caïlcedrat) from seeds, some (eucalyptus, neem, Prosopis, mango, guava, and limes) from seedlings obtained in Fatoma, and others (Vitex doniana) from cuttings. Men transplant certain wild species, including Diospyros, Vitex doniana, Ficus platyphylla, and Ficus gnaphalocarpa. One woman had transplanted a wild-growing neem from the bush to her concession. Some of the women had also tried grafting mangoes, but termites ruined the experiment. No villagers reported having a home nursery.

Tree Protection Practices. The villagers claimed to protect certain tree species (Zizyphus mauritania, Vitex doniana, karité, raffia palm, date palm, Balanites aegyptica, and Acacia albida) that regenerate naturally in their fields. However, we saw very little evidence that villagers actually did protect these species, since few mature trees of any species can be found in the fields surrounding the village. Within the confines of the village, valuable trees are encouraged to grow by removing weeds around the base, making a water catchment around the base of the seedling, adding fertilizer, watering the tree, and surrounding the tree with thorny branches to prevent animal damage. For larger trees, tree owners may add manure around the base, trim the branches, and surround the tree with a thorny fence. Protection and maintenance practices are the same for women and men.

There are no village restrictions on the use and cutting of trees by their owners.

Village Reforestation Efforts. The villagers of Daka-Womina have taken part in three collective tree-planting campaigns. In 1986, a local NGO (Six "S") sponsored the planting of a village woodlot on the outskirts of Daka-Womina. Eucalyptus was the only species planted. The objective of the project was to provide the village with fuel and construction wood. Unfortunately, the land was poorly suited to tree production due to water-logged soils during part of the year, and only a few trees managed to survive.

A more successful eucalyptus planting was sponsored by ORM in 1989 around the edges of the small irrigated rice perimeter. The trees receive an adequate supply of water, yet the soils are not water-logged. Animals are also kept out of the perimeter, keeping animal damage to a minimum.

The women of Daka-Womina also planted a woodlot of Gmelina and neem in January 1990. The woodlot is surrounded by a thorn fence to keep out animals, and the women take turns watering the trees. The main purpose of the woodlot is to demonstrate to NGOs that the village is interested in further development.

6. Soil Conservation Practices

Water-caused soil erosion is not a problem in Daka-Womina since the village is located in a depositional environment. Wind-based erosion, however, is a problem, though no windbreaks occur around private fields. Practices used to improve soil fertility include short-term fallowing, addition of organic manure, plowing in residues, and passive manuring by permitting livestock to graze on crop residues.

C. Tenure Systems in Tiroguel

1. Land Tenure

The lack of secure access to land that typifies the Daka-Womina tenure system is also characteristic of Tiroguel's land tenure system. Many of the villagers have access to millet fields under borrowing arrangements, both long and short term, with villagers in Manako. To gain access to irrigated rice fields, the villagers must lease land from Opération Riz Mopti or make under-the-table arrangements with ORM parcel holders in other villages.

The degree of control that Manakoans exercise over land that has been lent out for several generations is unclear. Few villagers pay tribute for the right to use such lands, and many villagers felt that it would be difficult for the owner's heirs to take back the land. Land disputes between residents of the two villagers are common, however. In one case last year, the entire village of Tiroguel protested an attempt by a Manakoan to claim land farmed by one of their fellow villagers. Tiroguel finally won the case, since the Manakoan was unwilling to go through a long court proceeding to get back the land. To minimize attempts to take away their land, most Tiroguellians no longer let their fields lie fallow, preferring instead to manure the land heavily to increase soil fertility.

Collectively Managed Fields. Tiroguel does not have any land that is owned or farmed collectively by the village.

Family-Managed Fields (Foroba). Most villagers farm at least one parcel of land on an extended family basis. These parcels are known as foroba. Agricultural decisions are made by the family head (the eldest living male) or his representative. The produce from this field goes into a family granary, and the families working the land eat together.

Individually Managed Fields (Kuruga or Nokure). In addition to the extended family fields, both men and women usually work at least one field of their own. The individually worked fields are called kuruga or nokure. Agricultural decisions for the kuruga are made by the user of the land. If the kuruga user is a married man, he works the land with help from his wife or wives and his children. If the land user is an unmarried man or a woman, he or she generally works the land alone. The products belong to the individual farming the land, with perhaps a share due to the owner if the land belongs to someone else. The kuruga is cultivated on those days (often Tuesdays or Fridays) when the foroba is not being farmed.

Common Lands. The biggest commons is the forest, or toggere, located between Missira and Tiroguel. The land itself is controlled by Manako, so that anyone who wishes to cultivate land in the toggere has to get permission from Manako's leader. However, the resources on the land can be used by anyone.

Certain areas near the village are designated as animal corridors, or burti. Farming is forbidden on this land. The corridors are used mainly by transhumant herders, and access is controlled by ODEM.

2. Land Acquisition Methods For Native Villagers

Inheritance. Most male villagers have inherited at least some of the parcels they farm. Both family and individual fields can be inherited. Family land can either be kept together and farmed as a unit, with the eldest surviving brother making the management decisions, or be divided equally among the heirs. If the family decides to separate the land, the deceased's brothers and sons inherit equal parts. The eldest brother has first choice of the parcel(s) he wants. Women cannot inherit land.

Borrowing (Lubbal). Both men and women can borrow land from a family member, another villager, or even a resident of another village. If a person borrows land, the owner may require a fagot of millet as a sign that the land is borrowed. However, sometimes the user pays more; other times he pays nothing at all. If the land is planted in rice, the two parties fix the amount of rice to be paid beforehand. In some cases the borrower works in the lender's fields in exchange for the use of the land.

Land can be borrowed for a fixed or an indefinite time period. Long-term borrowing arrangements, where the arrangement is passed on to the borrower's heirs, occur frequently. Owners can take back borrowed land once all the crops have been harvested, and borrowers who fail to put the land into production risk losing it.

Women generally gain access to land by borrowing land. When a woman borrower dies, the field usually reverts to the owner. However, sometimes the borrowing arrangement is passed on to the woman's daughters.

Inter Vivos Gifts (Donkoro). Gifts of land are extremely rare in Tiroguel, mainly because the villagers have little land to give away.

Sharecropping (Feccugal). Sharecropping, most commonly encountered on rice fields, takes two forms. Under one type of arrangement, if a farmer does not have enough land, he approaches another farmer for the right to use some land. The sharecropper than gives the landowner a percentage of the harvest in exchange (generally one-half or one-third of the harvest). In the other type of sharecropping, a farmer with insufficient land will arrange to work someone else's field while the owner agrees to pay for any inputs. The harvest is then divided, with the production from one-half of the field going to the sharecropper and the production from the other half going to the owner.

Pledging (Tolmude). If a person needs money, he can pawn land by giving over his land as a guarantee. The land is then controlled by the moneylender until the loan is paid back. If the pledgee dies before

paying off his debt, his children can still get the land back once they pay off the debt.

Purchase (Sooti Ngesa). Land is occasionally bought and sold in the Tiroguel area. A sale must be witnessed by all the villagers, and a paper (tallewu sedafu) is drawn up. Any type of land (house compounds or fields) can be sold except for the ORM land.

Renting. The villagers said that land rentals do not occur. However, no local rules forbid rentals.

3. Land Acquisition by Outsiders

Few outsiders obtain land from Tiroguellians, primarily because most of the land in the area is controlled by other villages or Opération Riz Mopti. Outsiders who decide to reside in Tiroguel can obtain land in a variety of ways. The most common method of land acquisition is to borrow land from other villagers, usually the host family or the village headman. The conditions for borrowing land are the same for an outsider as for a native. If the borrower dies, his children may be allowed to continue farming the land, provided that the lender does not need the land himself. However, the owner always has the option of taking the land back. Outsiders can also sharecrop, take land as a pledge, and purchase land.

4. Tree Tenure in Tiroguel

General Rules Governing Tree Rights. As a general rule, tree ownership is closely linked to land ownership. Thus the person who owns the land also owns the trees on the land and could in theory exclude others from using the trees. However, as elsewhere in the Fifth Region, Tiroguellians consider certain trees to be more valuable than others. Rights governing the valuable species are generally more strictly enforced than are rights to less important tree types. The following species fall into the "valuable tree" category: raffia palm, karité, néré, doum palm, tamarind, baobab, Ficus platyphylla, Acacia nilotica, and all exotic fruit species. As a rule, the tree owner reserves the right to cut or trim these trees and harvest the fruits. Fallen branches are generally open to any passer-by. Local convention forbids the cutting of live mature raffia palms, Ficus platyphylla, Acacia albida, doum palms, and tamarind trees, even on private fields.

Rights to Trees on Family-Managed Land. The head of the family controls the trees located on family-managed lands. Other family members may plant or cut trees only after getting authorization from the family head. Valuable trees (see list above) are considered the property of the family head. In theory, even other family members must get permission from the family head to gather fruits from these trees, but in practice family members rarely ask permission in advance. Fruits on other trees, such as Zizyphus mauritania, Diospyros mespiliformis, Detarium microcarpa, and Landolphia, can be gathered by anyone passing by. The right to cut branches is restricted to family members, but fallen branches can be gathered by anyone.

Rights to Trees on Individually Managed Land. The owner of the kuruga has planting and cutting rights to trees on that land. Fruits of valuable trees can be collected only by the owner or his immediate family while other fruits can be collected by anyone. Fallen branches and fruits are open to all.

Rights to Trees on Borrowed Land. Trees on borrowed land belong to the owner. In general, the landowner will retain rights to certain species (karité, néré, doum palm, raffia palm, tamarind, baobab, and Acacia albida as well as exotic fruits). Cutting rights are also usually retained by the owner. However, a borrower can cut branches, collect fruits (except those just mentioned), and gather branches and fallen fruit.

Borrowers do not have the right to plant trees on borrowed land without prior approval from the owner. If they do plant trees, the owner retains the trees when the parcel is taken back. Owners also have the option to destroy a tree planted without permission. Owners rarely agree to let borrowers plant trees lest the borrower's claim to the land be strengthened by his planting trees on it.

Women are allowed to plant trees on the land they borrow from their husbands, but the husband is considered the tree owner. In practice, few women in the village plant trees.

Rights to Trees on Sharecropped, Pledged, and Purchased Land. Rights to trees on sharecropped and pledged land remain with the landowner. When land is sold, all rights to the trees are transferred to the new owner.

A Special Case: Tiroguel's Village Woodlot. Several years ago, the Service des Eaux et Forêts asked the villagers of Tiroguel to plant a village woodlot. A small area of land belonging to the village headman was set aside and planted with Prosopis and eucalyptus seedlings. The men of the village planted the trees as a group. The headman watered the trees until they were large enough to survive on their own. The villagers are unclear about who owns these trees, the villagers or Eaux et Forêts. The general feeling is that the villagers have the right to collect any fruits or leaves, but that only the Eaux et Forêts agents can authorize trimming or cutting of the trees. Fallen fruit and branches are considered open to anyone, including nonresidents.

5. Tree Use and Management

The residents of Tiroguel make much more use of locally gathered tree products than do their neighbors in Daka-Womina. Women gather firewood for home use and for sale or exchange. Thorny species are an important source of fencing material to protect vegetable gardens in the rainy season. A wide variety of wild fruits is gathered and sold in Fatoma or surrounding villages. The pods of Acacia nilotica are collected and used for tanning leather. A variety of tree leaves and barks is used for medicinal purposes. Other tree products, including construction wood, mats, baskets, ropes, and cooking utensils, are purchased.

Tree Planting Practices. Tiroguellians traditionally have planted a variety of native and imported fruit trees. Raffia palm, mangoes, doum palms, and néré are the most commonly planted fruit species. In recent years, villagers have begun to plant neem and eucalyptus, which are valued for their medicinal properties.

Villagers grow raffia palms, doum palms, and neem by planting the seeds directly in the ground. Mangoes are raised in home nurseries and transplanted. Néré and neem are grown from seedlings obtained from the Eaux et Forêts nursery in Fatoma. Grafting and propagation from cuttings is not practiced.

When planting trees, villagers dig a hole for the seed or seedling. Manure is mixed with the soil to provide nutrients for the young tree. A fence made of branches or bricks is then constructed to prevent animals from eating or trampling the tree. The tree is watered twice a day until it can survive on its own. When the tree is taller, the planter will trim the tree so that the trunk can grow straight.

No cases of women's planting trees were recorded in the village. However, there are no local rules that forbid women from planting trees.

Tree Protection Practices. Virtually all trees that produce fruit for human consumption are protected to some extent by Tiroguellian farmers. Karité, néré, Diospyros mespiliformis, tamarind, Zizyphus mauritania, Ficus platyphylla, Ficus gnaphalocarpa, raffia palm, doum palm, date palm, Landolphia, Lannea microcarpa, and Sclerocarya birrea are included in the protected category. Protection consists of not destroying the young seedlings when they encounter these species in the field and weeding around the base of the young trees to allow them to grow better. In addition, villagers are unlikely to cut down mature specimens of valuable trees.

Other species valued for their forage, thorny branches, and seed pods are also allowed to grow in some fields. Such trees include Acacia albida, Acacia nilotica, and Acacia seyal. No attempt is made to protect natural regrowth in rice fields.

Soil Conservation Practices. The topography in the Tiroguel area is flat enough that water-caused soil erosion is minimal. Soil conserving structures such as earthen or stone dikes are generally not used by farmers in this area. Wind-borne soil erosion is a problem, but other than allowing a certain number of trees to remain in the millet fields, the villagers employ no systematic measures of protection.

Tiroguellians do, however, make use of techniques designed to improve soil fertility. Most common among these techniques are intensive manuring, the plowing in of crop residues, encouragement of Acacia albida stands, and passive manuring (that is, permitting livestock to graze on fields in the dry season). A three-to-five-year fallow used to be practiced, but with increasing likelihood of land disputes with Manakoan

landowners, few villagers are willing to let their fields lie fallow for more than a year.

D. Land and Tree Tenure in Missira, a Peulh Herder Village

1. Rights to Land

Like their neighbors in Daka-Womina, the Missirans who farm have to lease their land from Opération Riz Mopti. Others borrow millet land from residents of Tiroguel. Except for the two Rimaïbe families in the village, farming is only a secondary occupation. Herding is the most important economic activity for most families in the village.

Collective Fields. Missira used to have a village rice plot, which was farmed by the entire village. However, since the construction of the rice perimeter, this tradition is no longer maintained.

Family Fields (Ngesa Foroba). Most Missiran families farm at least one field as an extended family unit. The ngesa foroba is controlled by the family head. The produce is placed in a family granary.

Individual Fields (Jomforo). Some individuals farm their own fields (jomforo) on the days that they are not required to work on the foroba. Among the Peulh, only the men have their own fields, but both Rimaïbe men and women generally have at least one jomforo. The individual using the field makes all agricultural decisions for the land, and the crop is placed in his or her granary. Many of the Peulhs hire outside laborers to work in their fields.

Common Lands. Missira has claims to two forested areas south of the village: the Toggere Siou, and the Hoore Sonere. The Toggere Siou is split between the villages of Missira and Tiroguel while Missira alone claims the Hoore Sonere.

The Missirans consider the two forests an important source of raw materials and fruits. In fact, they refer to the forests as their "granaries." Both forests are also important pasturelands for the animals, especially during the hot season. Villagers used to cut branches to obtain leaves for animal fodder, but this practice has greatly diminished since the Eaux et Forêts agents began fining branch cutters. The forests remain an important source of herbaceous fodder, which herders often cut and carry to the animals remaining in the village.

The main woody species in the two forests are Tamarindus indica, Zizyphus mauritania, Diospyros mespiliformis, Landolphia, and Borassus aethiopum.

2. Land Acquisition by Missirans

Inheritance. Missirans used to inherit most of the land they farmed. However, with ORM's takeover of the bulk of the village's

territory, the majority of Missirans now have access to land via leases with ORM. The leases are not necessarily hereditary, but thus far sons have been able to take over the leases registered in their father's name. Household compounds are not controlled by ORM and continue to be inherited. Among both the Peulh and the Rimaïbe, only men can inherit land.

Opération Riz Mopti Leases. Opération Riz controls both millet and rice land in the vicinity of Missira. To obtain a parcel of ORM land, a villager must place a request with the Chef de Casier, who is responsible for administering land under ORM control. In theory, one need not pay for the right to register the land in one's name. However, villagers claim to have paid as much as 25,000 CFA per hectare to get access to good quality rice land. Barring very low flood levels or locust invasions, the lessee must pay a 12,500 CFA fee per hectare at the end of the harvest. The payment can be made in kind, using a price per kilo fixed by ORM.

Leaseholders do not have the right to rent or sell the land registered in their name. Rights to use the land are forfeited if the leaseholder fails to put the land into production or if he fails to pay the yearly user fee by the deadline.

Gifts of land (Jeyal). In the past, it was possible to obtain land in the form of inter vivos gifts. The giver would transfer all of his rights to the receiver. However, such gifts no longer occur since very few people farm land of their own.

Borrowed land (Lubbal). Missirans both lend and borrow land. Borrowing arrangements are particularly important for Rimaïbe women, who cannot register for land with ORM nor inherit land. Usually the borrower pays the lender a token payment for the use of the land.

Land Rentals. Land rentals between private individuals used to occur in the village, but the practice has died out since ORM took over the most productive lands.

Other Types of Access. Missirans claim that no one sharecrops, pledges, or purchases land in the village.

3. Land Acquisition by Outsiders

A large number of stranger farmers moved into Missira's territory in 1987. At that time, the villagers of Missira agreed to allow a nomadic resettlement camp, comprised of destitute Tuaregs, Maures, and Sonrhais, to establish a settlement just west of the village. Although only a short distance separates the two settlements, they remain politically distinct. In 1989, these outsiders began farming on land which they had received from Opération Riz.

If someone wishes to establish a household compound in the village itself, he must obtain approval from the village council. Such arrangements are rare, since few outsiders come to settle in Missira. Household

land received in this fashion is considered a definitive gift, or jeyal, which can be taken back only under exceptional circumstances.

4. Tree Tenure in Missira

General Tree Tenure Rules. As in Tiroguel, tree ownership is closely linked to land ownership. The landowner also owns the trees on the land, regardless of who planted them. The following species are considered particularly useful species: Borassus aethiopum, Vitex doniana, Diospyros mespiliformis, Tamarindus indica, Zizyphus mauritania, and Hyphanae thebaica. Rights to harvest the fruits of these trees are more strictly enforced than for other species. As a rule, only the tree owner has the right to cut down, remove live branches from, and harvest the fruits of the trees on his land. Fallen branches and fruits can be gathered by any passers-by.

Rights to Trees on Land Managed by the Extended Family. Rights to the trees on family land are vested in the head of the extended family. Any family member can plant trees on the land, though the approval of the family head is usually obtained in advance. The head is in charge of making decisions about cutting down a tree or trimming its major branches. Although the fruits of important species "belong" to the family head, any family member can collect them. Nonfamily members can collect fallen fruits and gather fallen branches without asking permission in advance. Fruits of "unimportant" species can also be collected by anyone, even if they are still on the tree.

Rights to Trees on Individual Fields. The owner of the jomforo controls the cutting of trees and the trimming of branches on his land. Fruits of valuable trees can be gathered only with the permission of the landowner. Fallen fruits and branches can be gathered by anyone.

Rights to Trees on Borrowed Land. In Missira, borrowers generally assume the owner's rights to cut down, trim, and harvest fruits of the trees on the borrowed land. Borrowers have to get the owner's authorization to plant trees. However, landowners rarely let borrowers plant trees, for fear that conflicts will arise over the question of tree ownership when the land is taken back.

Rights to Trees on ORM Land. According to the villagers, leaseholders exercise the same rights to trees on their ORM plots as on private land. However, few mature trees are found on ORM land, thus making it difficult to determine what the tree tenure rules are for such parcels.

Rights to Trees in the Village Forests. Prior to the strengthening of the Eaux et Forêts system, Missira claimed exclusive use rights to both the Siou and the Hoore Sonere. Not only did they forbid outsiders to cut trees in the forest, but they also reserved for themselves the right to collect valuable fruits:

> In the past, there were lots of fruits in the Siou and in the Hoore Sonere. The villagers were always there, and someone

> from another village wouldn't have the courage to enter the forest. In the past, we would confiscate the fruit or the wood collected by a stranger, and we would give the stranger a warning. We had a chief who was the forest policeman, who was in charge of enforcing the rules about the forest."

Over time, the Missirans have lost control over the forest resources. At the moment, the fruit of only one species, the raffia palm, is reserved exclusively for residents of Missira. All other fruits can be collected by anyone passing through the forest. Cutting rights also were once exclusive to Missirans, but now anyone with a permit from Eaux et Forêts can cut in the forest.

Tree Use and Management. Although tree products are widely used by Missirans, many of the more important products are purchased rather than harvested from the surrounding bush. Given the sparse tree cover in the immediate area, the reliance on imported products is not surprising. In addition, the men in the village have no wood-carving tradition, and the village women do not collect fruits or firewood for sale. Construction wood, tool handles, chairs, baskets, and mats are usually purchased rather than made or harvested in Missira. The village forest supplies a variety of fruits, but sauce ingredients, such as tamarind fruits and leaves, are often purchased in neighboring villages. Firewood is not very plentiful, and many families use dried cow dung as fuel. Acacia albida is highly prized for both its leaves and its pods, which are an important source of animal fodder in the dry season.

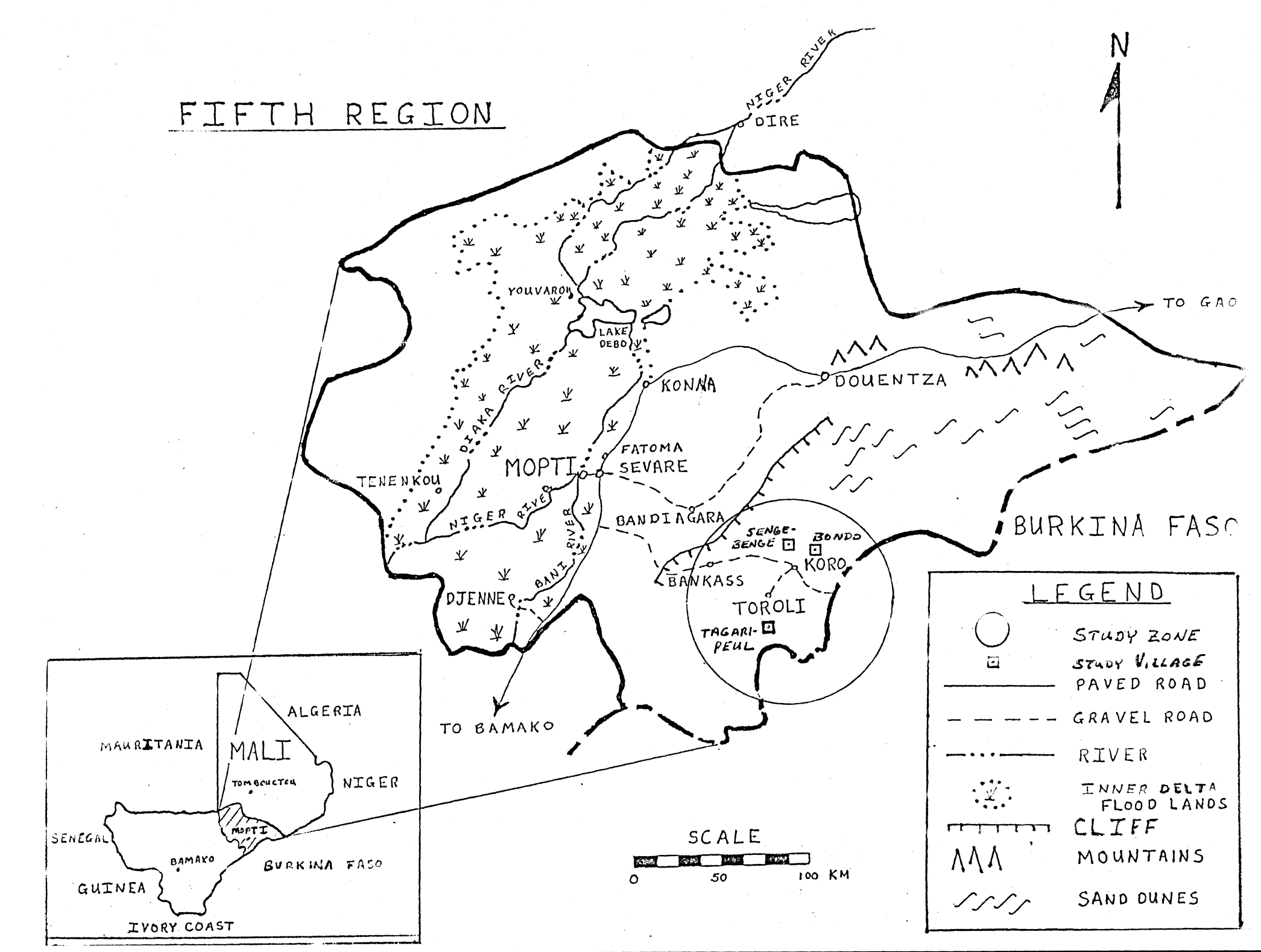
Tree Planting Practices. Until recently, few village residents had an interest in planting trees. This lack of interest is evident by the near absence of shade and fruit trees in and around the village. The most commonly planted species are fruit trees (mango, guava, papaya, date palm, and raffia palm) and shade trees (neem). Although the village women are not very avid tree planters, a few women have planted neem and raffia palms in their compounds. Women generally water the trees that men plant.

Certain species are seeded directly (mangos, date palms, and raffia palms), others are planted as seedlings (guavas, papayas, and neem), and others are grown from cuttings. The young trees are generally watered twice a day during the hot dry season and once a day in the cold season.

Tree Protection Practices. As elsewhere in the Fifth Region, Missirans encourage certain valued species to grow in their fields. Protection consists primarily of avoiding killing young desirable species and occasionally of weeding and trimming the tree. The following species are generally protected in the fields: Acacia albida, Acacia nilotica, Balanites aegyptica, Tamarindus indica, Vitex doniana, Borassus aethiopum, Zizyphus mauritania, and Hyphanae thebaica.

Soil Conservation Practices. Small earthen dikes are used to slow down water in the fields located near the village (Missira is situated on a small hill above the high water mark). Elsewhere such structures are unnecessary due to the level terrain.

The presence of large numbers of livestock in and around the village permits Missirans to employ much less intensive farming practices than their neighbors in Tiroguel. Few Missirans apply manure directly on their fields, relying instead upon the nutrients left by animals grazing on the stubble in the dry season.


FIFTH REGION
N
NIGER RIVER
DIRE
TO GAO
YOUVAROU
LAKE DEBO
DIAKA RIVER
KONNA
DOUENTZA
MOPTI
FATOMA
SEVARE
TENENKOU
NIGER RIVER
BANI RIVER
BANDIAGARA
BURKINA FASO
SENGE-BENGE
BONDO
KORO
BANKASS
TOROLI
TAGARI-PEUL
DJENNE
TO BAMAKO
ALGERIA
MAURITANIA
MALI
TOMBOUCTOU
NIGER
SENEGAL
MOPTI
BAMAKO
BURKINA FASO
GUINEA
IVORY COAST
SCALE
0
50
100 KM
LEGEND
STUDY ZONE
STUDY VILLAGE
PAVED ROAD
GRAVEL ROAD
RIVER
INNER DELTA FLOOD LANDS
CLIFF
MOUNTAINS
SAND DUNES

PART II. KORO CERCLE

(Arrondissement Central of Koro and Arrondissement of Toroli)

A. Description of the Research Area

1. Study Sites

The villages of Sengé-Bengé, Bondo, and Tagari-Peulh were chosen as study villages in Koro Cercle. Both Sengé-Bengé and Bondo are located in the Central Arrondissement of Koro, while Tagari-Peulh is located in the Toroli Arrondissement. All three villages were selected primarily because each has an Eaux et Forêts agent conducting extension activities in the area in addition to his normal regulatory duties. We were unable to complete the schedule of interviews in Bondo due to time constraints. Two villagewide meetings were held in Bondo, but no meetings were held with the village women nor were any individual interviews or farm visits conducted. The following summary of the Koro villages is thus based more heavily upon the information obtained in Sengé-Bengé and Tagari-Peulh.

2. Physical Geography

The Cercle of Koro is located east of the Bandiagara plateau in an ecological area known as the Seno plain. The mostly flat topography of the Seno is broken occasionally by small hills and depressions. The latter fill with water in the rainy season and are important watering holes for the region's livestock. They also allow the region's farmers to grow rain-fed rice and even some corn. Poorly developed sandy soils dominate the plain, but there are also significant pockets of silty clay soils near the seasonal ponds as well as areas covered by lateritic hardpan. The areas dominated by sandy soils are known locally as "Seno" (seno being the Fulani word for "sand") while the lateritic regions are known as "Ferro."

The vegetation varies considerably between the three study villages. Tree cover is sparse in the fields surrounding Bondo and Sengé-Bengé. The major field trees are Sclerocarya birrea and Balanites aegyptica, with occasional mature Acacia albida and Combretum glutinosum specimens. Zizyphus mauritania, Tamarindus indica, Adansonia digitata, Acacia nilotica, and Bombax costatum are also present in some fields. Large areas farther out from the villages are covered with thickets of Boscia senegalensis, whose fruits are an important source of food in times of famine. Forests comprised mainly of Acacia seyal, Acacia nilotica, Sclerocarya birrea, Balanites aegyptica, and Combretum glutinosum are located some distance from both villages. Many of the species so important to the Dogon cliff dwellers (raffia palm, karité, néré, Vitex doniana) are nonexistent or very uncommon. Within the villages, neem and eucalyptus predominate.

In contrast to the relatively unwooded areas near Sengé-Bengé and Bondo, Tagari-Peulh is located adjacent to extensive park-like forests of Acacia seyal, Acacia senegalensis, Combretum micranthum, Grewia bicolor, Mitragyna inermis, Pterocarpus lucens, and Anogeissus leiocarpus. A variety of fruit trees, including tamarinds, baobabs, Zizyphus mauritania, and Diospyros mespiliformis, is also found in the forests. Balanites aegyptica is the predominant field tree, with occasional Acacia albida, Lannea microcarpa, tamarinds, and baobabs. Very few trees are found in the village itself.

3. Cultural Geography

Sengé-Bengé and Bondo are administratively and economically tied to Koro, the capital of the Central Arrondissement. Although both villages have their own weekly market, many villagers attend the market in Koro to sell their products and to buy goods unobtainable in the villages. Representatives of the major government services are also based in Koro. Koro itself is somewhat isolated from the rest of the country. An all-weather gravel road links Bankass to the paved highway, but only a sandy track connects Koro to Bankass.

Tagari-Peulh is economically and politically dependent on Toroli, the arrondissement capital. The village is reached via a sandy track, which becomes impassable after heavy or prolonged rains.

Compared to the Bandiagara plateau and the eastern bank of the Niger River near Fatoma, the Seno is sparsely populated. Settlements are widely spaced. Even within the villages, household compounds are much larger and more dispersed than in the other study zones. Agriculture is also much more extensive, with more reliance on long-term fallow and passive manuring than in other areas in the Fifth Region.

4. Economic Activities

Prior to the French colonization, the Seno was inhabited primarily by Fulani herders and their Rimaïbe slaves. The Seno is an important wet-season grazing area for the transhumant herds of the inner delta. It is also an important dry-season grazing area for local herds since grass and browse is abundant. Lack of reliable and easily accessible water is the main constraint for livestock raisers--wells 40 meters deep are not uncommon.

Since the turn of the century, large numbers of Dogon farmers have abandoned their villages on the inhospitable Bandiagara plateau to take up farming in the Seno. Many of the Dogon established villages near existing Fulani settlements. It is not uncommon to encounter twin villages less than 1 kilometer apart, where one village is inhabited by Dogon farmers and the other by Fulani herders. A mutually beneficial relationship has been established between the two groups: the Fulani obtain millet in exchange for grazing their animals on the crop residues belonging to Dogon farmers. They also exchange milk for grains and forest products

harvested by the Dogons. Tagari-Peulh forms a paired village with Tagari-Dogon, and semipermanent herding camps are found within a few kilometers of both Sengé-Bengé and Bondo.

Livestock raising is the primary occupation of the villagers in Tagari. Cattle, sheep, and goats form the bulk of the herds. Each family is responsible for the care of its animals. A large percentage of the villagers leave with the herds after the millet is harvested for dry-season camps located in the area south of Bankass. In fact, Tagari-Peulh has only recently become a permanent settlement. Prior to the late 1940s, the area was used solely as a rainy-season camp. Most of the Fulani in Tagari also own land, which they lend out to Dogon farmers from neighboring villages.

Farming is the main occupation of the residents of Bondo and Sengé-Bengé. Millet is the major crop, but significant quantities of fonio, sorghum, peanuts, and cowpeas are also grown. Dah, okra, and peppers are grown in small quantities. Farmers with access to seasonal ponds also grow rice and corn. Gardening is an important cold season activity in Bondo, which happens to be located over a very shallow water table. The water table is too deep to permit dry-season cultivation in Sengé-Bengé. A few Mossi families have settled in Sengé-Bengé and Bondo. The Mossi men are the village blacksmiths, though they also do some farming.

5. Women's Economic Activities

In addition to their childcare and housekeeping tasks, women in the three villages also contribute substantially to the family's income. In Bondo and Sengé-Bengé, women help cultivate the family fields. In addition, they frequently grow peanuts, millet, okra, and dah on their individual fields. Although women in Tagari-Peulh do not participate directly in agriculture, some women hire laborers to work land that they have borrowed from their male relatives. In all three villages, women play an important role in transporting the millet from the fields to the granaries.

Most women in Tagari-Peulh own their own livestock (cattle, sheep, and goats). The women also make money by selling or bartering milk to their Dogon neighbors. Many of the women in Bondo and Sengé-Bengé also own sheep and goats but not cattle. The Mossi women are the village potters. In all three villages, women spin cotton and participate in petty commerce activities.

B. Tenure System in Tagari-Peulh

1. Land Tenure

Tagari-Peulh claims controlling rights to the land within its territory, including land farmed by neighboring Dogon villages. Its claims are based on the right of first settlement. The ancestors of the current villagers became the "owners" of the land around Tagari after they put in

a well so that part of the village could remain during the dry season. The village is comprised of members of the Bary and Boli families.

In 1959, Tagari-Peulh's claim to the land was questioned by the Dogon farmers who had begun farming portions of the village's territory. After a seven-year court case, the Peulh faction's claim was upheld, and the village was awarded a title to the land. However, the Dogon farmers still have access to Peulh land through individual borrowing arrangements.

Village Forests. Tagari-Peulh has two village forests, the Hoore Durugol, to the south, and the Petaljiga, to the east. The Hoore Durugol is used for animal pasture in the dry season while the Petaljiga is used in the rainy season. The Petaljiga is also a rainy-season campsite. Both forests provide the village with wood and fruits.

Fields Managed on a Village Basis (Ngeso Sudu Baba). A portion of the village territory is set aside for a village millet field. The field, which is known as the "ngeso sudu baba," is farmed on a collective basis by the young men of the village. The young men elect a leader from among the members of their age set to make decisions about the use of the land. The harvest from the ngeso sudu baba is stocked and sold to pay village fines or to provide credit to villagers who have financial difficulties.

Fields Managed on an Extended Family Basis (Foroba). Most residents of Tagari farm at least some land on an extended family basis. The family land, or foroba, is most often devoted to millet to fill the family granary. The head of the extended family is charged with all agricultural and land-use decision making for the parcel.

Fields Managed on an Individual or Nuclear Household Basis (Jomforo). Male villagers usually have access to plots which they farm (directly or indirectly) on their own. These individual plots are known as jomforo. Land-use decisions are made by the individual owning or using the jomforo. Jomforo plots are worked on Fridays or after the work has been completed in the foroba. The crops from the jomforo are stored separately from the foroba crops.

Fields Managed by Women (Ngeso Kokkado Debbo). Divorced and widowed women borrow land so that they can provision their granaries. The woman will pay neighboring Dogons to work the field, but she makes the land-use decisions herself. When the woman dies, the land reverts back to the owner. Two women in the village currently borrow land from their brothers.

2. Land Acquisition by Native Villagers

Inheritance. The most common method of obtaining access to land is through inheritance. If the land is farmed as a foroba, the deceased's eldest son becomes the decision maker. If the land is divided, each son inherits equal portions, which each controls separately.

Cases of preinheritance, where the son asks his father for a gift of land while the father is still alive, are also common. Such fields are referred to as "fields given to me by my father" (ngeso babam hokkikam). Control of the land is transferred entirely to the son receiving the land.

Borrowing Arrangements (Lubbal). Another method used to obtain land is to borrow it from a relative or another villager. Borrowing is the only way women gain access to land. The length of the loan is rarely fixed in advance, and loans can last from one season to many years. The lender reserves the right to take back the land if he should need it.

Gifts (Dokkal). In rare cases people may receive outright gifts of land. All rights are transferred to the receiver, and the land can be taken back only in very exceptional cases.

Other Types of Access to Land. No cases of land rentals, land pledging, sharecropping, or land purchases were reported by the villagers of Tagari-Peulh.

3. Land Acquisition by Newcomers

Newcomers planning to stay in the area gain access to land in two ways: either they receive land as a gift, or they borrow land from their relatives or other villagers. When a person comes to the village to settle, he approaches the village chief or the village council to ask for a piece of land for his compound and some land for his farm. Often the chief will give the newcomer a piece of his own land, though others can give or lend land to the newcomer as well.

4. Tree Tenure in Tagari-Peulh

In Tagari-Peulh, the owner of a parcel of land is also considered the owner of the trees on the land, even if someone else planted the trees. Certain trees are considered more important than other species, notably tamarind, baobab, and Lannea microcarpa. The cutting of these trees is restricted both in fields and in the forest. Rights to harvest the fruits of these trees are likewise strictly enforced, particularly for the tamarind tree. As elsewhere in the Fifth Region, only the tree owner has the right to cut down the tree, trim branches, or harvest fruits on the tree. In practice, the restrictions on branch cutting and fruit harvesting are not closely followed for less valuable species. Fallen fruits, and small quantities of fruit still on the tree, can be gathered by anyone without prior permission from the owner. Wood gatherers are supposed to ask permission to gather dead branches in fields, but in practice this rule is seldom enforced.

Rights to Trees on Village Land. There are presently no trees on the village millet field, and approval of the young men's leader is required before trees can be planted in the area. Both villagers and non-villagers alike can pasture animals in the village forests, but rights to cut trees in the forests are reserved for villagers of Tagari. Strangers

caught cutting live trees are warned, but the wood is not confiscated nor is the offender fined. Branch cutting is not regulated by the village, and fruits can be collected by anyone passing through the forest. Clearing land for agricultural use is prohibited in both forests since they serve as an important pasture grounds.

Rights to Trees on Extended Family Fields. The head of the family controls the rights to use and destroy trees on the foroba. Only the family head can authorize the planting of trees. His permission has to be obtained before any trees can be cut down or trimmed. All family members have the right to collect fruits on the trees. In fact, except for the tamarind fruit, even passers-by can gather fruits in small quantities. Fallen branches and fruits can be gathered by anyone passing through, provided that only small quantities are taken.

Rights to Trees on Individual Fields. The rights to trees on individual fields parallel those for the extended family field, except that the rights are vested in the field owner rather than the extended family head.

Rights to Trees on Borrowed Land. In theory, borrowers do not have the right to plant trees. In practice, however, borrowers (especially Dogon farmers) do plant trees. However, if the lender takes back the land, the borrower loses the tree. All other rights to trees, including the right to cut, are transferred to the borrower for as long as he or she farms the land.

Rights to Trees on Gift Land. All rights to plant, cut, and harvest trees are transferred with the land.

5. Tree Use and Management

The residents of Tagari make wide use of tree products in their dailylife. Unlike the Peulh in Missira, who must import their tree products, the Peulh in Tagari have a large supply of raw materials readily available. Tree leaves are an important fodder, especially just before the rains begin, when the grass has lost most of its nutritional value. The villagers expressed the belief that raising livestock is easier where there are trees because of the food and shelter they provide. Women do not cut live branches for fuel, relying instead upon the dead wood they can gather in the fields. Trees from the village forests are used for constructing houses and animal corrals. Several tree species provide medicines as well as flavorings for the sauces served with cereal grains. Construction wood, fencing, and medicinal products are generally purchased from neighboring Dogon villagers.

Tree Planting Practices. The level of tree planting among the villagers in Tagari is quite low. Few people plant trees near their houses, and even fewer plant trees in their fields. One man has planted neem received from the Eaux et Forêts agent in Toroli, and another man had planted a baobab near his home. Both men planted the trees as seedlings,

watered the trees until they were able to survive on their own, and built protective fences to protect the seedlings from animal damage. None of the women had planted trees. One man's wife helped water the trees which her husband had planted.

Protection of Natural Regeneration. Although tree planting is not a very popular activity, the villagers do make an effort to encourage certain trees to grow in their fields. Protection consists mostly of avoiding cutting the trees when plowing or clearing the fields. Very rarely villagers will make a catchment basin around the base of the tree, clear competing vegetation, and build a small fence of thorny branches to prevent the tree from being eaten or trampled by animals. The following species are protected in the fields: Acacia albida, baobab, tamarind, Lannea microcarpa, karité, Sclerocarya birrea, and Acacia nilotica.

Soil Conservation Practices. No soil conservation structures were observed in the fields around Tagari. Soil fertility is improved primarily by allowing animals to graze on crop stubble or by allowing the land to remain fallow for several years. Although a few villagers commented on the beneficial qualities of Acacia albida for soil improvement, none of the fields we visited had more than a few Acacia albida specimens.

C. Tenure Systems in Sengé-Bengé and Bondo

1. Land Tenure

Both Sengé-Bengé and Bondo were founded by Dogon farmers moving into uncultivated areas around forty years ago. Bondo is the second largest settlement in the Arrondissement Central. It was originally a farming hamlet, which developed into a major settlement due to the shallow water table that makes dry-season gardening possible. The main settlement is composed of seven quartiers, each with its own headman and council. Three agricultural hamlets are also part of the village.

Sengé-Bengé was founded by settlers from Koro about forty-five years ago. Immigrants from the ancient villages along the edge of the Dogon plateau moved into the area at about the same time. Sengé-Bengé is divided into four quartiers and a small subsidiary settlement, where gardens are cultivated in the cold season.

Although the terms for land categories differ between the two villages, the land tenure systems are very similar.

Village-Managed Lands. Neither village has a field that is presently managed by the entire village. However, both villages have uncultivated lands which are open to use by all the villagers. Sengé-Bengé has two uncultivated regions within its territory: the degou, and the samou. The degou is actually an area that was once cultivated but which has since been abandoned due to the hard soils. The samou has never been cleared and has a denser growth of woody species than the degou. Both

areas are used as pasture for the village animals and as sources of construction materials, fruits, and other tree products. Clearing can be done only if advance permission is received from the village chief.

Villagers from Bondo also have access to an uncultivated area. The area is used for pasturing animals and as a source of construction materials, fuelwood, and fruits. The area is shared with surrounding villages as well as with Peulh herders who camp near Bondo in the rainy season.

Quartier Fields (Kataga-wuru, Ange-wuru). Both villages have fields that are managed on a collective basis at the quartier level. In Bondo, these fields are known as kataga-wuru; in Sengé-Bengé, as ange-wuru. The quartier fields are managed by the Comité de Jeunesse in the quartier, with decision-making powers vested in the Secrétaire Général of the committee. The fields are farmed by both males and females of the age grade. Millet is grown in the quartier fields. The harvest is placed in a special quartier granary and is used to help villagers whose crops were poor. Any money from the sale of the quartier stock is placed in a special treasury, which is used to help members of the quartier who need credit.

Extended Family Fields (Poroba, Ginna-wuru). Most families have land which they farm together with other members of the same lineage. In Bondo, these lineage fields are known as poroba, while in Sengé-Bengé, they are called ginna-wuru. The poroba or ginna-wuru is controlled by the eldest male of the extended family. The younger family members do most of the work in the fields, and the harvest is placed into a family granary.

Individual Fields (Jom-wuru). Most adult males farm their own individual plots (known as jom-wuru in both villages) on the days when they are not working in the poroba or ginna-wuru. Agricultural decision making rests in the hands of the individual, and the harvest is placed in either a household granary (if the farmer is married) or an individual granary (if the farmer is single).

Women's Individual Fields. Women frequently borrow land from relatives or other villagers to farm on their own. These fields are called "nyawe-jom-wuru" in both villages. Upon the death of the woman farming the land, the land reverts to the lender. The women who farm their own plots of land make all agricultural decisions and control the disposition of the harvest.

2. Land Acquisition in Sengé-Bengé and Bondo

Inheritance. Inheritance is the most common way in which males obtain land in the two villages. Women cannot inherit land. Land is passed to the deceased's male kin, with each survivor being given an equal share should the heirs decide to divide the land.

Gifts. Gifts of land are another way in which villagers can acquire land. Gifts of land can be withdrawn only if the receiver commits

a serious offense against the giver. Generally the receiver gives his benefactor a token portion of the harvest to acknowledge his debt.

Borrowed Land. Borrowing is a common mode of access for many villages. Sometimes the period of the loan is fixed in advance, especially if the loan is only for one season. However, frequently no set period is established for the length of the loan. Although the borrower is not obliged to give the lender a portion of the harvest, it is customary for him to give the lender a fagot of millet to acknowledge the lender's claim to the land. Whether the loan is long term or short term, the lender has the right to take back the land at any time after the harvest. Borrowing arrangements are sometimes passed on to successive generations.

Other Forms of Access. Villagers claim that cases of renting and land pledging occur elsewhere in Koro Cercle, but that neither is practiced in these villages. No cases of land purchasing or sharecropping were reported either.

3. Rights to Trees in Sengé-Bengé and Bondo

As in the other study villages, rights to trees in these two Dogon villages are closely linked to rights to land. Thus rights to cut down trees, cut live branches, and harvest valuable fruits are reserved for the owner. These rights are more strictly enforced for trees located in fields near the village and for species that the owner considers very important. Although in theory the owner's permission is required for harvesting fallen branches and fruits, in practice these rules are rarely enforced. The important trees are primarily fruit trees, including species that are fairly rare. The list for both villages includes the following: tamarind, baobab, karité, Lannea microcarpa, Sclerocarya birrea, and Vitex doniana. Restrictions on the use of the tamarind and baobab are most strongly enforced.

Traditional Forest Regulation in Sengé-Bengé and Bondo. Both villages used to have their own forest regulation systems. The forest police regulated the cutting of trees on both private and public lands. Important trees, including Sclerocarya birrea, tamarind, baobab, Lannea microcarpa, Zizyphus mauritania, karité, Bombax costatum, Acacia albida, néré, and Balanites aegyptica, were protected from indiscriminate cutting. Harvesting of fruits was restricted to ripe fruits. Trees considered unimportant or harmful to the soil, such as Acacia seyal and Acacia nilotica, were not covered under the cutting restrictions.

A group of men, known as the Ogokana, was elected by village leaders to ensure compliance with the law. Offenders were brought before the village council, where they were required to admit their fault and pay a fine (usually millet or an animal). Wood was confiscated from nonvillagers who cut without permission, and the offender would be warned not to return. A portion of the fine was given to the forest guards, who received no other compensation for their work. The system was abandoned in

both villages upon Mali's independence, when the State laid claim to both the land and the trees.

Rights to Trees in the Village Forests. Bondo shares its village forest with surrounding villages and Peulh encampments. Villagers have the right to cut live trees for construction materials, harvest dead wood, and gather fruits. The village itself has no enforcement power over others using the forest, and regulation is left to the Eaux et Forêts agents.

Sengé-Bengé currently exerts only limited control over its forests. Villagers can cut any trees in the forest except those considered important. However, if they have no permit, they risk being sanctioned by Eaux et Forêts. The village has no control over nonvillagers who cut trees in the forest. In the past, any cutting had to be authorized by the village chief, but at the moment, anyone can get a permit from Eaux et Forêts without going through the chief. Rights to harvest fruits of all species, collect dead wood, and graze animals are open to villagers and nonvillagers alike.

Rights to Trees on Quartier Fields. Rights to trees on the quartier fields are controlled by the leader of the age grade. In Sengé-Bengé, tamarind fruits are collected by group members and used to make a drink which is served to all members who helped farm the field. Other fruits are open to anyone in the village. Dead wood is collected by the age-grade members and is shared among the group. The approval of the committee is required before any trees can be cut down or branches trimmed.

In Bondo, the fruits on quartier fields can be collected by any villager. Other villagers can cut trees or trim branches if they receive permission from the committee. Fallen fruits and branches can be gathered by any villager.

Rights to Trees on Extended Family Fields. The head of the extended family (the eldest male) controls tree use on the extended family fields. The permission of the family head must be obtained before anyone, including other family members, can cut down mature trees. Family members can cut branches without getting permission from the family head, but outsiders must first get permission. In Sengé-Bengé, tamarind fruits are harvested on a collective basis. Other important fruits can be collected at will by family members. Outsiders are permitted to collect small quantities of important fruits (except tamarinds and baobabs), though in theory only family members have the right to collect such fruits without the family head's permission. Fallen fruits and dead branches can be collected by both villagers and nonvillagers without advance permission.

Rights to Trees on Individual Fields. Rights to trees on individual fields are essentially the same as for the extended family fields, except that control over tree resources is held by the individual owning the land rather than the extended family head. Fruit-collecting rights are enforced strictly only for baobab, tamarind, karité, and Lannea microcarpa.

Cutting rights to large trees are strictly enforced. However, few landowners will complain if outsiders cut small trees or bushes, particularly if the field is some distance from the village.

Women's Rights to Trees. The trees located on the women's fields belong to the person who lent the woman the land. However, the woman has the right to use the trees and can trim small branches, gather fruits, and collect dead branches without getting permission from the landowner. In Sengé-Bengé, women can plant trees, but the trees revert to the owner if the owner decides to take back the land or if the woman leaves the area or dies. The owner reserves cutting rights to mature trees.

Rights to Trees on Borrowed Land. Borrowers are not supposed to plant trees unless they first get permission from the owner. Borrowers who plant trees lose rights to the trees if the land is taken back. Borrowers may cut trees, except important fruit trees (Lannea microcarpa, karité, baobab, and tamarind). They also may trim branches without prior permission from the landowner. In Bondo, fruit-gathering rights, even for important trees, belong to the borrower. In Sengé-Bengé, the borrower normally shares the valuable fruits with the landowner.

Rights to Trees on Gift Land. Rights to trees on gift land are transferred to the receiver. The receiver may plant trees on the land without asking permission from the giver. In addition, the receiver assumes the right to cut mature trees and gather important fruits.

4. Tree Use and Management in Sengé-Bengé and Bondo

Villagers in Sengé-Bengé and Bondo use a variety of tree products in their daily lives. Women supplement family income by gathering and selling fruits and leaves. Boscia senegalensis fruits are collected and processed during times of famine. Women also gather dead wood for fuel, some of which they may sell for extra cash. In both villages, men cut and transport large quantities of firewood, which is stocked for home consumption during the rainy season.

Basket making and wood carving are both important sources of income for men in Sengé-Bengé. Due to the rarity of raffia and doum palms in the area, basket makers and hat makers are forced to go to the Bandiagara plateau in search of raw materials. Most of the basket makers and hat makers are immigrants from the plateau, where raw materials are relatively plentiful. Certain types of wood used for making wood utensils (Entada africana, for example) must also be purchased or harvested in other villages.

In Bondo, where gardening is common, there is a great demand for thorny branches for fence construction. In both villages, a wide variety of trees is used for medicinal purposes.

Trees are also valued for the role they play in conserving and improving soils in the fields. In both villages, Acacia albida are

protected in fields. In Sengé-Bengé, villagers have recently begun to plant neem and Acacia raddiana windbreaks to decrease wind erosion in their fields.

Tree Planting. Interest in tree planting is much higher in Sengé-Bengé and Bondo than in Tagari-Peulh. Prior to the arrival of the CARE/Koro forestry project, villagers were already active tree planters. Baobabs, Ceiba petandra, Borassus aethiopum, Tamarindus indica, néré, and Sclerocarya birrea were the species that were commonly planted before the CARE agents came to the area. Most of these species were directly seeded or grown from transplanted seedlings. One woman interviewed grew seedlings by transporting manure containing baobab and Lannea microcarpa seeds to her fields.

More recently villagers have begun to plant neem for shade and as windbreaks, Prosopis juliflora for live hedges, and Acacia raddiana for windbreaks. Two of the villagers interviewed in Sengé-Bengé had also planted Acacia albida seedlings in their fields to improve soil quality.

Propagation of trees from cuttings does not appear to be very common in this area.

Tree Protection. Certain species are allowed to regenerate in fields. Species that are valued for their fruits are the most likely to be protected. Farmers will avoid cutting valued seedlings when clearing and preparing the land for sowing. In addition, most farmers will also weed around the young seedlings. Less frequently a small water catchment is dug around the base of the tree. Two of the three villagers interviewed also constructed supports for saplings to reduce wind damage. Some villagers protect valued trees by constructing dead fences around the tree. In recent years, villagers have started to construct millet stalk fences.

Soil Conservation and Improvement. Soil fertility is improved primarily through allowing animals to graze on crop residues and by allowing portions of fields to lie fallow for two to five years. Some farmers also encourage Acacia albida trees to grow in their fields in an attempt to improve soil quality. Manure is sometimes spread on fields that are close to the village but is rarely transported to distant fields.

PART III. KONNA ARRONDISSEMENT

A. Description of the Research Area

1. Research Sites

Two villages, Bogo and Djeninkore, were selected as pilot study villages in Konna Arrondissement. Bogo was selected as an example of a village in which tree-planting activity is high, while Djeninkore was selected as an example of a village in which such activity is low. In neither village has there been a concerted effort on the part of a government or a nongovernmental organization to encourage reforestation activities.

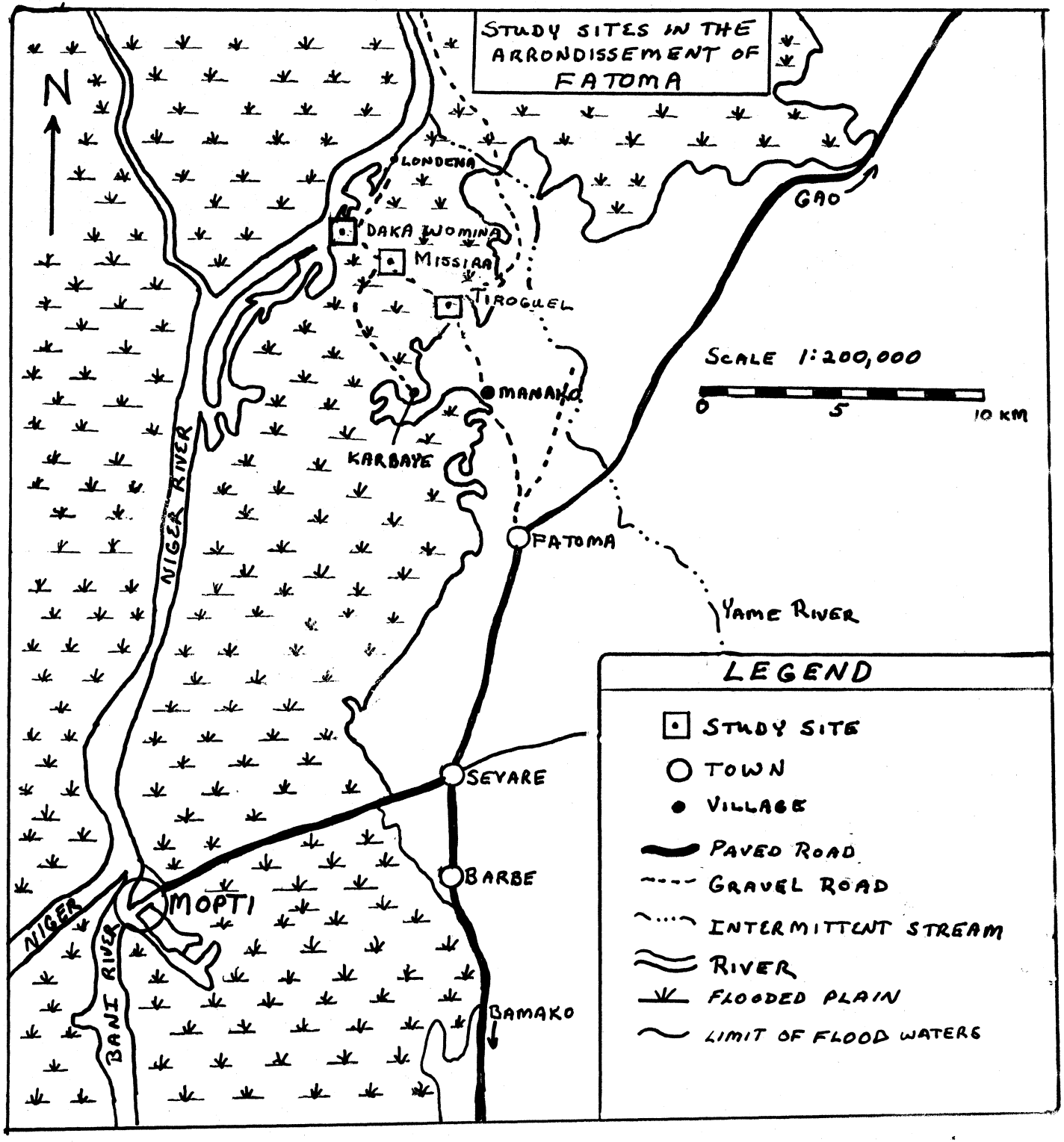
2. Physical Geography

Bogo and Djeninkore are both located on the interface between the seasonally inundated plain and the sandy uplands that adjoin the Bandiagara plateau. Villagers thus have access to flooded rice fields as well as millet fields. Silty clays are the predominant soils in the seasonally flooded regions, while deep sandy soils or laterite hardpan predominate in the uplands east of both villages. The area is one of the major crossing points for cattle entering and leaving the "bougoutières" of the inner delta. As a result, bushes and shrubs in the area are stunted from the effects of heavy browsing.

The climate is nearly identical to that in Fatoma Arrondissement, which adjoins Konna to the south. As elsewhere in the Fifth region, rainfall is very unevenly distributed so that crops often fail for lack of water at a critical time in their growth. The declining high water mark of the Niger's flood in recent years has made agriculture an even riskier business, since many areas no longer receive sufficient water to grow rice.

As in Fatoma, areas subject to flooding are nearly bare of trees. Villagers here also feel that trees attract birds and deliberately tear out any small seedlings that regenerate naturally in the rice fields. The sandy uplands near Bogo support a denser growth of trees, but the mature Acacia albida and Balanites aegyptica stands so typical near Fatoma are not present. Combretum glutinosum, Sclerocarya birrea, Acacia albida, and Balanites aegyptica are the dominant species in fields, while Combretum glutinosum, Acacia seyal, Acacia nilotica, and Acacia raddiana dominate in uncultivated areas.

Remnants of ancient fruit orchards (karité, raffia palms, néré, Sclerocarya birrea, mangoes, and Vitex doniana) are also found near Bogo, and most residents have a number of trees in their concessions (primarily neem, tamarinds, raffia palms, Prosopis, and eucalyptus). In contrast, Djeninkore is virtually devoid of trees, both inside and outside the residential limits. The lack of trees in Djeninkore is particularly striking


STUDY SITES IN THE ARRONDISSEMENT OF FATOMA
N
LONDENA
DAKA WOMINA
MISSIRA
TIROGUEL
GAO
SCALE 1:200,000
0
5
10 KM
MANAKO
KARBAYE
NIGER RIVER
FATOMA
YAME RIVER
LEGEND
STUDY SITE
TOWN
VILLAGE
PAVED ROAD
GRAVEL ROAD
INTERMITTENT STREAM
RIVER
FLOODED PLAIN
LIMIT OF FLOOD WATERS
SEVARE
BARBE
MOPTI
NIGER
BANI RIVER
BAMAKO

given the large numbers of mature trees in neighboring villages. Djeninkore's eastern boundary borders a vast scrubland dominated by Combretum glutinosum and Combretum micranthum, Guiera senegalensis and Pterocarpus lucens. These species, as well as Boscia senegalensis, Acacia senegalensis, Balanites aegyptica, Calotropis procera, Cassia sieberiana, and Zizyphus mauritania, are found in the fields located on the eastern limits of the village's territory.

3. Cultural Geography

The town of Konna serves as the economic and administrative center for Bogo and Djeninkore. Most village residents participate in Konna's weekly market, selling their crops, fish, and handicrafts and buying items that they cannot find in the village. Both villages are easily reached by road year-round and by boat during the height of the floodwaters.

Although Fulani is the dominant language in Konna Arrondissement, a number of ethnic groups inhabit the region. This diversity is reflected in the ethnic composition of the two pilot study villages. The majority of the villagers in both Bogo and Djeninkore are Marka (Malinke). Djeninkore also has a substantial population of Bozos and is closely tied to the neighboring Peulh village, Konza-Peulh. Bogo has substantial minorities of both Bozos and Rimaïbe as well as seasonal encampments of Peulh and Bella.

4. Economic Activities

Farming and fishing are the major occupations of residents of Bogo and Djeninkore. Although all villagers take part in the annual village-wide fish catch, in general, only the Bozos fish on a year-round basis. The Malinke and Rimaïbe villagers rely instead upon agriculture to make a living. Livestock raising is an important, but secondary, activity for many villagers. Most livestock are placed in the care of Peulh herders.

The major crops are rice, millet, and sorghum. Several secondary crops, including fonio, peanuts, and cowpeas, are grown by Bogo residents. In contrast, peanuts and cowpeas are only rarely grown in Djeninkore. Okra and dah are also grown. Very few villagers have gardens.

Remittances from relatives who migrate permanently or seasonally to southern Mali and the Ivory Coast are an important source of income for most villagers.

5. Women's Economic Contribution

Among the Malinke, women play a secondary role in agricultural production. The Malinke women in Bogo and Djeninkore rarely farm their own plots except for small gardens in or near the household compound. Women help prepare meals for the workers in the fields and assist with the sowing and harvest of millet. The women's role in rice farming is limited primarily to gleaning the fields after harvest. Rimaïbe women are much

more active in the fields and often have their own parcels of millet or peanuts. Bozo women catch fish using fish traps but do not participate in net fishing.

Women participate in a variety of income-earning activities, including petty commerce, food processing, spinning thread, and weaving blankets. The gathering of firewood and fruits for sale is not a common activity for women in either village.

B. Tenure Systems in Djeninkore and Bogo

1. Land Tenure

Djeninkore and Bogo differ considerably in the degree of control that each village exercise over its surrounding land area. Bogo is one of the oldest settlements near Konna and exercises a strong claim to agricultural lands within its territory. Villagers from other settlements frequently approach residents in Bogo for the right to borrow land. In contrast, Djeninkore exercises very little control over its land, particularly the millet fields to the east. Most villagers in Djeninkore borrow millet land from the ruling family in Konza-Peulh, often under arrangements that have been passed down from father to son for several generations.

Village-Managed Lands. At the present time, neither village has a field that is farmed collectively by village residents. Although both villages have specific forested areas where villagers can cut wood and gather fruits, neither village has the power to exclude nonvillagers from using these forests.

Family and Individual Fields. Residents of Bogo and Djeninkore farm land on either an extended family or an individual or nuclear house- hold basis. Agricultural decisions for extended family fields are made by the head of the extended family, usually the eldest male, and the field is farmed as a unit by several families. The grain from the fields is placed in a family granary.

Agricultural decisions for individual or nuclear household fields are made either by the head of the household or by the individual who manages the land. The field is worked by household members or by the individual. Grain from these fields is placed in a granary belonging to the nuclear household or the individual. In Djeninkore, women do not have their own fields. In Bogo, however, the Rimaïbe women do farm their own parcels. A woman with her own field makes all the agricultural decisions for that field, works the land or pays someone to work it for her, and has exclusive rights to the crops she produces.

2. Acquiring Land in Bogo and Djeninkore

Native villagers can acquire agricultural land in a variety of ways. Often a young man will approach his father or his uncle for a gift of land.

Such a gift is considered permanent and can be withdrawn only if the receiver commits a serious offense against the giver. The receiver of a gift generally offers the giver a token part of the harvest as an acknowledgment of the gift.

Male villagers also inherit land from their fathers or other male relatives. Inheritances can be farmed on an extended family basis by the heirs, or they can be divided up equally among the heirs and farmed individually.

A third way of acquiring land consists of borrowing land from another villager or from someone in another village. The conditions for land loans vary considerably. The length of the loan may be fixed, or it may be left indefinite. Fixed loans appear to be less common than indefinite loans; among the six loans we encountered, for example, all were borrowed for an indefinite period. In some cases the borrower has to give the lender a fixed amount of grain at the end of the harvest; in other cases the amount paid is left up to the borrower. Of the six cases of borrowed land among the Konna informants, three of the borrowers paid fixed amounts (one sack of rice for rice land, and one fagot of millet for millet fields), two gave the lender different amounts each year according to the harvest, and one gave the lender a 500 CFA one-time fee. Loans ranged from relatively short term (four years) to long term (thirty years). One farmer also had several pieces of inherited land that his great-great-grandfather had borrowed from a neighboring villager. This farmer pays nothing to the descendants of the original lender, though he does recognize their claim to the land.

Land can also be purchased. One of our informants had inherited a piece of land that his father had bought from someone leaving the area. Usually land is sold only when the last remaining member of a family decides to leave the village.

No cases of sharecropping, rentals, or pledging were reported in the two villages, though the villagers acknowledged that such transactions occur in neighboring villages.

3. Land Acquisition by Outsiders

Strangers can acquire land by asking the village chief for a gift of land on which to build a house and for a gift of agricultural land. The chief will select a piece of land under his control to give to the stranger. Such gifts are considered permanent and can be withdrawn only if the stranger leaves or if he commits an offense against the village.

Strangers can also borrow land from other villagers for a fixed or indefinite period of time. If the stranger becomes a permanent resident, the borrowing arrangement can be passed on to his heirs.

4. Rights to Trees in Bogo and Djeninkore

Rights to trees are tied to rights to land. As a general rule, only the landowner has the right to cut down trees, cut branches, and harvest valuable fruits. He can authorize others to do these tasks, or he can cede his rights temporarily to others. As elsewhere in the Fifth Region, landowners in Bogo and Djeninkore seldom enforce their rights to harvest less valuable fruits, collect fallen fruits, or gather dead branches.

Control of trees on extended family land is vested in the head of the extended family. Normally other members of the extended family can harvest fruits or prune branches without getting permission from the head. However, the family head must normally be consulted before another family member cuts or plants trees on the land. Similarly, control of trees on individual plots is vested in the head of the nuclear family if the individual has his own family. Again, household members have the right to gather fruits and trim small branches without getting permission from the household head. However, the household head's authorization is usually required before other household members can plant or cut down trees.

Residents of both villages avoid cutting mature specimens of certain local species, including Acacia albida, Ficus gnaphalocarpa, Lannea microcarpa, Sclerocarya birrea, Parkia biglobosa, Butyrosperum parkii, Vitex doniana, and Tamarindus indica, as well as all exotic fruit species. However, neither village has an internal system for enforcing the rule against cutting these species on private land. As long as a farmer restricts his cutting to trees on land under his control, he cannot be sanctioned by his fellow villagers. If a person cuts trees on another person's field without getting permission, the offender is brought before the village council and forced to pay a fine.

Rights to trees are transferred with the land in the case of land received as a gift. However, landowners generally reserve certain rights over trees on land they lend to others. For example, most borrowers cannot plant trees unless they receive permission from the owner. Even if a borrower has permission to plant trees on the borrowed land, the tree becomes the owner's property if the land is taken back. Generally borrowers are not allowed to cut fruit or shade trees without the owner's authorization. Borrowers usually have the right to cut branches and harvest fruits, though the owner may reserve rights to valuable fruits such as raffia palm, doum palm, Vitex doniana, and Tamarindus indica. Short-term loans are likely to be the most restrictive in terms of the borrower's rights to trees.

5. Tree Use and Management

The villagers of Bogo and Djeninkore rely much less on local tree products than their counterparts in Koro and Bandiagara. Gutters are made of fired clay rather than carved from wood, and many doors are made of roofing tin or imported wood. Mats and baskets are purchased, as are mortars, pestles, canoes, furniture, and most fruits. Even common sauce ingredients, such as tamarind leaves, are often purchased rather than

collected locally. Djeninkore residents transport construction wood and fuelwood from their forest, but villagers in Bogo purchase most of their construction wood and rely heavily on dried cattle dung for fuel. Even forage for the animals, including "bourgou" and Pterocarpus lucens leaves, are purchased. Villagers do use locally collected tree products for medicine and fencing.

Tree Planting Activity. Tree planting in Djeninkore is primarily a male activity. The types of trees planted by villagers are quite limited compared to the variety encountered elsewhere in the Fifth Region. Villagers reported having planted neem, Ficus platyphylla, karité, and date palms. Neem is either seeded directly into the soil or grown from seedlings. Karité is grown from cuttings, and the date palm is seeded directly. Trees planted in household compounds are usually fertilized with manure, watered regularly, and protected with a thorn branch or mud brick fence.

A greater variety of trees are planted by villagers in Bogo. In addition to neem, which is present in nearly all compounds, the villagers also plant néré, mangoes, papayas, karité, tamarind, raffia palms, Parkinsonia, Acacia nilotica, Prosopis juliflora, and Euphorbia. Euphorbia and Parkinsonia are both used as live hedges. One man has planted a windbreak of Acacia nilotica. A variety of planting techniques are used, including direct seeding (néré, Parkinsonia, and raffia palm), transplanting (neem, mangoes, Acacia nilotica, eucalyptus, tamarind, and Prosopis), and cuttings (karité). Planted trees are usually fertilized with a mixture of manure and soil, watered regularly, and protected by a fence.

In Bogo, women also plant trees. Of six women interviewed, three had planted trees. All three had planted trees only in their concessions. According to our women informants, women of the village have always planted mangoes and karité.

Protection of Natural Regeneration. In both villages, protection of natural regeneration generally consists only of avoiding killing trees while clearing and working the fields. Trees are also trimmed as they mature to get branches out of the way and to improve their growth. The main species that are allowed to grow in the fields (often in very small quantities) are: Combretum glutinosum (valued as a shade tree), Acacia albida, néré, Balanites aegyptica, Sclerocarya birrea, Zizyphus mauritania, baobab, Acacia nilotica, Pilostigma reticulatum, Boscia senegalensis, Guiera senegalensis, and Cassia senegalensis.

Soil Conservation. Villagers in Bogo and Djeninkore build grass and earthen dikes to slow down water flow in their millet fields. Manure is sometimes transported to fields, though the heavy concentration of livestock in the area often makes additional manuring unnecessary. Farmers who have no livestock or who cannot afford to transport a lot of manure to distant fields often make use of zais, a traditional method in which manure is placed only in the holes where the grain will be sown.