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**Fields, Fallow, and Flexibility:
Natural Resource Management in
Ndam Mor Fademba, Senegal**

Results of a Rapid Rural Appraisal

Mark and Karen Schoonmaker Freudenberger

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INTERNATIONAL
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DEVELOPMENT

DRYLANDS PROGRAMME

**FIELDS, FALLOW, AND FLEXIBILITY:
NATURAL RESOURCE MANAGEMENT**

IN

NDAM MOR FADEMBA, SENEGAL

Results of a Rapid Rural Appraisal

Carried out 25-30 October, 1991

Report by

Karen Schoonmaker Freudenberger
Mark Schoonmaker Freudenberger

RRA Team:

Karen Schoonmaker Freudenberger
Mansour Fall
Mark Freudenberger
Yvette Kinkpé
Babacar Mboup
Désiré Sarr

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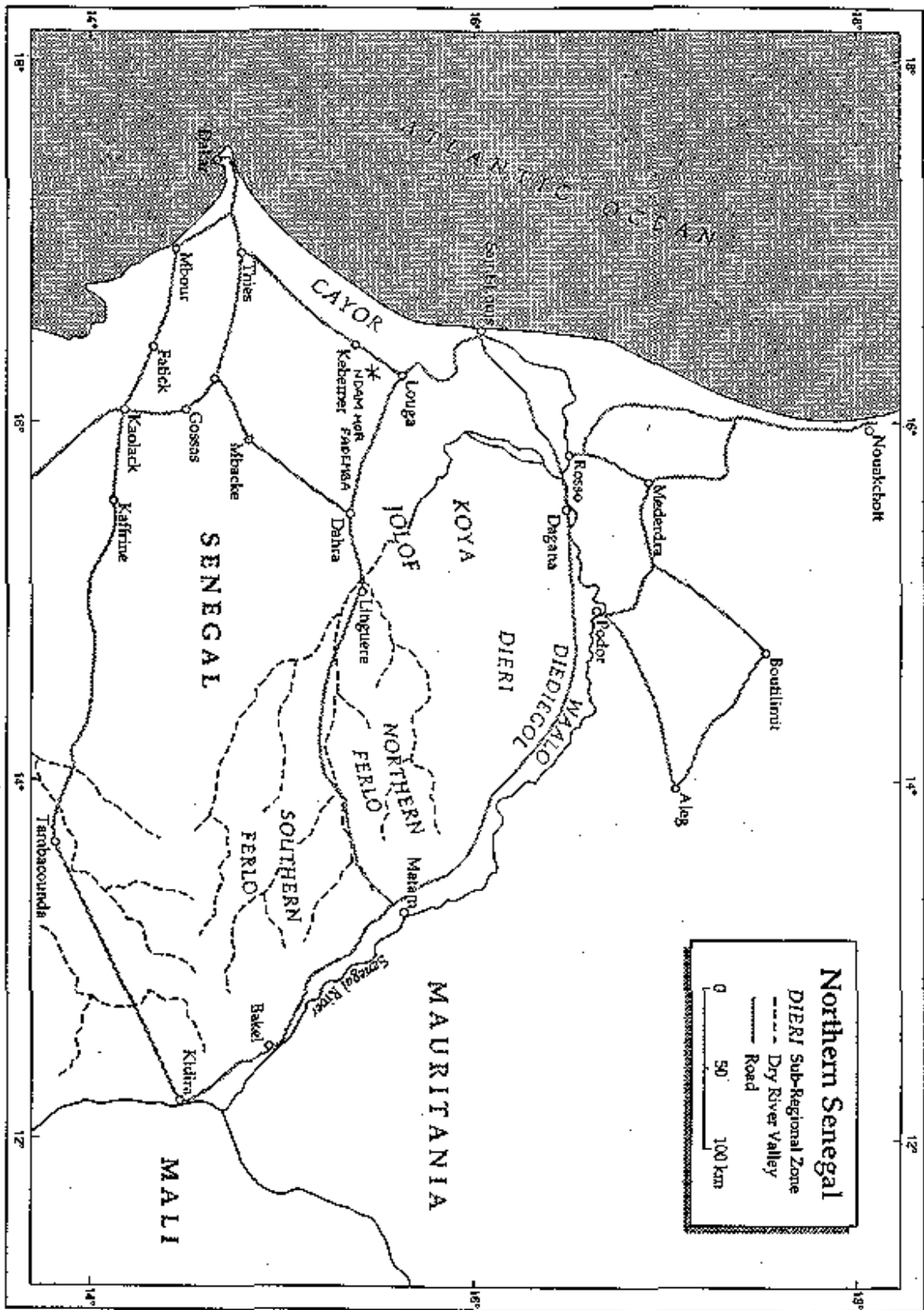
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NB: All the diagrams in this report are taken directly from activities in which the local population participated in the preparation of the diagrams. Graph 1 and Table 1 are derived from statistics in secondary sources. Tables 2, 3, and 4 are syntheses by the team of information obtained during numerous interviews and discussions in the village.



Summary

This paper presents the results of research done in the village of Ndam Mor Fadamba using Rapid Rural Appraisal from 25-30 October, 1991. The study looked at the way one village in northern Senegal manages its natural resources. Chapters two and three are largely descriptive, examining in turn the physical characteristics of the Ndam territory and the village's social structures and human organization. Chapter four goes deeper in analyzing the interaction between human and physical resources. In particular, the study focused on how resource use patterns have changed over time as villagers have adapted their livelihood strategies to periods of severe environmental stress, including twenty years of generally low and erratic rainfall. This has involved a diversification of activities, with relatively less emphasis on crop production and a concomitantly greater investment in livestock and off-farm activities, including emigration. The second part of the chapter looks at how decisions are made concerning resource use in the territory. It describes a hierarchy of decision making authority, in which individuals, heads of family, chiefs of lineage, and external structures including the corpus of national law each have an impact on how resources are managed.

We note that patterns of resource use have undergone dramatic changes within the memories of our informants and that this adaptability has been essential to the community's continued survival. In large part, the community's capacity to adapt is a result of indigenous management structures that permit great flexibility in the use of resources. The village has carefully defended these traditional structures in the face of more rigid laws governing resource use and the growing authority of outside decision making bodies.

The conclusions of the study and their implications for development activities in the zone are presented in chapter five.

Five "myths" or implicit assumptions which hide behind many of the past development activities in the region are presented with contrary evidence from this study to suggest that certain of these assumptions need to be reevaluated. Elements of the Ndam case study that should inform future development activities in the area are the following:

(1) The importance of a territorial response to resource planning

For purposes of natural resource planning, the village of Ndam Mor Fadamba is part of a larger territorial planning unit comprising six villages.

(2) The evolution of livelihood strategies and the growing importance of livestock

The villagers have adapted their livelihood strategies in response to changing economic and environmental conditions. Crops comprise an ever smaller part of

Chapter I: INTRODUCTION and METHODOLOGY

INTRODUCTION

Within the past several years a micro-territorial orientation to rural development planning has moved from the realm of theory into the domain of practice throughout much of Africa. The "aménagement/gestion du terroir villageois" approach, which promotes more effective local-level management of natural resources by sedentary and pastoralist communities (Painter 1991), has generated many innovative projects, particularly in the Sahel region. It advocates a participatory planning process whereby the development agency and the local community jointly plan and implement programs in a spatially defined village territory. The territory is a socially recognized, delimited and appropriated unit in which the local community members share a sense of belonging; that is, it is "theirs" because of previous claims made by the community or their ancestors.

Non-governmental Organizations (NGOs) who adopt the "*aménagement du terroir villageois*" approach find that they must acquire a solid understanding of household and community agricultural and pastoral production systems. In the past many development agencies simply hired social scientists to conduct pre-project studies that were then used by a technical staff to design project interventions. Often these projects, reflecting the priorities and perspectives of the development agency and not those of the local community, failed dismally. Over the past decade, attention has turned to more participatory methods of collecting information and integrating it into the project planning process. "Rapid Rural Appraisal," "Participatory Rural Appraisal," "*Recherche-Action*" and numerous related research techniques all strive to incorporate local perspectives and the indigenous knowledge of the beneficiary populations into the planning and implementation of local development efforts.

In the field of resource management, participatory research methods have been used with local populations in both east and west Africa to define the territorial limits of villages and the land uses within these spaces. From this starting point, development agencies and the communities with whom they work have jointly defined local problems, determined appropriate responses, and prepared resource management plans (National Environment Secretariat 1991). The Rapid Rural Appraisal conducted by World Vision in Ndam Mor Fadamba represents a first step in learning about a community and its environment. As such, it begins a process which could lead to joint preparation of future program and project activities by World Vision and the residents of the Ndam territory. It was clear from even this brief study that the community does indeed possess an array of skills and insights that could be used to design and implement creative development activities. In addition to providing information about the village selected for the study, the process of information gathering and analysis should more broadly inform World Vision's activities in the region and increase staff sensitivity to a range of issues related to natural resource management at the local level.

The Essential Role of Indigenous Knowledge in the Participatory Planning Process

Rural Sahelian communities possess a vast knowledge of their surrounding environments. Until recently development practitioners have largely ignored this resource, failing to appreciate the wealth of practices employed by rural communities to survive in a rapidly changing and risk filled social and ecological environment. Rapid Rural Appraisal techniques can be helpful in eliciting and elucidating the knowledge possessed by rural communities and translating local expertise into a form that can be used by development planners. The RRA conducted in Ndam Mor Fadamba generated a prodigious amount of information in a short period of time about the constraints and opportunities faced by the local community. The team came away from the six day experience deeply impressed by the diversity of strategies used to survive in a capricious semi-arid environment long buffeted by drought and changes in the regional economy. The community is constantly experimenting with ways to produce adequate food and cash to sustain its livelihood and we noted several innovative resource management practices that could have applicability to similar ecological zones elsewhere in the Sahel. The Ndam populations are managing the relatively meager resources at their disposal in an effective and carefully considered fashion.

The village population was also very clear on areas where they have identified limits to their knowledge and would particularly welcome information from "formal scientific" sources. This suggests that if the process of consultation and dialogue continues -- bringing local knowledge and outside expertise to bear on jointly identified problems -- numerous proposals will emerge for how the resources of Ndam Mor Fadamba might be better conserved and regenerated.

METHODOLOGY

The field study was carried out as part of a training program introducing the staff of World Vision to Rapid Rural Appraisal¹. It was also intended, however, to help orient the agency's activities as it moves more systematically toward a program focus around natural resource management. Hence, while generally addressing natural resource issues, the study purposefully maintained an open-minded, exploratory attitude. The intention was not to gather information around a pre-defined set of activities, but rather to gather information enabling the agency to establish a program in response to local needs and concerns.

¹For more information on the techniques used in RRA, see Schoonmaker Freudenberger and Gueye (1990), McCracken et al., and National Environmental Secretariat.

Objectives

The following objectives were set by the team before leaving for the village.

- I. Identify the territory of Ndam Mor Fadeniba and profile its physical characteristics
 - Soil
 - Water
 - Flora
 - Fauna
 - Climate/Rainfall

- II. Identify the human resources in the territory of Ndam Mor Fadeniba
 - A. Population (Density, Ethnic groups, Distribution)
 - B. Social Structure and Organization (Livelihood strategies, social stratification, decision making structures, religion)

- III. Analyze the interaction between physical and human resources in the territory of Ndam Mor Fadeniba
 - A. Use of Natural Resources
 - Who uses the natural resources?
 - How and for what purposes are they used?
 - B. The Management of Natural Resources
 - Who decides how resources will be used? (Institutions and individuals)
 - What use-rules govern resource use?
 - Local rules
 - Legal framework
 - C. Perspectives on the Future
 - Opportunities
 - Constraints

In defining its objectives the team explicitly noted that they wished to explore each of these objectives in its broader geographic and historic contexts so as to avoid viewing the village and its situation as isolated in space or static in time.

The Team

A six member team represented diverse disciplines and perspectives and included two women. Half the team were World Vision staff people, two of whom knew the village and area well. The other three team members all had extensive experience working with natural resource issues in Senegal, but had no particular experience in this village or region.

Karen Schoonmaker Freudenberger: Socio-economist (Team Leader)

Mansour Fall: Agriculturalist/World Vision

Yvette Kinkpé: Generalist/World Vision

Désiré Sarr: Rural Sociologist/Institut Sénégalais de Recherche Agricole

Mark Schoonmaker Freudenberger: Natural Resource Planner/Land Tenure Center, University of Wisconsin

Babacar Mboup: Communicator/World Vision

The Study Site

The village selected for the study, Ndam Mor Fadamba, has long participated in World Vision activities and has benefited from a tubewell equipped with a handpump, a school, and diverse gardening, forestry, and agricultural projects. Administratively situated in the *arrondissement* of Sagatta in the Department of Kebemer and the Region of Louga, it is located some 30 kilometers directly south of the regional capital of Louga and 15 kilometers from the *arrondissement* center. With a population of 560 people and situated well off the main road, World Vision, which works in a broad spectrum of villages in the area, considered it to be reasonably representative of the area and the villages in which it works -- one of the principal criteria used for site selection. In retrospect, we suspect that certain factors, including the village's maraboutic origins and World Vision's extensive activities, have favored the village relative to others in the zone.

The Study

The team spent five and a half days in the village, from 25-30 October 1991, arriving on the afternoon of the first day. We lodged in the village with the chief and one of his principal councillors. RRA encourages the use of a range of information gathering techniques as well as a diversification of informants representing different interests or perspectives in the community. The "triangulation" of information sources and techniques helps to offset the biases that may characterize a single approach. In preparing this report, a number of secondary sources on the agro-ecology of northern Senegal and the history of the Kayor² were used in an effort to place the field study in its larger context.

Among the techniques that proved particularly useful in encouraging the active participation of villagers were a transect, in which the team and three informants selected

²Once a great Wolof kingdom, the Kayor (or Cayor) now refers to a geographic region that runs roughly north-south, parallel to the coast of Senegal, between the cities of Thies and Louga.

by the village piled into the back of our pick-up truck to traverse the territory of the village; two mapping exercises in which large numbers of village men participated in drawing, first, a map of the village and then a map of the territory in the sand at the village square; a Venn diagram in which village institutions were mapped out using colored papers of different sizes; and several matrices used as analytic tools to encourage deeper reflection on changing resource use patterns over time. A wealth ranking also proved very revealing of economic and social stratification in the village.

The study took place at a time that unfortunately coincided with the harvest. As a result, women were particularly busy with field work. Men were for the most part occupied in the early part of the day and returned to the village in the mid-afternoon, at which time they gathered in the public square. This public gathering, in which all the families of the village were represented, provided the ideal opportunity to carry out discussions with a large and representative group of men. It was with this group that we did the maps, Venn diagram, discussion of the transect, and one of the matrices. We then used the morning and evening hours for individual and small group interviews, many of which were intended particularly to solicit the views of women and minority perspectives in the village. Hence, in most cases the mornings were devoted to semi-structured interviews in individual compounds with (for example) women, the Fulbe herding family, the chief of the village, etc. In several cases the team divided into two smaller teams to conduct these interviews and then shared the information afterwards. A chronological list of activities undertaken during the RRA can be found in Appendix 1.

The team met each day, usually in the evening, to discuss both their findings and any methodological issues that had arisen and to plan the next day's activities. While the team did not leave the village, the morning of the fifth day was devoted to a preliminary analysis of the results up until that time in order to focus the last days' work. On the last afternoon in the village, a feedback session was conducted with most of the adult members of the village (both men and women) to explain the work we had done as well as to solicit corrections and additions to our findings. This proved to be particularly useful in adding women's perspectives to activities that had been conducted with men alone. (For example, the women added some organizations that concerned them to the Venn diagram.)

Limitations of the Study

The enthusiasm and interest of our village interlocutors, combined with the spirit of exploration manifested by the members of the team, made for a highly productive and enjoyable field study. The team had ample time to triangulate information within the village and has a high level of confidence in the results obtained, all the time realizing that in such a short period of time there are bound to be limits to the kinds of information one can obtain. Future World Vision activities must be prepared to verify, augment, and where necessary correct these initial findings. The one area where the team found the greatest deficiency in our results was that all the information was gathered from the perspective of the inhabitants of Ndam Mor Fademba. This was particularly a limitation where disputes with neighboring villages were concerned and it might have been useful to

collect the views of adversary parties, as well as the administrative officials who have dealt with these conflicts. This was not done, in part due to time constraints, and in part due to a fear of raising suspicions concerning our motives with our hosts in Ndam Mor Fadamba. These questions can probably be better addressed on separate, informal visits to the other villages and administrative centers.

While the multidisciplinary nature of the team provided many useful insights throughout the study, it would have been useful to have had more technical expertise in both the forestry and livestock sectors.

Chapter II: THE TERRITORY AND PHYSICAL CHARACTERISTICS OF NDAM MOR FADEMBA

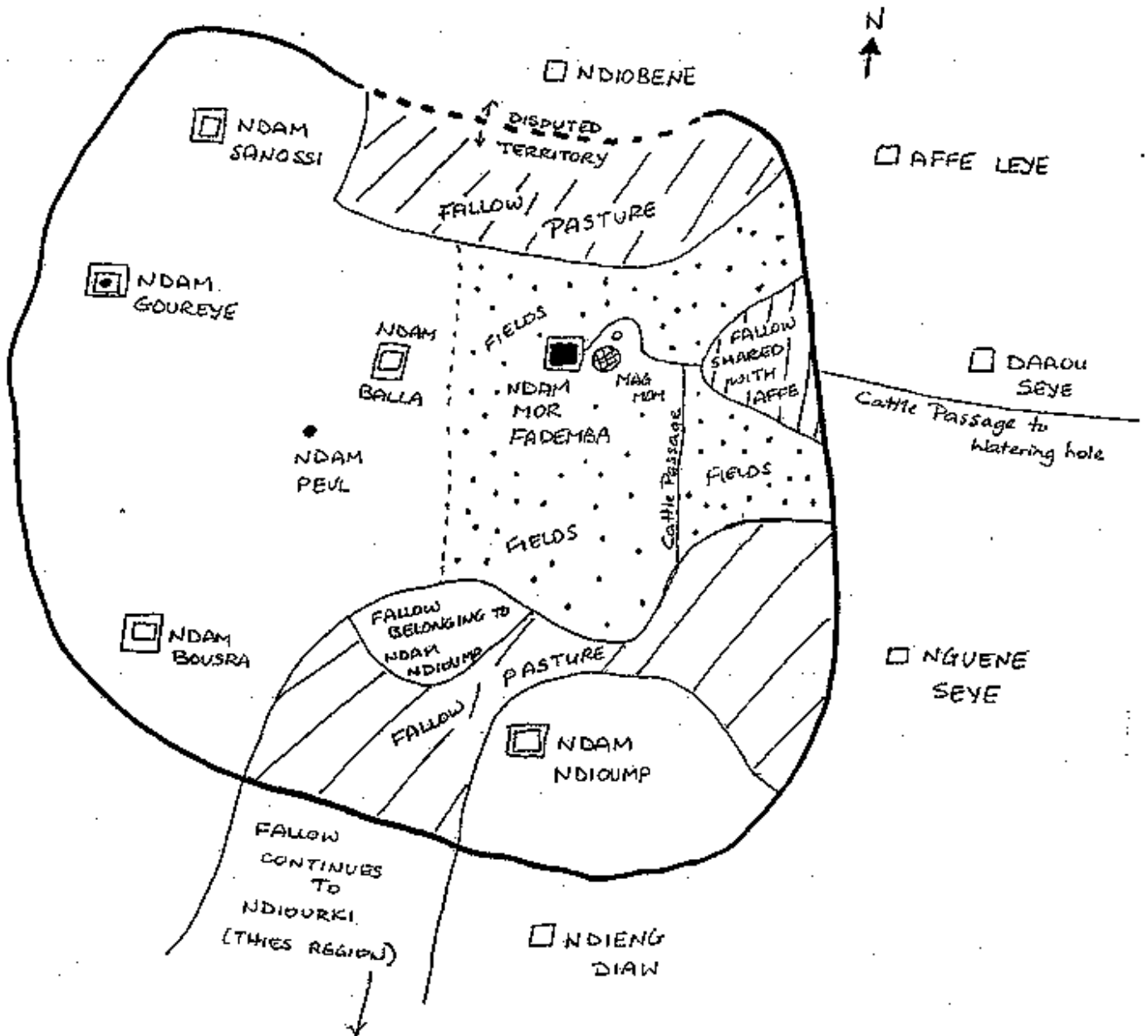
THE TERRITORY OF NDAM MOR FADEMBA

Two participatory mapping exercises were held with the men of Ndam Mor Fadamba to define the territorial limits of the village (see Diagram 1). These maps drawn in the sand indicated that the village of Ndam Mor Fadamba considers itself closely attached to six other neighboring villages, linked together by historic and religious ties. A strong sense of collective attachment to the space of the six Ndam villages permeated the discussion of territorial limits. References to the history of how the Ndam settlements came to be in this part of the Kayor demonstrate the attachment of the residents to the territory.

Few boundary markers demarcate the land holdings between the six Ndam villages. The frontiers between one Ndam village and another are generally fluid as land is loaned and exchanged among relatives and friends. In contrast, the external boundaries of the collective Ndam territory are very well defined by such geographical features as the top ridges of sand dunes, large trees, and sometimes hedges ("salanes") constructed of *Euphorbia balsamifera*. The boundaries of the western reaches of the territory are much more clearly articulated than those of the eastern side, a sign perhaps of differing land pressures. Territorial limits on the western and northern fronts have been fought over violently in the past. "Salane" fences and bush lands are in some cases indicators of disputed territories. The construction of a live fence in one Ndam village occurred following a serious dispute with a neighboring community.

The uncultivated northern fallow lands of the Ndam territory are part of the disputed boundary between Ndam Mor Fadamba and Ndiobène. For decades Ndiobène and Ndam Mor Fadamba have disputed the limits of their respective territories and violence has broken out between the two communities over the contested lands. In order to bring a halt to the conflict, the Senegalese administrative authorities and the Rural Community Council banned cultivation in the disputed territory. Today the disputed space is in effect a "no man's land" which may be grazed by the livestock of the two disputing villages but is cultivated by neither side.





DIAGRAM 1
MAP OF THE TERRITORY



- ☐ Village within the territorial limits
- Village outside the territory
- Land cultivated (or in short-term fallow) by residents of Ndam Mor Fadamba
- /// Land allocated to long term (≥ 5 years) fallow by residents of NMF
- ⊗ Mag morn, village reserve

This map of the territory of the Ndam villages was drawn in the sand in the village square by a group of about 15 men. The map is not necessarily drawn to scale. The distance from the edge of the village to the beginning of the fallow lands due south is about 2 kms. The distance from the inhabited village to the southern edge of the territory is about 5 kms.

DIAGRAM 2
TRANSECT OF THE TERRITORY

ZONE OBSERVATIONS	INHABITED ZONE 	EDGE OF VILLAGE 	FIELDS 	PASTURE/FALLOW 
USE	Houses, School, Commerce, Infrastructure, Seed storage, mosque, solar system, wells, public square, store house	Coop building, health hut, tethering area, hay stacks, gardening, football field, cemetery, wood stacks, garbage	Wood, crops, collection of tree products, animal passageways, roads, post-harvest pasture	Wood, pasture, gathering, medicines, 'no man's land' tracks, catteways
SOIL	joor	joor	joor dekk joor kialt (degraded)	→
TREES	Neem, kadd, baobab, seng, lemon, orange, mango, calatropis, mandarin, date, rian	Soump, kadd, neow, dakaar, aem, ngue, guy, seng, soon, rath, njandam, beer, xuree, rand, juu, salaar	→ + neree, dori	regeneration of trees
CROPS	hot pepper, eggplant, tomato	cowpea, cassava, peanuts, vegetables, potatoes, pepper, sorghum, maize	peanuts, millet, cowpea, sorghum, bambara groundnut, hibiscus, cassava, melon	
GRASSES		ijemb, salguuf, bissag, ndatukon, calawli, mbaranbef, ndenaat, ceker, katijantabe, xaaxaam, dagg, baketeis, caxax, kuttut	→ + las, yimb	regeneration of grasses
ANIMALS	Horses, cows, sheep, goats, donkeys, chickens, guinea fowl, pigeons, lizards, snakes	wild cats, hedgehog, jawa, sagal, seect, tog, tiprip, akiew, cap, ceref, viper	sheep pasture here during dry season	→

The transect of the village territory was done by driving from the center of the village to the southern edge of the territory in a pick-up truck with three male village informants. We stopped at frequent intervals to ask questions about resource use patterns and to interview anyone we saw about their activities. This included several women harvesting firewood. Later the information was compiled into this diagram with the assistance of some 15 village men. Local species names are given in Wolof.

Land-Use Patterns in Ndam Mor Fademba

The lands occupied by the village of Ndam Mor Fademba may be sub-divided into four quite distinct use zones (see Diagram 2).

1) Village Center

The village center consists of a large public square around which are built compounds and other village infrastructures (e.g. stores, mosque, school, a potato drying hut, solar electric panels). Following a fire that burned Ndam Mor Fademba in 1967, the residents rebuilt the village on a grid pattern so as to avoid future conflagrations. Each household was granted a large concession on which to build residences. Wide sandy roads lead out from the square between the walled off compounds. Large *neem* and *balanites* trees grace the public square and various shade and fruit trees fill the courtyards of individual compounds. The village is an oasis of shade and greenery within an otherwise barren and dusty landscape. Within the immediate confines of the village, women cultivate a few vegetables watered using a borehole constructed by World Vision. Small ruminants are kept within individual compounds while the majority of the village's cattle are kept in common corrals at the edge of the village near one of the wells.

2) Village Periphery

The land immediately behind the residences of Ndam Mor Fademba is used to store peanut hay, pile up household wastes and animal manure, and stockpile firewood. During the rainy season women cultivate not only the staple crops of peanuts and millet, but sometimes sorghum and maize on this land manured with household wastes. Small gardens of cowpeas, manioc, and vegetables are tended here during both the rainy season and the dry season. Even though the majority of the land is allocated for household use, several public infrastructures are also found including the cemetery, the peanut cooperative, and a football field.

3) Cultivated Household Lands

Household members cultivate more distant fields scattered throughout the territory of the Ndams. These lands are less well fertilized than those immediately surrounding Ndam Mor Fademba due to the high costs of transporting manure and household wastes to fields that can be as far as 5-7 kilometers from the village center. Field crops, primarily millet and peanuts, are cultivated in these more distant fields though minor cash crops like bissap (*Hibiscus sabdariffa*) are often intercropped with millet or line the boundaries of fields. Pure stands of bissap may also be found from time to time, planted at the last moment by those who suffered crop failures earlier in the season and lack seeds to replant millet or peanuts.

4) Village Fallow and Pasture Lands

Bush fallow rotations are still practiced in the territory, though the system has undergone considerable modification. The fallow not only regenerates the sandy soils of the territory, but the fallow lands also serve as a key grazing reserve for the village's

livestock. Short scrubby species of trees, which become an important source of fuelwood, quickly sprout when fields are abandoned. Various forest products are gathered primarily by women for household consumption and market sales.

The farmers of Ndam Mor Fadamba once managed a system that consisted of north-south rotation of cultivated field crops and long-term bush fallow. For about five years all of the land north of the village would be cultivated. Over the succeeding five year period these lands would be left fallow and villagers would shift their cultivated lands to the south. This system has been noted for other Wolof villages in the Peanut Basin (Pelissier 1966).

The introduction of the agricultural mechanization programs of the early 1960s and 1970s led to a profound modification of the traditional fallow system. The combination of mechanization (which resulted in a much greater land area being put under cultivation) and the disputes with Ndiobène (in which the Rural Community Council ruled that the land in dispute could be cultivated by neither side) led to the adaptation of the former fallow practices. Now, by consensus, the villagers decide on the areas that will be left in long-term fallow. Since a given family's plots are scattered (often in several 2-3 hectare plots) throughout the Ndam village territory, they can leave fallow those areas that fall within the designated pasture areas and cultivate in their other available plots. As can be seen by the map (Diagram 1), much of the outlying lands of the Ndam territory is now devoted to long-term fallow.

The chief of Ndam Mor Fadamba manages a village "reserve" known in Wolof as the *mag mom* lands. This land comprises the former site of the village before it moved to its present location in 1914. In addition, in those extremely rare cases where an entire family leaves the village and no member remains behind, their land becomes part of the *mag mom*. Only the chief can allocate these lands which are distributed to those in need of temporary lands for field crop cultivation or farmed by members of his extended family.

THE ECOLOGY OF THE NDAM TERRITORY

The populations of the territory encompassing Ndam Mor Fadamba confront a constantly changing physical environment. The sandy soils and the tree and grass cover of the territory have been profoundly altered both by human agency and by fluctuations in climatic conditions. As in many parts of the Sahel, the physical ecology of the Ndams is very sensitive to variations in rainfall. For centuries droughts and famines have characterized the history of northern Senegal. But the chronicles of famine have been brought on not only by drought and other natural calamities but also by profound changes in the broader economy of the region. In the pre-colonial period the history of the Kayor was punctuated by famines caused by wars and pillage (Becker 1975). Today the profound ecological changes within the memory of the population of Ndam Mor Fadamba have been strongly influenced by twenty years of drought as well as by such human factors as government agricultural policies promoting mechanization and peanut production and the vagaries of international prices for cash crop commodities.

Climate

The Sahelian climate of the Ndams' territory is highly variable in both space and time. From a long term climatic perspective of several centuries, the region has suffered much drier eras, but also periods in which the climate was considerably more humid than at present (Nicholson 1979:39). The sixteenth through eighteenth centuries were considerably more humid episodes than at present. While an overall more humid climate probably persisted well into the 1700s, severe periods of low rainfall did strike northern Senegal from time to time during this wetter era. Periods of below "average" rainfall lasting ten years or more struck the region periodically. These droughts have been extensively chronicled by explorers and travelers (Becker 1985). More recently (1913, 1940, 1983) severe droughts have struck much of the Senegambia with devastating consequences on the rural populations (Sircoulon 1976).

Rainfall statistics have not been kept for the Ndam territory. Until recently, the closest rainfall gauge was in Sagatta, about 15 km from Ndam Mor Fadamba. These statistics confirm the perceptions of the villagers that rainfall has fallen significantly since the late 1960s (see Graph 1). From 1961 to 1969 the territory was blessed by an average annual mean of 493 mm. From 1970 to 1990 the annual mean has fallen to only 297 mm. Seasons of low rainfall (100-300 mm) are more frequent than plentiful (300-500+) years (see Table 1).

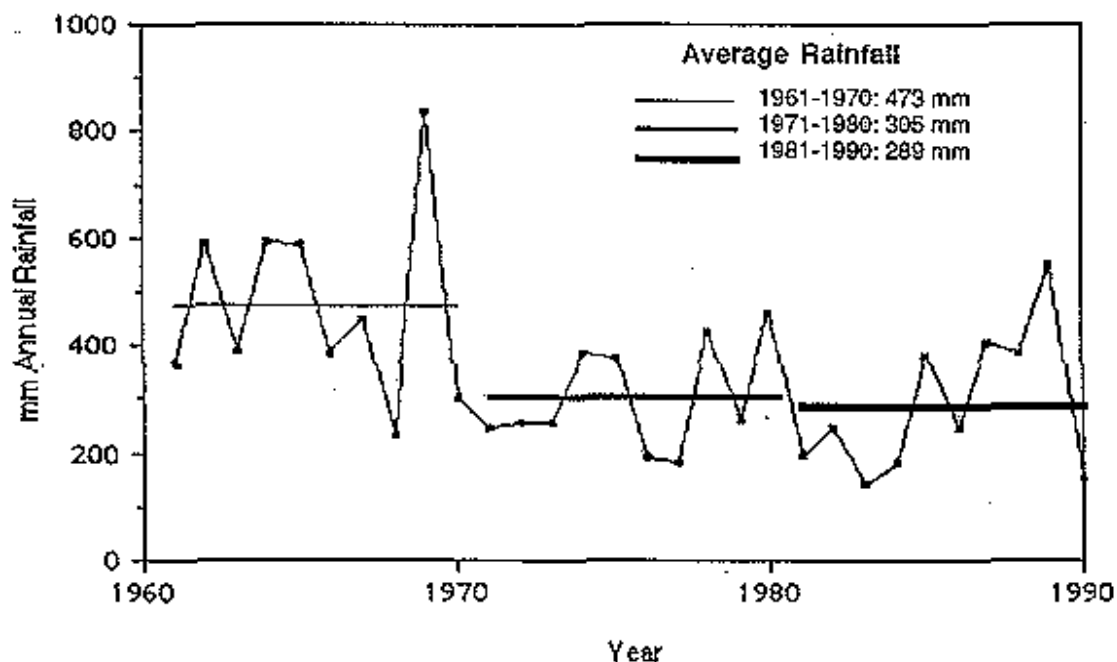
The progressive decline in rainfall has triggered numerous changes throughout the ecosystem and economy of the Ndams. Farmers have abandoned late maturing varieties of millet ("sanyo"), sorghum ("fela"), and peanuts and replaced them with shorter cycle varieties. Maize and manioc were grown during the higher rainfall years, but now very little is produced, even in the better watered lowland depressions. One of the poorer farmers of Ndam Mor Fadamba discussed the implications of the constant fluctuations in rainfall. In excellent years, harvests will provide 8 to 9 months of food, in average years crops yield about 5-6 months of food, but in bad years, "like those of the present," harvests last for only 2 to 3 months.

TABLE 1

RAINFALL STATISTICS
ARRONDISSEMENT OF SAGATTA

Year	mm	Year	mm	Year	mm
1961	365	1971	249	1981	197
1962	588	1972	255	1982	247
1963	389	1973	257	1983	142
1964	594	1974	387	1984	184
1965	590	1975	376	1985	380
1966	387	1976	194	1986	247
1967	449	1977	184	1987	406
1968	235	1978	425	1988	386
1969	837	1979	262	1989	548
1970	301	1980	458	1990	153
mean 1961-70	473mm	1971-80	305mm	1981-90	
	289mm				

GRAPH 1
ANNUAL RAINFALL 1961-90
ARRONDISSEMENT OF SAGATTA



This graph was compiled from the data in Table 1 which were collected by the government extension service at the *arrondissement* capital in Sagatta.

Soils

The territory of Ndam Mor Fademba is gently rolling, a result of dunes formed during the Ogolien period, some 20,000 to 14,000 years before the present. The sandy red and reddish-brown ferruginous soils, known in Wolof as *joor* soils are highly permeable to water. Water erosion is relatively minimal on these soils, yet wind erosion can be considerable once the protective vegetation cover is removed.

From as far back as the early colonial period agronomists have been deeply concerned about the decline in the fertility of the sandy soils of the peanut basin (Aubert and Maignien 1949). This perception is shared by the farmers of the Ndams who decry the loss of fertility of the *joor* soils. Villagers note that the presence of the parasitic weed "striga" in millet fields is a visible sign of the poor condition of the soils. On striga infested soils, farmers are forced to abandon millet production and farm peanuts instead. The physical structure of the soil has also been affected by the removal of the herbaceous and ligneous cover. In some parts of the territory, the lack of protective vegetation has resulted in severe wind erosion and the exposure of a clay hardpan, known in Wolof as *walt* soil.

Trees

The evolution of the density and composition of the tree cover reflects profound changes that have taken place in the weather and the economy of the territory. Foresters and botanists have noted that the climax tree vegetation in many parts of northern Senegal disappeared with the advent of the peanut economy (Giffard 1974:104; Trochain 1949:1040; Aubreville 1937). Today "pseudo-climax" species which are more drought resistant have replaced the denser forests of the past. Elderly informants remember that the tree cover was so dense that "one could not see through the trees." The villagers of Ndam Mor Fademba painted a nuanced picture of the causes behind the disappearance of many species. One factor cited as leading to the disappearance of many trees was the clearance of large parts of the bush for the cultivation of peanuts, a practice stimulated primarily by the agricultural mechanization policies of the early 1960s (see chapter 4). The severe droughts of the early 1970s also took a toll.

Several tree species have become extinct or greatly declined in number within the memory of elderly informants. Some of the principal species in this category are the following: *Securidaca longepedunculata* ("fuf"); *Ximenia americana* ("golon"); *Uvaria chamae*, ("hasao"); *Acacia seyal* ("surur"); *Sterculia setigera* ("mbepp") and *Parinari macrophylla* ("neow"). These trees, mostly broad leafed, were all used extensively for food, medicines, and construction timber. Sahelian foresters have argued for some time that the progressive decline in the rainfall of the Peanut Basin has created an environment hostile to tree species whose habitat is more typically the higher rainfall zones (Giffard 1974, von Maydell 1986). The occasional tamarind, *neow*, or *fuf* are but relics of an earlier rainfall regime. It should be noted however that the decline of the density of the tree cover and the species composition is not uniform within the environs of the Ndams. In the Ndam territory, the multiple purpose *Acacia albida* tree is quite rare, yet in

neighboring villages dense concentrations may still be found in suitable environments such as lowland depressions that capture rainfall.

The landscape is now dominated primarily by scrubby but hardy trees. On fallow lands large leaved as well as the spiny acacia species have generally been replaced by hardier varieties such as the *Combretum glutinosum* ("rath") and *Guiera senegalensis* ("nguer"). Other drought tolerant trees such as the *Balanites aegyptiaca* ("soump") are also prevalent. As pioneer species, these trees quickly colonize degraded soils to fill the niche left by the decline in the less drought tolerant species. Despite the sparse distribution of the tree cover, many species serve as important sources of forage for the livestock of the village (see chapter 4).

Natural regeneration does occur, however, with the return of better years of rainfall. Informants reported regrowth of several valued species such as the *Acacia Albida* and the *Parinara macrophylla*. The *Acacia albida* seems to recover especially quickly in places such as the corrals where livestock are guarded in the evenings. The disputed territory reserved presently for grazing also shows a dense growth of *combretum* species.

The settlement area of Ndam Mor Fadamba is covered by a quite dense concentration of carefully tended trees. In the center of the village, baobab (*Adansonia digitata*) trees provide not only shade but also rope from the bark, fruit, and leaves for food and forage. *Prosopis* (*Prosopis juliflora*) trees have been planted in the central square for shade. Nearly every compound has one or more large and well trimmed neem (*Azadirachta indica*). This species is intensively coppiced and used primarily for poles employed in the construction of thatch roofs.

Herbaceous Cover

The quality of the vegetation varies enormously from year to year and also from place to place within the territory itself. The grass cover is largely dominated by annual species. The pastoralist Fulbe are particularly attuned to variations in grass cover and note that the quality of the annual grasses varies greatly as a function of the rainfall. Following years in which rains are plentiful, vegetative quality is sometimes worse due to excessive amounts of moisture in the grasses. "The veins of the grass are too full" during these years, according to one herder.

The quality of the herbaceous cover also varies significantly from place to place within the territory. The noxious annual grasses of the *Aristidea* and *Eragrostea* families are found in many areas, an indicator recognized by villagers as a sign of poor quality soils. Several highly valuable types of grasses are found in the zone. Tufts of *Andropogon guyanus* are found occasionally within the territory. These grow naturally in better watered lowlands and are now cultivated by some farmers as a cash crop (see chapter 4).

By the end of the dry season, there is often little remaining of the grass cover. The scarcity of grasses is particularly acute following poor rainy seasons or unusually long dry seasons. However, bush fires are no longer reported to be as prevalent as in the past.

This may be due to several factors. The villagers of the Ndams may not be burning off grass cover as much as in the past due to the importance the population places on livestock production. Fields cleared of crops also provide effective barriers to the spread of bush fires. But perhaps the most important factor is that the years of low rainfall have diminished the amount of dry litter and hence the tendency of fires to spread rapidly.

Wildlife

The wildlife of the Kayor is now largely extinct. Large game animals were hunted out several hundred years ago to meet the demands of European mercantilist traders (Boulègue 1987). Until the mid-1930s hunting generated game meat for the populations of the territory. Only small predatory species remain to this day to prey upon small fowl and young livestock. Domesticated livestock have now replaced the large ungulates of the past. A 1987 census conducted by World Vision indicated that the 560 inhabitants of Ndam Mor Fadamba possessed 60 cattle, 450 goats/sheep, 21 horses, and 35 donkeys. The population of livestock, and especially the number of small ruminants, has probably increased since that time.

Water Regime

There are presently three hand dug wells in the village that are primarily used to water livestock and one borehole equipped with a hand pump, used primarily for domestic consumption. This latter pump, constructed by World Vision, assures a potable source of drinking water. There is also a motorized borehole in a village some 5 km away but the residents of Ndam are reluctant to drive their animals there except in case of severe need (when the village wells run dry) because of the distance and the fees they would be required to pay.

Chapter III: HUMAN RESOURCES IN THE VILLAGE OF NDAM MOR FADEMBA

The village of Ndam Mor Fadamba is a compact grouping of 18 compounds arranged in concentric rows one or two deep behind the four sides of the village square. A careful look around the well tended central square begins to offer the perspicacious observer clues about the complex social relations characterizing the village. One side of the square is bounded by cement walls delimiting the compounds of the principal village notables. Horse drawn carts stand in front of these compounds, one of which also shelters the thriving village store. The other sides of the square are fronted by neat millet stalk fences while the compounds behind are either not fenced at all or are delimited by half-fallen hedges or millet stalk fences begging for repair. Only through much deeper discussion do the mutually reinforcing hierarchies of social, economic, and religious power which control virtually all aspects of village relations begin to reveal themselves to the outsider.

History of the Village

The Maraboutic family Lo first colonized the lands now comprising the village of Ndam Mor Fadamba at the time of the Damel Madior Fall (probably in the 18th century). Demba Lo was the first to settle the origin village of Ndam Goureye, from where he sent his sons out to begin communities in the other Ndams. The chief of the village who recounted the history to us noted that the land was delimited (at the time of Demba's father Makhtar Lo) by a man who set out on his horse to trace its boundaries. This would appear to correlate with the description given by Mamadou Diouf (1990:24) of lands assigned by the ruling *damel*: "all other land can be distributed by the king to princely families or to the *marabouts*. They call them *gor mom* (the property of the one who clears the land). This type of ownership is the *leu* or *veu fas*, that is the space that can be traced by a horseman in one day, the system used by the *damel* to delimit this kind of domain. Concerning the land given to the *marabouts*, the commonly used name is: *sax* (alms)."³ According to the chief, this original dotation of land still defines the territory of the collective Ndam villages, with the only change being the area to the north which is under dispute with the village of Ndiobène.

It appears that this early colonization found a certain number of inhabitants, already converted to Islam, resident on the colonized lands. These people were taken on as *talibés* (religious followers) of the Lo marabouts. Ndam Mor Fadamba has moved three

³Original French text: "toute autre terre peut être distribuée par le roi à des familles princières ou à des marabouts comme dotation. On les appelle les terre *gôr mom* (propriété de celui qui les défriche). Ce type de propriété est le *leu* ou *veu fas*, c'est à dire l'espace conconscrit par un cavalier en une journée, système utilisée par les *damel* pour délimiter ce type de domaine. En ce qui concerne les terres concédées aux marabouts, le nom plus communément admis est: *sax* (aumones)."

times since its initial founding (for reasons not explained) with the last site before the present being the *mag mom*, where a *rand* (*Bauhinia rufescens Lam.*) tree was planted to indicate the site of the village. In 1914, the village moved a very short distance from the *mag mom* to its present location "because too many people were dying there," but the village cemetery still remains in the old site which continues to be part of the village land holding.

Population: Composition, Ethnicity, Religion

The population of Ndam Mor Fadamba is currently 560 people, of whom 262 are under 18 years of age. This population has decreased significantly within recent memory since in the years since the droughts of the 1970s some 16 families have moved to Touba, the cradle of the Mouride religious sect and the fastest growing city in Senegal. The active adult population in the village is dominated by women and older men since younger males seek every opportunity to find work outside the village, either in the urban centers of Senegal or overseas (especially Italy). The diminution of labor implied by this outmigration has had a significant effect on agriculture and natural resource management (see chapter 4).

The village is comprised almost exclusively of Wolofs, with the one exception being a Fulbe family specializing in herding activities who lives in a compound on the edge of the village.

All of the villagers are Moslem, with the largest number belonging to the Mouride sect and a small minority following the Tidianes. As such the village is closely implicated in a net of reciprocal obligations with the religious authorities, represented locally by a *marabout* in Ndam Bousra. This includes individual families' contributions of labor to the *marabout's* fields as well as a portion of their harvest to his granary. In addition, the community makes significant contributions of cash and cattle to the religious leaders at the time of the annual *magal*. The village men working abroad, as well as those organized in Dakar, make sizeable contributions to these religious gifts. The religious group known as the *Dahira* (which includes members from all the Ndams) contributes on the order of one million cfa⁴ to the annual religious festival, as much as 400,000cfa of which may come from workers abroad.

Village Livelihood Strategies

The livelihood strategy of the village continues to be centered around crop production, though this is complemented by an increasingly diverse set of economic activities including animal raising, the collection and processing of forest products, commerce, and outside employment. Over the past 20 years, with the diminution of rainfall and pursuant drop in yields and increase in the riskiness of crop production, cultivation has become ever less important in this portfolio of livelihood strategies. Animal raising has taken on greater importance while families have mobilized all possible surplus resources to buy the

⁴approximately 250 cfa = US\$1; 50 cfa = 1FF

tickets needed to send their sons away, preferably abroad. As described below, this has tended to reinforce the economic stratification in the village since those with surpluses have been able to invest in diversification (whether animals, commerce, or emigration) while those in more marginal economic situations have remained largely dependent on increasingly precarious agricultural livelihoods.

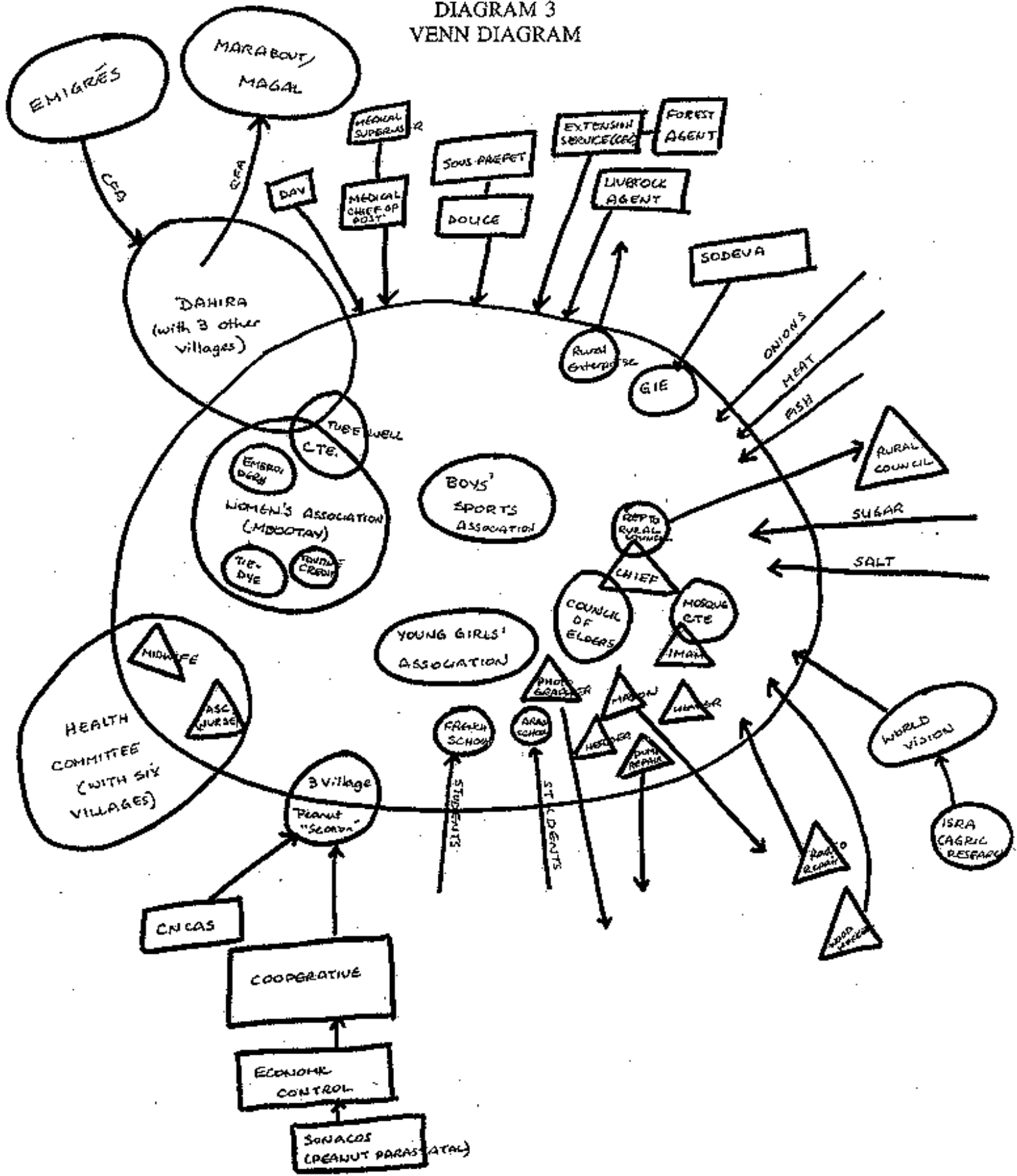
Both men and women own animals in the village, with women most often investing in sheep and goats if they earn a small profit from their field crops (generally peanuts, cowpeas, and hibiscus flowers). These small ruminants are raised with the explicit intention of selling the males (usually before the Tabaski holiday or as needed in times of financial crisis) in order to generate further revenues. Herd size is increased by keeping the female progenitors. Women's activities also include the collection of forest fruits including *neow*, tamarind, baobab, and *balanites*. For the most part revenues from these activities are quite limited, though one woman does a thriving business in various products (cous-cous made from the fruit, almonds, and in the past oil made from the almonds) of the *neow* tree. (See Appendix 2 for more information on *neow* processing.) The diminution of several of the more valuable tree species has reduced women's possibilities to earn money from these sources and the fruits are now usually reserved for use as condiments. Women generally ranked the sale of animals as their principal revenue generating activity, followed by the sale of products from their fields.

Village Organization

Ndam Mor Fadamba has a well developed structure for local decision making (see Diagram 3), with several social and community service organizations. Among the more important of these are the *Dahira*, which is organized for religious ends, a women's association which includes several "tontines" providing rotating credit to its members, and a health committee. It is important to note that several of these committees, including the *Dahira* and the Health committee are not exclusively concerned with Ndam Mor Fadamba but implicate several other neighboring villages as well. Along with the communal definition of territory (see Chapter 2), this suggests the need to adapt any development interventions to the relevant unit of operation, which is not necessarily the single village.

The central decision making authority in the village is the Chief who convokes a Council of Elders when key decisions are to be made. It appears that this council comprises a core of highly respected men, drawn from the highest social classes (see below) who participate in almost all decisions. Depending on the issue, other men -- less highly placed -- may be called upon to offer advice and counsel, according to the choice of the chief. It was clear that certain men of lower socio-economic status are highly respected for their general wisdom or specialized knowledge and play an important role in village decision making. A close advisor to the chief (currently the wealthiest man in the village and the chief's brother) serves as the representative to the Rural Community Council and is delegated considerable authority by the elderly chief.

DIAGRAM 3
VENN DIAGRAM



This diagram was done with a large group of village men in the central square. A large circle was drawn on a sheet of flip-chart paper laid flat on the ground. Colored papers of various shapes and sizes were then superimposed on the circle to represent various village organizations and services. When women were later presented with the diagram, they added some women's groups that had been missed.

While it is not a commercial center, the village is well connected to a wide range of administrative structures, including extension agents and representatives of the government who are reported to come to the village from time to time. It is also keenly aware of the political environment in which it operates and while the vast majority of the population supports -- as individuals -- the opposition party, the village's main representative to outside decision making structure (the rural councillor) is a declared member of the *Parti Socialiste*, currently in power.

It is important to note that the emigrés are well organized wherever there is a significant cluster, as in Dakar and Italy. These groups get together at least once a year and tax their members in order to send a contribution back to the village. The money passes through the village *Dahira* and is contributed, as noted above, to the annual religious festival. They also provide a system of mutual assistance for newly arrived emigrés from the village, paying all the costs of subsistence for the first three months while the newcomer gets settled and finds employment.

Socio-economic Stratification

There is a clear stratification of wealth and power in the village, much of it determined by social origins and the continuing dominance of the founding Lo family. Traditional Wolof patterns of social stratification have been reproduced into the present although some few families have been able to move from formerly subservient positions into more prosperous economic classes. Nevertheless, certain rights within the village (such as rights of seniority concerning land allocation at the village and territory level, see below) are restricted to those who are directly descended, both matri- and patri-lineally from the original Lo founding family. With a few notable exceptions, land holdings, wealth, and power all tend to follow similar patterns of stratification.

A wealth ranking carried out with one of the wealthier and socially elite members of the village and an informal discussion on the same topic with an informant from the poorest, dependent class were highly consistent in their criteria for wealth and prosperity as well as their evaluation of socio-economic rankings in the village and. "To be wealthy," said one, "is to have the means to satisfy your needs without having to call on anyone else." In dividing the village into five wealth classes, the top two were distinguished by being comfortably well off, with children working as emigrés who sent money back to the family. (Typically, emigrés reported that their contribution was calculated according to the families' food needs: "we estimate how much it would cost to feed the family for 3 months and send that amount four times a year.") Both these elite groups own cattle; the significant difference between them was described as a question of "destiny", presumably referring to the advantages resulting from historical social status and links to the founding family. Among the particular benefits of this highest ranked group is the maraboutic right to mobilize labor.

The third group was described as moderately well off but does not benefit from outside income from emigré children. The fourth and fifth groups, in contrast, both struggle to maintain a livelihood based almost exclusively on their limited agricultural and ancillary natural resource based activities. The fourth group is able to juggle some small economic

activities such as the collection of firewood while the fifth group was described as "having nothing everything is difficult". The point was made that while everyone has sufficient access to land, the poorer groups do not have the means (e.g. animal traction, equipment) to fully exploit that land.

On numerous occasions villagers cited the lack of carts as a constraint both to income generating activities (access to markets, etc.) and to agricultural improvements requiring the transport of manure and other inputs. There used to be many carts in the village but the majority were sold to raise the capital needed to purchase food during a string of poor farming seasons. Those who sold the carts thought that they would be able to buy them back in better times, but instead with a succession of bad years, they have in most cases had to go the next step as well and sell their draught animals.⁵ There are now only six working carts remaining in the village and other families are obliged to borrow or rent them when they have pressing transport needs.

Informants at both higher and lower echelons of the socio-economic ladder spoke of the reciprocal relations tying one to another. Describing the socio-economic hierarchy, a poorer informant noted, "each person knows his rights, his responsibilities, and above all his limits." For his part, a wealthier man said that, "we are always on the look-out to render a service to those who need it." The wealthy are involved in providing credit for seeds and other inputs and contribute to the support of dependent families through periods of hunger. Hence, perpetual indebtedness -- while absolutely necessary for survival -- as well as the inability to generate investable surpluses continue to reinforce and deepen the economic dependency of poorer classes even as changing times have weakened the strict *social hierarchies at the origin of such socio-economic distinctions.*

⁵A good draught animal costs about 70,000 cfa while a cart can be bought for 30,000 cfa.

Chapter IV: THE INTERACTION BETWEEN PHYSICAL AND HUMAN RESOURCES

THE DYNAMICS OF RESOURCE USE IN THE NDAM TERRITORY: PAST, PRESENT, AND FUTURE

Perhaps the most important finding of this study concerns the constant and dynamic reequilibration of human livelihood strategies in the village of Ndam Mor Fadamba in response to changes in natural resource endowments, some caused by exogenous factors such as rainfall and others the result of human interventions. As interesting as the adaptive strategies themselves was the ability of our village informants to provide sophisticated analyses of these evolving strategies, both to explain past interactions between their physical environment and livelihood strategies and to speculate on where this may lead in the future.

Some of the complexities of human/physical interaction in the Ndam territory were captured in a matrix compiled and analyzed by three older men in the village, one of them the chief of the village, the second the most prosperous citizen and rural councillor, and the third the head of the Fulbe herding family. They were asked to make a historical analysis of evolving resource use focusing on three time periods that had already been determined to be distinct ecological eras in earlier discussions with villagers. The first of these was the period before mechanization was introduced into the village, the second was the period from approximately 1963 to 1973 when mechanization was in full throttle (encouraged by government incentives), and the third was the situation found in the present, as particularly influenced by the droughts of the late 1970s and early 80s. We later added a fourth column, asking our informants to speculate on the future. The resource indicators on the vertical axis of the matrix were the amount of land left fallow, the amount of land under cultivation, the number of cattle held by villagers, the number of sheep and goats, and finally, the density of the tree cover. The matrix as completed by our three informants appears in Diagram 4.

Looking at each period in turn beginning with the era before mechanization, the farmers described a time when only a small percentage of the village land was cultivated but noted that the land was very productive and yields were high. Given the ease of feeding animals from the extensive and rich bushlands, herds of both bovines and small ruminants were large. The tree cover, as described nostalgically by the herder, was so thick that animals "had to weave a path through them since there were no straight passageways". The situation changed dramatically with the introduction of animal traction ploughs in the early 1960s. It is interesting to note that this period coincided with a decade of consistently good rainfall, during which only one year fell below 300 mm. Given generous credits,

DIAGRAM 4
 ECOLOGICAL MATRIX: EVOLUTION OF NATURAL RESOURCES

PERIOD RESOURCE	BEFORE MECHANIZATION 1963	PERIOD OF MECHANIZATION 1963-1973	SINCE DROUGHTS (TODAY) 1991	THE FUTURE
AMOUNT OF LAND IN FALLOW				
AMOUNT OF CULTIVATED LAND				
NUMBER OF CATTLE				
NUMBER OF SHEEP/GOATS				
DENSITY OF TREES				

To prepare this diagram, a large sheet of paper was laid flat on the ground and the vertical and horizontal categories were written in and explained to our three informants: the elderly chief of the village, the community council representative, and the head of the Fulbe herding family. Using hibiscus seeds, they then filled in the matrix and explained the reasoning behind their allocation of seeds to each square of the matrix.

many farmers quickly invested in the new implements and "now one farmer could cultivate the land that had required ten men." There was a rapid expansion of cultivated land, with a concomitant decrease in the land reserved for pastures and, farmers are quick to note, a notable reduction in yields per hectare. Villagers describe it as a period of land shortage when most people were looking to increase their holdings and there was constant pressure on pastures. The emphasis on cultivation and the increasing difficulty in maintaining livestock on declining pasture reserves led to significant declines in herd size for both large and small animals. The clearing of land for fields and the need to open up cultivated lands to permit the passage of animal drawn equipment resulted in a dramatic decline in tree cover throughout the territory.

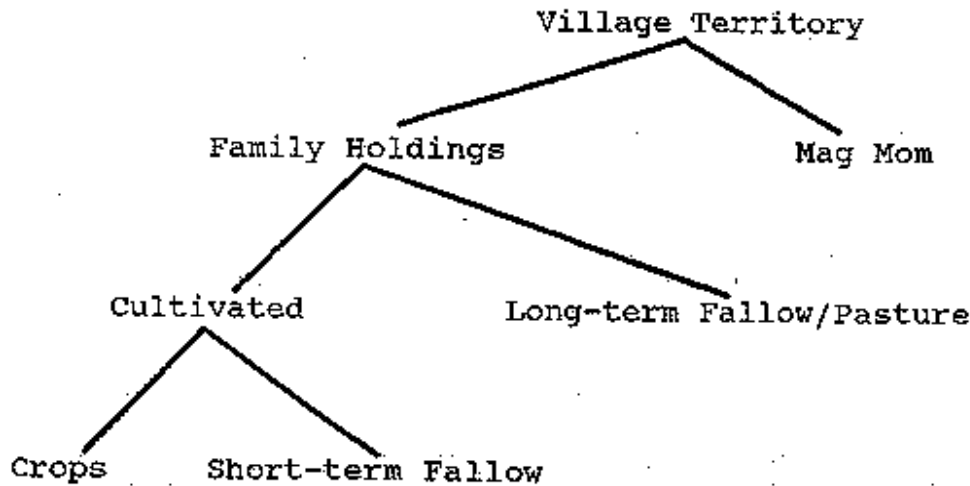
The situation described today reflects human and natural responses to the repeated droughts that have struck Senegal and the Kayor since the early 1970s. Whereas in only one year between 1960 and 1970 did rainfall amount to less than 300mm, in the two decades since 1970 no fewer than twelve years have experienced less than 300 mm of rain, with half of those years accumulating less than 200 mm. The undependability of agriculture under these capricious climactic conditions led to the vast outmigration of village youth and a significant decline in the amount of land under cultivation. Under conditions where the harvest is at best uncertain, farmers have again sought to increase their herd size, a practice made possible by the reduction of cropland and the reestablishment of vast pasture reserves similar to those that existed before mechanization. The quality of these pastures and the density and diversity of tree cover has significantly declined with reduced rainfall though, as noted in chapter 2, the reinstatement of longer fallow systems is encouraging a certain regeneration.

Looking to the future, these Wolof farmers of the Kayor -- once described as exploiting a farming system "with few animals and even fewer cows....the divorce between cultivation and animal raising is a general characteristic of Wolof agriculture"⁶ (Pelissier 1966:150) -- expect that they will significantly increase their animal holdings, and especially their sheep and goats. They anticipate that crop production will continue to decline in importance and that, in the absence of any significant change in rainfall, the tree cover will stabilize at current levels.

The reduction and high variability of rainfall is a serious disincentive to investment in agriculture and the economic and ecologic development of the territory. The returns to any such investment are at best uncertain and, in the calculations of the local population, modest in contrast to the potential benefits offered by other investments -- notably outmigration and livestock. "Even in a bad year you can get something from a cow," noted one farmer. Another compared investments in livestock with peanut cultivation: "It's better now to invest in five lambs than to seed 500 kg of peanuts. Same with a cow....I can raise a cow for three years and sell it for more than 50,000cfa. You can't get the same yield from crops." Given these perspectives, the village preoccupation with how to improve pasture lands (see Chapter 5) becomes easily understandable.

⁶ original quote in french: "ils ont peu de bétail, du moins de bovins....le divorce de la culture et de l'élevage reste un trait général de l'agriculture Wolof."

Within the broad trends outlined above, farmers are making decisions daily and annually concerning resource use and their strategies to exploit land, tree, and water resources. The village territory, as described in Chapter 2 is divided between community "reserve" lands (the *mag mom*), which comprise a small proportion of the total, and family landholdings.



Family holdings are generally dispersed throughout the territory in parcels of 2-3 hectares. At any given time, one part of the family holding is devoted to crops while another part, falling in a zone demarcated by village consensus, is left in long-term (five or more years) fallow and becomes part of an open access pasture zone. Firewood and fruit collection is also freely permitted on these pasture lands. During the time that these lands are in pasture, families cultivate their plots in other areas of the territory. If, by chance, a family does not have alternative options for cultivation and all their lands fall in the designated pasture area, they can appeal to the chief to receive a compensatory plot outside the pasture zone. (See management of Natural Resources.) At this time, when outmigration has diminished the demand for land, there is plenty of land for all who wish to cultivate and land loans, especially for residents of the Ndams, are easily negotiated.

A woman, on marrying into a family, is allocated her own field(s) by the head of family and maintains this allocation for as long as she remains in the family. The plot(s) are generally in close proximity to the compound so as to minimize the time women spend walking to and from their fields and thus do not fall in the potential pasture zone which is further from the village. Women reported having ample land for their needs and said they could quite easily obtain a larger parcel if they needed it. Even if they were unable to cultivate the area under their allocation due to labor shortages, they felt under no threat of losing the land, and seemed confident that it would remain theirs indefinitely.

to cultivate the area under their allocation due to labor shortages, they felt under no threat of losing the land, and seemed confident that it would remain theirs indefinitely.

On the lands considered "cultivated" the "holder" (head of compound in the case of men's land, the woman holder in the case of women's land) decides on the rotation of crops and the short-term fallow (1-2 years) that will be practiced on the land. Thus a woman who has two fields may decide to cultivate one (typically in some combination of peanuts, cowpeas, and hibiscus) while leaving the other in fallow. If she has one field she will subdivide it into cultivated and fallow sections. The men's fields usually are planted in a rotation including peanuts, cowpeas, and millet, with poorer farmers cultivating relatively more millet and cowpeas while richer ones place a significantly larger area in peanuts. For the most part, peanuts are sold, millet is home consumed, and cowpeas are divided with some for sale and some for home consumption. Poorer families eat a larger proportion while wealthier families tend to sell most of the crop. Peanuts are seen as an increasingly attractive crop, both for the monetary benefits and because peanuts have proven themselves less vulnerable than millet to parasites and poor soil fertility. The poor, however, experience difficulty in obtaining sufficient peanut seed.

Nurturing the Land

Local populations have a rich knowledge concerning soil fertility and practices to regenerate impoverished soils. They no longer use much inorganic fertilizer due to the high price relative to the selling price of peanuts. However, they employ numerous organic methods in their efforts to maintain soil fertility (see Table 2). Both short and long-term fallow is recognized as critical to the regeneration of soils. One progressive farmer has developed his own practice to regenerate the most severely degraded *walt* (hardpan) soils on which nothing will grow. He carries millet stalks from his fields and distributes them on the *walt* field during the dry season. Sand blows over the millet stalks and he abandons the field during the entire following rainy season when the stalks decompose naturally. In the following year he is able to plant again.

TABLE 2

PRACTICES EMPLOYED BY THE FARMERS OF NDAM MOR FADEMBA
TO CONSERVE/REGENERATE NATURAL RESOURCES

Practice	Constraint
Women leave the central stalks of <i>rath</i> bushes to hasten regeneration when they harvest firewood.	
<i>Rath</i> in fields are pruned so that they grow into trees: used for agroforestry.	
Manure is spread on fields close to the village. It is applied in bands in order to systematically enrich the soil.	Shortage of carts to transport manure. Shortage of manure.
Cattle are rotated among fields at night.	Not all farmers own cattle.
Farmers respect systems of short-term fallow and crop rotation.	
The village organizes long-term fallow to permit the regeneration of pastures.	
Use of organic fertilizers.	Fertilizers too expensive.
Millet stalks are composted on fields suffering from wind erosion.	
Several tree species (<i>kadd</i> , <i>neow</i> , <i>soump</i> , <i>seng</i> , are carefully protected when fields are ploughed.	
<i>Andropogon</i> grasses are cultivated in fields.	
Improved wood stoves are used to diminish the consumption of firewood.	Stoves deteriorate quickly.
Fulbe herders trim trees in order to encourage new growth.	Conflict with forest code.

The role of trees in maintaining soil fertility is also highly appreciated. Women, especially, report carefully cultivating around naturally growing tree seedlings. Several men in the village have deliberately devised an agro-forestry system using the *rath* (*Combretum glutinosum*) which usually grows as a low, bushy pioneer species. By carefully pruning the bush, they develop a single trunk tree around which crops can be cultivated and they have found that yields under the tree, where leaf litter nourishes the soil, are higher than elsewhere. Since the roots are deep they do not prevent mechanical ploughing. This experiment is being carefully watched by other villagers but the technique is not yet widely practiced.

Women systematically distribute manure from their sheep and goats on their and their husband's near-by fields although the shortage of manure is perceived as a constraint. Each woman parks her animals at night on a clearly marked spot usually just behind the compound or village from which she removes the manure regularly. While the manure from sheep and goats accrues to the individual owner and is apparently carefully managed, the village cattle are confided to the care of one of two herders, with the largest cattle owners keeping some part of their herd with each. During the dry season, the cattle are left to browse at will on the village pasture lands but each night they return to the "park" where the calves are kept. The field where the herd is parked thus benefits from the manure which accumulates during the night. The park is moved every 7-10 days. According to the herders, only one owner requests that the herd be parked on his lands; the rest of the time the park rotates on the fields of the herder. If someone who did not own cattle wanted the park to pass on his/her lands, he would have to pay a fee and the villagers, while well aware of the value of manure, are apparently unwilling to pay for the service.

Use of Trees and Grasses

As noted above, women, especially, are active in the harvest of fruits, leaves, and wood from indigenous tree and bush species. Men from poorer families also depend on the collection of firewood as one of their few non-agricultural income generating activities. Firewood can be collected freely on any of the communal pasture lands designated by the village, though it is illegal to cut living wood. *Rath* and *nguer* (*Geuera Senegalensis*) bushes can be cut while still living; however, women have developed deliberate practices to hasten the regeneration of these species. When collecting these species, which are among the preferred varieties of cooking wood, the women trim all but the central stalks. If these central stalks are not cut, the women say that the bushes can be again harvested after several months. In contrast, *rath* that have been pruned for agroforestry as described above may not be harvested for firewood by anyone except the landholder or those who have his permission.

Unlike firewood, which can only be collected from lands which have been put into communal management (like the pastures or disputed lands with Ndiobène) or from a farmer's own fields, fruit from indigenous species can be collected freely from any private or public lands. Thus, for example, a woman can collect the fruits from any *neow* in the village, even those growing on privately held and cultivated lands. Similar rules apply to baobab, *balanites*, and tamarind trees.

The diminution of the once plentiful *neow* tree is widely lamented by both men and women in the village. It was described as a "blessed" tree since it sheltered and provided shade to the prophet Mohamed. A woman who is widely reputed as the local *neow* expert estimates that about 4/5 of the *neow* trees in the territory died off during the drought years and their aftermath. She also notes that during the past three years (rainfall of 406 mm [1987], 386 mm [1988], 548 mm [1989]) there has been a noticeable regeneration of the trees. Since women systematically protect *neow* shoots and animals, reportedly, do not browse the young trees there may be a significant regeneration of this much appreciated species.

The tree is valued for medicinal purposes and because its fruits, known as *pomme de kayor*, have multiple purposes. The pulp is rich in vitamin C and can be eaten fresh or dried and pounded into cous-cous. As noted below, this was an important famine food in the past. The almond, which is a highly appreciated snack food, is very rich in lipides and proteides, and when the trees were more common was frequently processed into oil. Even the shell around the almond is useful and makes an excellent fuel for cooking. In addition to these benefits, farmers note that plants grow better around the base of the *neow* than in the fields at large. While the *neow* played an important role in food and income security in the past, it is now exploited primarily by a few specialist (women) collectors due to the time it takes to harvest fruits from the now scarce and widely dispersed trees.

There was some dissension concerning the question of whether trees are pruned for animal fodder in the village. The Wolof farmers systematically disavowed such practices, having been told by Water and Forest agents that pruning is illegal. The Fulbe herder, however, not only owned up to such practices but maintained (a claim justified by scientific evidence) that careful pruning is necessary to encourage regrowth. In fact, there was much visual evidence of tree pruning in the territory and it is unlikely that one Fulbe family is responsible for all of it.

Like the loss of diversity of tree species, farmers widely regret what they perceive to be a qualitative decline in pasture lands. Many of the grasses now common in the territory are known to be inferior species that are often indicators of poor soils. One formerly common and valuable grass species -- the *andropogon* -- now grows only rarely in the wild. It was particularly useful for thatching and some farmers have now begun cultivating the grass in carefully tended plots. The practice is catching on more broadly as it is highly lucrative: fifty stalks gathered in a bundle sell for as much as 1,200 cfa and the market is robust with people coming from neighboring villages to purchase the grass. *Yimb* grass (*Crotalaria*) is also cut by some farmers on common pastures and sold in the local market for horse hay. Given the increasing importance of livestock raising in the village, techniques to improve the quality of pasture lands are a priority concern of the population.

Natural Resources in Village Survival Strategies

To better understand the coping and livelihood strategies of the villagers of Ndam Mor Fadamba we spent one of our afternoon sessions with the village men discussing the times of crises that fall within living villagers' memory and the principal strategies people used to survive during each hardship. Diagram 5 shows the matrix of crises and strategies as described and ranked by our interlocutors. The matrix and lively discussion around it were highly revealing of the changing village economy over the past 50 years and, particularly, the role of natural resources in survival and livelihood strategies.

All of the crises cited by the village men involved serious shortages of food except the 1967 fire which spared most of the granaries. Comparing the pre-drought strategies with more recent crisis management, there is a clear evolution from strategies based primarily on exploitation of locally available natural resources to strategies based on outside employment and the generation of cash to purchase food and essential items from outside the community. Thus during the first world war when supplies were disrupted and drought stalked the territory, as in the locust invasion five years later, villagers relied primarily on the collection of wild leaves (especially from the *mbuum* plant) and tree fruits (especially *neow*) either to consume directly or to barter for millet. Hunting was also an important source of food in these early crisis periods. The leafy *mbuum* plants were early victims of drought while the *neow* survived longer and continued to play a role, though diminished, in survival strategies through the recent locust invasion in 1988. Trees also play a critical role during drought periods when branches are cut for fodder to replace decimated pastures.

Since 1973, as seen in the lower half of the matrix, villagers have relied less and less on natural resource based strategies and instead depended on revenues from outmigration. This reflects broader trends in the local economy and the diminishing role of agriculture in many families' livelihood strategies.

DIAGRAM 5
COPING MATRIX: VILLAGE STRATEGIES IN TIMES OF CRISIS

CRISIS STRATEGY	WW II 39/45	LOCUST INVASION 1950	FIRE IN VILLAGE 1967	DROUGHT 1973	RAT INVASION 1976	2nd LOCUST INVASION 1988
Eat New Tree Fruit	•••	••	••	••	••	•
Eat Wild Leaves	•••	•••	•	•	•	
Eat Manioc	•••	•••				
Eat Dugoor Tree Fruits	••					
Food Aid	•••	••	••	••	••	•
- Cultivate and wean Cotton	••	••				
Eat Millet Bran	•••	••				
Hunting	•••	••	••		•••	
Eat Cowpeas	•••	•••	••	••	••	••
Dig trenches against Locusts	••	•••				
Trade New fruit for millet	•••	•••	••	••	•	
Sell Chickens	•••	•••	•••	•••	•••	•••
Rural → Rural Urban Migration				•••	•••	•••
International Migration				•••	•••	•••
Sell Weak animals to buy food for strong			••	•••	••	••
Buy flour				•••		
Cut branches for Animal Feed				•••		
Eat Own Animals	•••			•••		

This diagram began by a discussion with a large group of village men (and a few women on the periphery) to identify the categories on the horizontal axis: the periods of crisis within the memory of village inhabitants. They then brainstormed about their strategies to respond to those crises and the strategies were noted on the vertical axes. After this lengthy discussion, we asked our interlocutors to rank the importance of each strategy during each time of crises by placing from zero to five seeds in each matrix square. When we got to the emigration square, the young men who were placing the seeds under the supervision of the elders requested to use more than 5 seeds.

THE MANAGEMENT OF NATURAL RESOURCES

In looking at the management of natural resources within the territory of Ndam Mor Fadamba, we were concerned particularly with how access rights to a wide array of natural resources are structured and the process by which individuals, groups within the community, and the state influence the allocation and use of the land, trees, and pastures of the territory. The team found that decisions governing the use of natural resources are determined at many different levels (see Table 3). A large number of decisions are made by residents of the territory themselves. In the schema of Table 3, this is represented in the four layers shown at the top of the decision making hierarchy. Decisions are made with varying degrees of formality at each of these levels.

The least formal, but nevertheless critical set of decisions, are made by individual landholders and resource users. As we shall see below, while these decisions concerning which crops to plant and how to collect and use resources may appear mundane, they are often among the most critical in the conservation -- or deterioration -- of community resources. This level is also significant because, unlike more formal decisions taken at higher levels, women are very active decision makers at this level. The second level of decision making takes place at the level of the extended family, where the family elder plays a critical role in allocating lands. The third and fourth levels of decisions are vested in designated authority figures: the chiefs of the village and the territory, respectively. Various conflicts are resolved by these authority figures who both manage the consensus concerning broad land use (pasture/fallow vs. cultivated lands) within their village and territory and are responsible for negotiations with neighboring territories and communities. Currently, the chief of Ndam Mor Fadamba happens also to be, by rights of seniority, the chief of the territory but this is a coincidence that should not be permitted to obscure the difference between the two levels of decision making.

Both pre-Islamic and Islamic land allocation norms influence resource management decisions in the Ndams. The ancient principles of "rights of age" and social status combine with maraboutic authority in designating the village authority figures. To this day the eldest member of the Lo family living in the territory is designated as the *chef de terre* of the territory, while the eldest Lo in the village is the *chef de village*. Similarly, rights of seniority apply at the family level where the eldest male is responsible for decisions concerning, particularly, the allocation of family lands.

As we shall see below, the residents of the territory have a strong interest, reinforced by historical tradition, in maintaining as many decisions as they can at the local level. Nevertheless, nationally promulgated decision making structures (notably the rural Community

TABLE 3
NATURAL RESOURCE MANAGEMENT
LEVELS OF DECISION MAKING

DEFINITION OF TERRITORY	FALLOW/PASTURE LANDS	CULTIVATED LANDS	TREES	ANIMALS	LEVEL OF DECISION
	Use rights: Pasture Wood Harvest forest products	Choice of crops, Decisions on soil fertilization and enrichment	Care and Use of Trees	Investment Decisions Use of Manure	
	Families Decide by consensus on Rotation of Fields	family elder allocates land w/in families Decisions concerning land loans to people w/in territory	land holder controls planting of trees	? Herder controls cattle, manure, and milk	
	negotiates rights in case of conflict is informed of all decisions	controls land loans to people outside of territory Responsible for allocation of village "reserve"	negotiates conflicts between families		
Negotiates conflicts w/ other villages and Community Council	Negotiates fallow policies w/ other villages				
CR and state authorities decide conflicts between territories LAW OF THE NATIONAL DOMAIN	Decide Conflicts on Cattle "Passage-ways" LAW OF THE DN DECREE ON PASTURES AND PASSAGES		TREE CUTTING PROHIBITED FOREST CODE	REQUIRED VACCINATIONS FOR CATTLE PASTORAL CODE	

Councils) and laws (notably the Law of the National Domain) have a considerable influence on village and territory resource management strategies. In some cases villagers appear to have modified their actions to conform with national policy, in others they have maintained practices that do not strictly conform to the laws but have taken measures to reduce the likelihood of direct conflict with external authorities.

Hence, the tenure system of the Ndams, where "tenure" means the set of rights which a person or some private or public entity holds in natural resources, is a complex amalgamation of three rather distinct set of norms and land use practices. It can perhaps be best described by what the French legal anthropologist Le Roy describes as "local tenure law" that is neither "traditional" nor "modern" (Le Roy 1980:11). The system incorporates aspects of pre-Islamic and Islamic traditions, yet also reflects the pervasive influence of the corpus of Senegalese land laws as codified primarily in the 1964 *Loi sur le Domaine National*.

The Hierarchy of Decision Making Concerning Resource Management in Ndam Mor Fadamba

1. Individual Resource Management Decisions

Many key decisions concerning investment in and exploitation of natural resources are taken by individuals in the community who manage their own fields and the collection of forest/bush products. Hence, the individual exercises control over many land use decisions on personal fields. This includes the choice of crops, types of soil fertilization techniques, and the care and utilization of trees on that plot. Most of the activities to regenerate and nurture natural resources cited in Table 2 above are the result of individual decisions. While women do not possess the right to transfer land use rights to offspring, they receive their own plots from their husband's family at the time of marriage and make decisions concerning the use of that land. As owners of many of the small animals in the village, they also make many of the decisions concerning the use of manure that is applied to their or their husband's fields.

Individuals also have the right to harvest the fruits and leaves of indigenous trees anywhere within the territory (on both individually and commonly held lands) and are responsible for their own actions to care for and exploit the products of tree resources. The case cited above of women managing the regeneration of shrubs used for firewood demonstrates the central role women play in the protection and regeneration of the environment and, again, the importance of individual decisions and actions in maintaining the resource base.

2. Family Decision Making Concerning Natural Resource Management

The extended family exerts considerable autonomy over the use and management of its land holdings. The eldest member of the family plays an important role in determining what lands will be placed in fallow and is responsible for decisions regarding loans of

land and conditions of rent and use for those living within the Ndams. He may loan land to other members of the village without consultation with the authorities, but land loaned to those living outside of the community must be approved by the chief. These elders may prohibit land borrowers from engaging in certain practices that would lead to land disputes, such as planting trees or investing in physical infrastructures such as digging wells or building *salane* fences. Conversely, the head of the extended family may require land borrowers to practice soil and water conservation activities (eg. prohibit cutting of tree seedlings) as a condition of the loan.

Through a consensual process the heads of households participate in negotiations concerning which lands are to be placed in long-term fallow/pasture. This can be a long and drawn out process as some households and individuals may lose land needed for their livelihoods to the reserve and must be compensated from land elsewhere. The village chief plays a mediating role in these discussions and can loan reserve lands such as the *mag mom* or other extended family holdings to resolve land shortages that might otherwise impede reaching a consensus on the delimitation of pasture zones.

The exchange of rights to cultivate land seems to be extensive within the Ndams. Informants indicated that the households who have departed for Touba loan their lands to Ndam Mor Fadamba residents for up to ten years or more. (As long as even one member of the family remains in residence in the Ndam territory, the extended family maintains rights to their landholdings.) Informants report that rent is not paid on these lands: "the *dime* (1/10th of harvest) is not paid here, but elsewhere." However, it is customary to give small gifts in recognition of the beneficence of the land holder and the distinction between gift giving and rent is sometimes small. One member of the community gives 200 kg of millet or 10,000-15,000 CFA for the right to cultivate substantial tracts (as much as 10 hectares) of Lo family lands.

3. Concentration of Decision Making Power in Lineage Lo: Chief of the Village and Territory

The land tenure system in the Ndams is greatly influenced by the village's maraboutic origins. The Lo family exerts enormous influence over the allocation of resources in the territory: it not only controls access to the majority of land in the zone, but also negotiates and enforces many of the land use practices found in the territory. As noted above, only a member of the pure Lo lineage can become, by right of seniority, the chief of Ndam Mor Fadamba, or the chief of the territory that encompasses all six Ndam villages.

The dominant position of the Lo family can only be fully appreciated by referring to the history of Islam in the Kayor. A review of historical secondary sources suggests that long before the French conquest of the Kayor in the late 19th century, Islamic scholars provided political advice and amulets to the *damels* (heads of the Wolof monarchy) of the Kayor (Sar 1973). The *damels* granted marabouts land in recompense for their services and built political alliances between the court and the marabouts through marriage, a point confirmed in interviews on village history with the Ndam Lo family.

On these lands, the marabouts created villages to support their disciples. Around the *daara* or coranic school, disciples cleared the land. Removal of the dense forest cover reinforced rights of occupancy. In this sense, the marabouts employed precepts commonly found in Wolof society that the person or group that first cleared the land obtained "rights of first occupancy" and could thereby exclude others from cultivation in the cleared territory. The marabouts in turn allocated individual plots of land to their disciples who then paid religious tithes of labor and commodities (*assaka*) on a periodic basis. The disciples were often escaped or emancipated slaves, lower caste households, and resource poor free-born peasants. Free-born peasants joined the maraboutic settlements in order to seek protection from the heavy extractions of the monarch that characterized eighteenth and nineteenth century Wolof society. This history continues to be very much reflected in the social stratification of Ndam Mor Fadamba today. To understand the importance of enduring local rule making structures, it is also worth noting that the pre-colonial state had few rights to intervene in the internal affairs of these maraboutic villages.

Like the *chefs de terre* of the pre-Islamic Kayor, the chief of Ndam Mor Fadamba is responsible for allocating the *mag mom* -- the village reserve lands which belong to no individual family. The chief is informed of all land transactions that occur in the village and resolves disputes that may arise. When someone from a neighboring village seeks to obtain a loan of land, this person must pass through the chief to obtain authorization prior to negotiating with individual land holders. The elder Lo consults a council of elders consisting primarily of the other "pure" Lo families of the Ndams.

The chief and the village elders foster consensus over land use decisions through constant discussions around the village square and in meetings at the mosque. Each afternoon many of the adult males gather under the lofty trees of the village square. Regardless of class differences, the roughly eighteen heads of households informally debate the many issues that confront the community. The small size of the village undoubtedly facilitates the resolution of any disputes that arise. The heads of households decide among themselves where to locate the fallow/pasture lands for the particular year, how land will be loaned from one to another in order to meet family needs, or how to organize village development projects.

The consensual decision making process under the purview of a locally respected authority figure contributes to the maintenance of a very flexible land tenure system. The Lo family provides the institutional structure needed to constantly re-negotiate the relative size and location of fields, pastures, and fallow lands. This local level institution may be criticized for being an anachronism of the past feudal structures of Senegalese rural society; however, it plays a critical role in facilitating flexible land use arrangements that meet the very localized ecological and economic exigencies of the community.

Interface with the *Loi sur le Domaine National*

The 1964 *Loi sur le Domaine National* and the 1972 *Loi Relative aux Communautés Rurales* stipulate that most of the national territory of Senegal belongs to the state and give the Rural Community Councils the right to allocate land to those who develop it ("*mise en valeur*") according to criteria laid down by the council itself. Land cannot in theory be sold, loaned, or rented and all land transactions must pass through the Rural Community Council. The council may grant land that is not fully exploited to anyone able to turn it to productive purposes and is also given powers to resolve land conflicts. Decisions made by the council may be vetoed by the *sous-préfet* and the *préfet* and thus the state maintains a strong hand in local decision making.

The residents of Ndam Mor Fademba are very much aware of the general provisions of the laws and particularly those decrees that pose most threats to their traditional land tenure systems. Among the most threatening provisions of the national law are those that govern land loans and, at the same time, give decision making authority to the rural council. The *Loi sur le Domaine National* reads that all land transactions must pass through the Rural Community Council and expressly forbids land loans. While this is rarely enforced, the community council and the administration have been known to enforce a provision of the law that allows a person who cultivates a piece of land for three or more successive seasons to obtain title to that land. The villagers are aware of cases in which land borrowers have successfully made requests for titles to the community council.

Another potential problem for the kind of resource decisions made locally in Ndam Mor Fademba is the unidimensional definition of *mettre en valeur* that is often adopted by rural councils who judge "value" by short-term, immediately visible production -- usually field crop cultivation or the installation of improved infrastructures on a piece of land. Much of the land in the Ndam territory is, as we have seen, allocated to fallow pasture uses that are important to both the regeneration of soils, grasses, and trees, and to providing the forage needed by increasingly large herds in the village. If disputes concerning such lands come before the community council, the land is likely to be judged underutilized and reallocated to users who promise more immediately productive (and often unsustainable) valorization of the land. From the perspective of the local population, the national law tends to lock in land use patterns and hence greatly diminishes the flexibility of more traditional systems. In the words of the chief, the law treats the "use rights" of more traditional systems as though they were "property rights" and thus leads to conflicts.

The leaders and population of Ndam Mor Fademba have responded in a variety of ways to these threatening provisions of the national law, all the time seeking to protect local systems of resource management that they see as better suited to their needs and concerns. A list of measures to protect local rights as reported by village informants appears in Table 4. Some of the measures are intended to prevent claims by borrowers who might feel empowered by the national land law. Knowing that loans of three years or longer may be contested by the borrower, Ndam farmers limit the length of time they will loan a particular parcel and judge with great care the character of the borrower, avoiding transactions with anyone who is likely to stand up for their rights under the

national legislation. When land is loaned out, the lender is careful to give a tract that is clearly part of his own holding (in the middle rather than the edge of a landholding, for example) and to limit the investment the borrower can make (in tree planting and construction of infrastructure) in case there are later disputes concerning who added value and has rights to the land.

On their own fields, and particularly those that are not placed under traditional crop cultivation, farmers employ a number of practices to demonstrate that they are adding value to the land in case of some future dispute. If they plant *andropogon* grasses (which might be confused by an outsider as natural pasture), for example, they carefully hoe around the plants to indicate their personal investment in the landholding. Pruning *rath* bushes, in addition to the other benefits noted above, indicates the farmer's investment on fallow lands that may otherwise be judged "unproductive."

Finally, the residents of the Ndams try to protect their interests by resolving disputes locally as much as possible and not propelling disagreements to a level where outsiders (such as the community council) will be brought in as arbitrators. At least in Ndam, where traditional decision making structures are well established, this appears to have actually strengthened the role of traditional systems in resource management and dispute resolution. The council is acknowledged to have a function in gathering taxes, negotiating the passage of cattle paths through contiguous territories to more distant water points, and resolving disputes where no local solution can be reached but this latter function is perceived as an option of last resort to be avoided as much as possible. The council is viewed by the village population as corruptible, and likely to base its decisions on interests which do not reflect local concerns.

The village's experience with the conflict over territorial lands to the north in dispute with the neighboring village of Ndiobène stands as a continuing and sore reminder of the dangers of letting disputes be resolved by outsiders. The dispute dates back to the colonial period and has resulted in numerous violent conflicts between the two villages over the intervening years. After a battle between the two villages in 1966, the conflict was brought before the rural council which ruled that the lands under dispute could be cultivated by neither side but would remain an open access pasture zone to be used by both villages. From the point of view of the aggrieved residents of Ndam, this was not only an unjust decision (the lands, they believe, form a part of the original territory allocated to the Lo family during the time of the *damel*) but has resulted in an irrational use of space that had formerly been part of the their north/south rotation system.

TABLE 4

PRACTICES TO SECURE RIGHTS OF POSSESSION TO TREES
AND LAND

Land

- * Carefully judge the character of the person requesting land, assess motives of land borrower. Will the borrower attempt to acquire permanent possession of the land?
- * Limit the length of time lands loaned to no more than two to three consecutive seasons.
- * Lend land in the middle of one's plot rather than on the edges in order to clarify possession.
- * Limit the investments the borrower may make on the loaned land (eg. tree planting, live fence construction, wells, construction). If a borrower plants trees, remove them.
- * Ensure that one family member remains in the village when the others emigrate in order to maintain the family's access to traditional landholdings.
- * Plant live fences (Euphorbia balsamifera) to define the limits of the loaned land.
- * Plant live fences to delineate the limits of contested borders.
- * Resolve land disputes locally to ensure that the Rural Community Council or the administration is not called in. Respect traditional rights of seniority.
- * Do not encourage *ndalo* gifts by the borrower for this can be possibly perceived as a purchase and not a symbolic act.

Trees and Grasses

- * Trim naturally regenerated trees to indicate rights of possession.
- * Prohibit land borrowers from planting fruit trees
- * Cultivate Andropogon guyanus grass and weed the field to indicate rights to the land on which it is planted.

The principal land disputes in the Ndams seem to be centered around the terms of loans of land, the boundaries of land holdings, and the delineation of cattle tracks. Disputes seem to follow a well established path as they rise from the household into the public domain. First the conflict is treated within the family circles and, if not resolved, rises to the chief. The chief may at this point call on a council of elders or even convene the whole village. Witnesses are brought in and the case is discussed publicly. Most of these disputes seem to have been resolved quite amicably by the chief, his council of elders and the disputing parties. The case of the Ndiobène conflict is the only one to have been brought before the rural council.

Chapter V: CONCLUSIONS, OPPORTUNITIES AND CONSTRAINTS

CONCLUSIONS

In synthesizing the considerable quantities of information collected during this brief field study, several issues of particular importance to World Vision's future work on natural resources surfaced. In addition, we noted a certain number of observations that may be of broader interest to people working on agricultural and general development projects in the region. This is but one case study and its results cannot be generalized.

Nevertheless, it offers evidence which contradicts certain widely held misperceptions about villagers' activities and planning perspectives and, as such, may help outsiders to question the often implicit assumptions from which they have worked in planning development activities in the past. The following points illustrate some of the more common myths that are belied by the evidence of Ndam Mor Fadamba.

Myth 1: Villages act as isolated entities. (Most projects take individual villages as their units of operation.)

For both natural resource and other planning purposes, the village of Ndam Mor Fadamba manages its interests in close collaboration with other villages. In the case of natural resource management, the key unit for planning is the territory which comprises six villages: hence, it would make little sense to undertake resource planning around a solitary village.

Myth 2: Wolof farmers are cultivators with little interest in livestock and animal raising.

The evidence suggests that Ndam farmers are balancing a portfolio of livelihood activities and carefully reequilibrating their investments based on the expected returns of each. At the present time, the importance of cultivation is declining, while livestock and non-farm activities are becoming increasingly important. Hence, it will come as a surprise to many to learn that pasture improvement is a priority concern for these Wolof farmers. Projects which operate from the archaic assumption (probably reflecting the reality of the 1960s and early 70s) that the farmers are concerned almost exclusively with crop production risk overlooking higher priority preoccupations and concerns.

Myth 3: Indigenous decision making structures have become largely defunct with the imposition of more formal legal frameworks and codes regulating the use of natural resources.

Traditional decision making structures are very much alive in the Ndam territory and may even have been strengthened by the perceived threat of "modern"

institutions and laws that do not meet villagers' concerns. Every effort is made to resolve controversies locally so as to avoid giving outsiders the power to intervene in local issues. Since the vast majority of local resource use decisions are made with reference to these indigenous management structures, it is essential that projects have some sense of how these work and do not assume that widely quoted national legislation is the operating norm for resource management practices in rural areas.

Myth 4: Villagers are fatalistic acceptors of destiny, practice traditional agriculture, and rarely innovate or experiment on their own.

Numerous examples of local experimentation were observed in the Ndam territory during our brief visit. Farmers at all levels of the socio-economic spectrum were seeking ways to improve the management of their environment, whether women encouraging the regeneration of firewood producing species, or a young male farmer observing improvements in soil fertility as a result of his agro-forestry innovations. There are clearly opportunities for projects to nurture and build on farmers' own interests in experimentation and their evident concern for problems of environmental degradation, rather than imposing preconceived and ready-made solutions to what outsiders perceive to be pressing problems.

Myth 5: Villagers are generally conservative and take a very short-term planning perspective.

Villagers are necessarily concerned with assuring their daily and annual health and food security and, as such, may be perceived as operating on a short time horizon. However, evidence from Ndam suggests a much more complex planning process in which villagers actively seek to maintain a system of long-term flexibility which permits them to adapt in the short-term to changing conditions and hence increases their chances of meeting immediate needs. One could argue that this provides for a longer term planning perspective than, say, the national land legislation which values land (*mis en valeur*) strictly in terms of immediate productivity. The state, then, is prepared to reallocate land to the person or persons who can render it most immediately productive. Village valuation of land appears to be based not just on current production, but also places value on the period of fallow/regeneration needed to bring land into future production and considers the need to keep land in reserve in case resource needs change over time. Such a system places inherent value on flexibility. Because we consider this aspect of flexibility to be among the most important findings of the Ndam study and critical to World Vision's future activities in the zone, the next section takes up this issue in greater detail.

FLEXIBILITY IN THE INDIGENOUS RESOURCE MANAGEMENT SYSTEM

The most significant observation to come out of the analysis in Ndam Mor Fadamba is an appreciation of the population's efforts to maintain flexibility in resource management and livelihood strategies. Beginning with the physical characteristics of the Ndam territory, one is immediately struck by the immense -- and not always unidirectional -- changes that have characterized the environment and economy of the region in even the relatively short period that falls within the local inhabitants' memory. Longer term changes in rainfall patterns, soil conditions, and tree and grass cover are often magnified by more extreme seasonal and micro-spatial variations. Far from reacting as the passive or fatalistic victims so commonly portrayed, the inhabitants of the Ndams have adopted flexible livelihood strategies that have engendered significant adaptations in the way they use local resources.

This, in turn, has required a sophisticated resource management system: one that is able to respond to the vagaries of the physical and economic climate in such significant ways as completely reallocating which lands are to be devoted to private (crops) and common (pasture) concerns. The Ndam villagers have thus struggled not only to adapt their individual survival strategies, but also to maintain the flexible arrangements in local resource management that are so essential to villagers' being able to modify their livelihood strategies over the longer term. As individuals and as a community, they have resisted official and institutional pressure to introduce more static, rigid, and codified patterns of use rights that might protect their interests at any given point in time but would make it far more difficult to adapt to changing conditions.

When NGOs and other outside change agents intervene in realms as potentially broad and long-term as natural resource management or the "*aménagement du terroir*" it is essential that they be aware of the local populations' underlying attitudes toward long-term survival strategies and the management of risk. Where flexibility is a key feature of such strategies, the outsider must be particularly sensitive to maintaining this element in whatever activities and improvements are proposed. In such cases, each proposed activity must be judged not only in light of what it offers in the current allocation of resources, but how it may affect the future allocation of those resources to other purposes. Today's communal pasture may be tomorrow's private peanut field, and so on. Donors who fail to recognize these underlying strategies may either have difficulties attracting adherents to their proposals or, if the incentives offered in the present are high enough, may persuade villagers to participate but in so doing jeopardize the very systems which permit them to adapt and respond to the erratic environment in which they live.

Among the key elements contributing to flexible resource management in the Ndams are the following:

- (1) co-management of the territory with several other villages which permits each village access to somewhat greater geographic diversity. Risks are reduced and villagers have more opportunities to adapt to micro-territorial variations in rainfall or pasture quality;

(2) maintenance of very flexible arrangements concerning borrowing and lending of land (in contravention of official policy) which encourage temporary land transactions in favor of those with the means to render the land productive but do not jeopardize (thereby discouraging loans) the longer term interests of the lender;

(3) local governance of resource management at the territory level which permits on-going negotiation over resource use patterns in time and space. (As conditions change, the spatial distribution of pasture and cropland as well as the length of fallow can easily be renegotiated among the users.);

(4) a multi-dimensional definition of land value which accords importance not only to land under cultivation or high intensity use (as valued by national land laws), but also to territory in pasture, as well as land that is allocated to regenerative fallow at the present time but will be brought into higher value production again in the future;

(5) the existence of multiple use-rights over a given space which means that an individual may be the landholder for cultivation purposes but that it is open to public access for the harvest of tree products.

Certainly, strict enforcement of the *Loi sur le Domaine National* would considerably reduce the flexibility inherent in the local system of resource management. But other more apparently benign development efforts to render the resource base immediately productive may have similar consequences if they foster more exclusionary or exclusive resource use patterns.⁷ It is hoped that by highlighting the importance the local population accords flexibility, this study may make development agents more sensitive to the existence of such arrangements and thereby help to avoid some of these unintended but nevertheless detrimental side effects.

⁷Examples of project activities which may (but do not necessarily) have negative consequences on flexible systems of local level resource management are: intensive tree planting efforts (such as village woodlots) which are not subject to the same open-access tree harvesting rules as other village tree resources; encouragement of farmers to fence or hedge areas to exclude access; construction of infrastructures for cattle which predetermine a fixed grazing or watering area.

TABLE 5

OPPORTUNITIES AND CONSTRAINTS FOR IMPROVED NATURAL
RESOURCE MANAGEMENT IN NDAM MOR FADEMBA

OPPORTUNITIES

- * The villagers have a deep understanding and concern for issues of natural resource management
- * The local population has already demonstrated significant initiatives and strategies to deal with the deepening resource crisis
- * A package of local technologies has been experimented by the population to conserve/regenerate natural resources
- * Land is not a severe constraint and local decision making structures/institutions are well developed

CONSTRAINTS

- There is a lack of technical information available locally on certain issues of concern to the village
- The low and variable rainfall has resulted in a diminished importance being accorded to agriculture and a lowering of the returns to investments in land and agricultural production
- There is a strong and probably uncontrollable outmigration of village youth (limiting available labor)
- The macro-economic situation (prices, inputs, etc.) is unfavorable to local investment in agriculture

OPPORTUNITIES AND CONSTRAINTS

Two prevailing themes should guide World Visions' future activities concerning natural resource management in the Ndam territory. The first, as noted above, is to respect the flexible systems of resource allocation and use already employed by the local population and to make every effort to ensure that project activities are compatible with these flexible, adaptive system. These issues should be raised explicitly with the population in planning activities: if measures are taken to regenerate *neow* trees on pasture lands, who will participate and who will have access to the tree products? What will happen if that land reverts to individual cultivation?

The second guiding theme concerns the process needed to implement the activities. It was evident to the team that only by continuing to pursue the kind of participatory research and planning process already begun during this study will project activities have any chance of achieving their intended objectives over the longer term. It was clear from our brief stay in the village that the population of Ndam Mor Fadamba has a deep interest in resource management issues as well as a vast knowledge concerning their local environment. Both of these are critical inputs to any future project activities.

The next step is to launch a planning process with the local population, beginning with the information and rapport already established in this initial study. While it would be inappropriate to predict exactly what priorities or interests will arise from this process (which in future RRA work should ideally follow directly, in a seamless transition, from the study phase), there are strong indications of the direction future activities are likely to take given the concerns already raised by our initial visit. Some of the general opportunities and constraints related to undertaking a participatory planning process around natural resource management issues are summarized in Table 5 above.

Among the areas in which there are opportunities for the project to intervene are (1) encouraging the more systematic extension of promising indigenous resource management techniques and (2) researching and disseminating information in areas where the local population feels they need assistance.

1. Extension of indigenous resource management techniques.

As noted in Table 2, the population of Ndam Mor Fadamba already has a repertory of practices used to nurture and regenerate their environment. Some of these practices are quite widely known and practiced, while others are at earlier stages of experimentation and adoption. A first step in the planning process in Ndam may be to explore why there are variable rates of adoption for these practices and whether some of them might be more systematically promoted in the territory and region (e.g. *rath* agroforestry systems or the regeneration of *walt* soils by millet stalk composting). As World Vision undertakes other studies and planning activities with populations in the zone, it will have the opportunity to document a range of indigenous management techniques, to explore with

villagers the appropriateness of these techniques in different settings, and to facilitate exchanges permitting village experts to share their knowledge.

2. Research to fill information lacunae in priority areas of concern to the local population.

The Ndam villagers expressed their frustration at not having sufficient information concerning several resource management issues of high concern. World Vision could play a useful complementary role by finding out and sharing whatever information is already available on these topics and, if relevant research has not already been undertaken, persuading research institutes such as the *Intitut Sénégalais de Recherche Agricole* (ISRA) to undertake a focused research program responding to specific village concerns.

Among the issues raised by the Ndam population as areas where they would like more information were:

- * experiences to regenerate pasture lands and improve the composition of grass cover;
- * practices to regenerate valuable indigenous tree species including especially the *neow* tree;
- * recommended trimming/pruning practices for indigenous tree species (this research should be done in conjunction with the local Fulbe herders who have an expertise in this domain).

In addition, it may prove useful to combine formal scientific research with the ongoing research activities already being carried out by the villagers themselves. Two topics of particular interest to the village are:

- * information on the cultivation of *andropogon* grasses, including particularly their competition for water and other inputs, their effect on soil fertility, and various cultivation alternatives (band vs. plot, for example);
- * information on agroforestry with *rath* bushes or trees, including the effects on soil fertility and yields.

The key role for World Vision in this process will be to complement, and not smother, the dynamic process of reflection and resource allocation that already takes place in the territory. This can probably best take place by focusing on facilitating the process of discussion and planning around resource management issues (already begun during this first RRA). The goal of the process will be not only to make more effective use of local natural resources, but also to improve the village's capacity to plan around priority concerns, whatever they may be. Providing information from the available literature in response to village resource management concerns and, where necessary, commissioning additional research are also appropriate NGO actions to complement village initiatives. It

may, at some later point, become evident that additional technical assistance is needed to overcome a specific barrier to implementing the program designed by the village planning process (e.g. credit, certain infrastructure developments, etc.). World Vision may also have a role in helping to meet these needs, though care must be taken to ensure that it is the village planning process that identifies constraints and bottlenecks, and not the provision of assistance or services that drives -- and orients -- the planning process.

APPENDIX 1
ACTIVITIES CARRIED OUT DURING THE FIELD STUDY

When	Activity*	By Whom**	With Whom
Day 1, pm	Protocol Map	Team	20 village notables (m)
Day 2, am	Transect	Team	4 men
am	SSI	"	Woman cutting rath wood
am	SSI	"	Man working Bissap field
am	SSI	"	Young man in rath field
pm	GI	"	Old and young men
pm	GI	Women	5 women in compound
evening	interaction	Team	
Day 3, am	SSI	Team	Chief of Village
am	Visit	Men	Marabout field workers
am	SSI	Women	2 women in compound
am	SSI	Women	1 woman in compound
pm	share info	Team	
pm	Year Diagram	Team	15 men
evening	Interaction	Team	
Day 4, am	SSI	Women	1 woman in compound
am	SSI	Women	2 women in compound
am	SSI	Women	1 woman in compound
am	SSI	Men	Fulbe Herder family
am	SSI	Men	Wolof Herder family
am	SSI	Men	Male grass cultivator
pm	share info	Team	
pm	Matrix	Team	15 men
evening	Wealth Ranking	Team	Man
Day 5, am	Analysis	Team	
pm	Map	Team	15 men
pm	SSI	Mansour	1 man
pm	Wealth Ranking	Mansour	1 man
evening	interaction	Team	
Day 6, am	Labor calendar	Team	3 women
am	SSI	Team	2 male Emigrants
am	Matrix	Team	3 men
pm	Feedback	Team	Most village adults

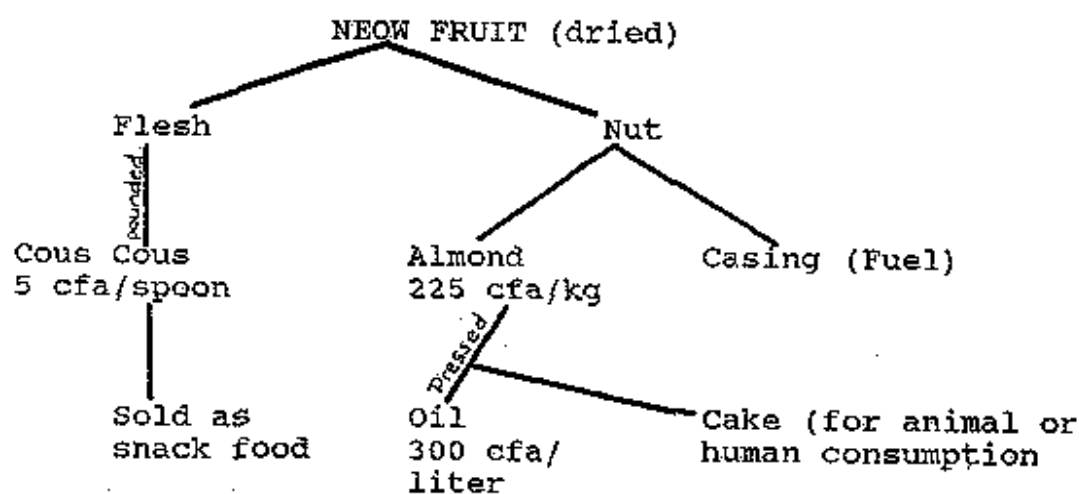
* SSI is semi-structure interview; GI is group interview

** Women means the women in the team (sometimes with the communicator for translation) conducted interviews apart; Men means the male members of the team conducted interviews apart.

APPENDIX 2
THE PROCESSING OF NEOW FRUIT (*PARINARA MACROPHYLLA*)

As noted in the text, the *Parinara macrophylla* tree, known locally as *neow*, was one of the most highly regarded local species. To the regret of the Ndam population, as many as four fifths of the trees have died out, probably mostly as a result of drought. Women, who harvested the fruits and processed them into products both for local consumption and sale, particularly lament the diminution of the species and there is considerable interest in its regeneration. The information on the processing of the *neow* fruit comes primarily from Joba Gueye, a remarkable woman who is known locally as a specialist in this domain. Whereas many women have reduced their *neow* collection activities as the work needed to harvest the fruit from widely dispersed trees has increased, Joba continues to earn substantial sums -- though nothing, she says, like what she earned in the past -- from her activities.

After the reddish brown *neow* fruits are collected in large sacks, they are dried. In this state they can be stocked for a year or longer, one of the reasons they were in the past so valuable as emergency rations during times of famine. As can be seen below, every part of the fruit has a use.



In the past when the trees were more plentiful, Joba sold as much as 300 liters of oil in a year, in addition to the part that she conserved for home consumption. She has not made any oil in the past three years due to the difficulties in obtaining sufficient quantities of nuts. She does continue to sell the almonds and the cous-cous. This year, for example, she earned 4000 cfa from the sale of cous-cous. The money that she earns is invested in small-scale livestock. We can begin to compare the value of this tree crop, which nourishes and regenerates the soil, with -- for example -- the value of peanuts which continue to leach the soils of nutrients and organic matter.

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IIED'S DRYLANDS PROGRAMME

The Drylands Programme at IIED was established in 1988 to promote sustainable rural development in Africa's arid and semi-arid regions. The Programme acts as a centre for research, information exchange and support to people and institutions working in dryland Africa.

The main fields of activity are:

- Networking between researchers, local organisations, development agents and policy makers. Networks help exchange ideas, information and techniques for longer term solutions for Africa's arid lands.
- Support to local organisations and researchers to encourage sharing of experience and ideas, capacity building and establishing collaborative links.
- Action-oriented research in the practice and policy of sustainable development in Africa's drylands, focusing on the variability of resources and incomes on which populations depend, development-oriented research methodologies, and natural resource management systems.



IIED

**INTERNATIONAL
INSTITUTE FOR
ENVIRONMENT AND
DEVELOPMENT**

**3 Endsleigh Street, London WC1H 0DD, UK
Telephone: 44.71.388 2117
Fax: 44.71.388 2826
Telex: 317210 BUREAU G**