CHAPTER 1: BACKGROUND AND PROBLEM STATEMENT
1.1. Introduction: An overview of natural resource issue in West Africa

During the last few decades, climate variability and human activities have accelerated natural resource degradation in West Africa. Traditional production systems have become progressively unsustainable as higher demographic pressure, increasing poverty, and greater food insecurity lead to more intensive activities and practices depleting natural resources. Increased competition for natural resources has given rise to conflicts (actual or potential) between stakeholders. The prevalence of conflicts in the Niger River delta of Mali is typical of most West African countries. Natural resource depletion and high pressure on existing resources leads to conflicts in Sahelian countries (Mali, Niger, Burkina Faso, Senegal, and Mauritania) as well as in coastal countries such as Côte d’Ivoire.

Conflicts recurrently occur in the Sahel. In Burkina Faso for example, conflicts between farmers and pastoralists are frequently reported in most parts of the country. For example, conflicts occurred, in the Central Plateau (Ziniaré in 1968), in the west (Sideradougou in 1986 with 5 dead reported, Mangodara in 1995 with 7 dead, Banfora in 2001), and more recently in 2003 in the east where 10 people were killed in the Gourma province, in the village of Balere.

In Côte d’Ivoire, with a higher natural resource base, some urban inhabitants hire workers to grow cash crops (coffee, coconut, rice) on their behalf on rural or semi-urban lands. Usually, they get the legal right to use these lands straight from government institutions in Abidjan. This may lead to conflicts with local people who are the traditional landholders (key informants interviewed in 1998). This started a process peaking in 1999 and 2000 when village natives and foreigners, mostly from Burkina Faso, Mali and also Ivorians from other regions of Côte d’Ivoire, came in conflict over the cultivated land. Many people were killed on both sides in the far west area of the country and the situation is still unstable. A key-informant prophesized in 1998 that Côte d’Ivoire “was seated on a socio-political bomb” due to the land issue. One year later, the most

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1 In 1998, a preliminary visit by the author in some West African countries (Burkina Faso, Mali, Niger, Côte d’Ivoire and Senegal) and interviews conducted with key-informants (development agents, researchers, administrative decision-makers, NGOs…) revealed the presence and similarities of conflicts in these countries, although their gravity may vary from one country to the other.

2 Most foreigners, like Burkinabè are just Burkinabè by name: they were born in Côte d’Ivoire; their parents or grand-parents were sent there in the 30s or 40s by the colonial power at the time when Upper-Volta (now Burkina Faso) and Côte d’Ivoire were merged, as working labor on the colonial plantations. Some of them acquired the land from natives either by purchase or by any other arrangements with the landlord. Unfortunately, since they are still not citizens of Côte d’Ivoire, they have no perennial rights on such lands.
severe conflict started in Tabou (west of Côte d’Ivoire) where an open and deadly conflict started between local Ivorian people, the Kroumens, and the Lobis from Burkina Faso. Most foreigners, particularly Burkinabe (about 17,000 people) had to leave the area for their home country. This Tabou tragedy illustrates the social and political challenges of natural resource (land in particular) management in Côte d’Ivoire where citizenship is closely related to the land issue.

One of the recommendations of the United Nations, representing the international community for a long-term solution to the current political crisis in this country is to solve the land problem.

In the southern part of Niger (region of Dosso), the demographic pressure is relatively high (nearly 100 inhabitants per sq. km) and transhumance (to and from the north of Benin) increases the potential for conflicts. Corridors for transhumance exist but are not respected by farmers who invade most areas reserved for livestock. A case study from the district of Boboye is illustrative of the severity of conflicts as well as the extent to which conflicts can occur. Conflicts often occur in this fertile region of Niger, between farmers and pastoralists at village level, due to farmers’ settlement around water points that obstructs transhumance corridors. Crop damages by animals become more and more likely to occur and may be followed by bloody or sometimes deadly conflicts (Autorité du Liptako-Gourma, 2002).

In Mali, conflicts are most frequent and severe in the Niger River delta because of the large diversity of natural resources that used to attract many stakeholders. Kodio et al. (2000) and Vedeld (1997) reported hundreds of conflicts over land, unresolved for years or simply potential conflicts that could arise anytime. It is interesting to note that beyond the Mopti region (Gao and Meneka) where activities and stakeholders are similar, conflicts decrease in intensity as well as in severity.

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3 Prior to the start of the rebellion in the northern part of Côte d’Ivoire on September 19, 2002, a law was adopted which states that land can no more be inherited by foreigners. After the parents’ death, the (dead) foreigner’s rights on the piece of land vanish and inherits cannot be proprietors of this piece of land. At the same time, this law does not allow the acquisition of Ivoirian citizenship for millions of people although born in this country some decades ago, before the independence of the country.

4 The district of Boboye is located in a transition zone between the southern part of Niger and the northern part of Benin; it seasonally hosts livestock moving down from Niger to Benin and back; the nomadic herders frequently violate the transhumance corridors and create damages on farmers’ crop fields, which is source of conflicts.

5 Pastoralism is the most common activity; when conflicts occur, solutions are easily and quickly negotiated between opponents.
1.2. The current landscape of Agro-pastoral systems in the Sahel: a source of conflicts

The semi-arid region of West Africa (see Figure 1.1) commonly known as the Sahel\(^6\) is characterized by monomial rainfall regime with an annual rainfall fluctuating between 100-200 mm and 1000mm or 1200 mm. Annual rainfall levels have been decreasing over the course of the last century (Farmer, 1989; Sunzini, 1992); climatic/weather change over the two decades has shortened the rainy season, substantially modifying the landscape of the region as rainfall isohyets have moved southward.

Drought has always been seen by many experts as a chronic problem in the Sahel: 12-15 year droughts were recorded in the 1680s, the 1750s, the 1820s and the 1830s. During the 20\(^{th}\) century, the Sahel has been plagued by extended droughts in 1910-14, around 1930, and in 1940-44, 1968-73, and 1980-84. “While there are indications that earlier droughts were confined to relatively small areas, there has been a continual increase in the duration and the extent of drought over the last 100 years and consequently in the destruction caused by it. This has held true up to very recent times” (Leisinger et al. 1996)

Moreover, other stresses such as low fertility, low organic matter content and low water retention capacity of the soils have constrained rainfed agriculture and the productivity of natural vegetation (Sunzini, 1992, op. cit.). Only 8% of the land area in the Sahel is suitable for agriculture\(^7\) and currently 5% of this area is devoted to irrigated agriculture.

Nearly all agricultural land is used so that additional cropping land can only come from existing fallow land or from land that have been traditionally shared with herders such as the bottom valley lands\(^8\): the so-called “agricultural frontier”\(^9\) extends from year to year.

The once 10-15 year fallow period is now reduced to 1 or 2 years or have entirely disappeared (Sanders \textit{et al.}, 1996). Intensive land use with low level of inputs and poor techniques resulted in a yield decline for both food and cash crops in traditional systems. To such yield declines, farmers react by expanding their fields into marginal lands: current cultivation techniques have to be adapted to the new and harder environmental conditions and conflict potential with pastoralists increases.

\(^6\) The total area of this zone is about 1,500,000 square Km for a population of 44 millions, (6,5% of this population is rural); 65% of this population is rural.

\(^7\) The control of the onchocerciasis and other public health measures increased population densities particularly in the southern regions with better production conditions (better rainfall and soil fertility, lower health risks). This was the case in Burkina Faso for example in the 1970s, when the southern part of the Central Plateau was occupied by farmers installed after the eradication of the onchocerciasis along the Volta Rivers.

\(^8\) ‘Bas-fonds’ in French: they are essentially lands along old rivers courses where better cropping conditions give better yields.

\(^9\) “Front agricole” in French.
Simultaneously, pastoralists, facing the same degrading environmental conditions develop survival strategies; their herd composition is function of their ability to adapt to long-term environmental and market conditions. Despite the semi-arid zone’s low theoretical carrying capacity\textsuperscript{10}, population density is often higher than in sub-humid and humid agro-climates zones of sub-Saharan Africa with a population growth as high as 2.5\% per year (McIntire et al. 1992). Leisinger et al. (1996) predicted a decrease in the environmental carrying capacity in Africa and particularly in the Sahelian zone, due both to cropping and livestock production pattern, which will lead to resource degradation, particularly if no appropriate water and soil management techniques such as zaï, contour rock bunds, tied ridges, half-moon technique,

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure1.png}
\caption{The semi-arid region of Africa}
\end{figure}

\textsuperscript{10} The carrying capacity of the Sahelo-Sudanian zone (the area between the 350-600 mm isohyets and containing more than half of the total population of the Sahel) is about 15 people per sq km under present land-use practices. Current estimates of population density in this zone put the number of people per sq km at 20, which means that the present pattern of resource use is already exceeding the carrying capacity., Leisinger et al. (1996)
high-yielding seeds, fertilizers…… are applied and no social innovations involving people’s participation developed and adopted (see chapter 2 for “success stories” of some techniques in the Yatenga region, Burkina Faso).

1.3. The case of the Niger delta region of Mali

In Mali, and particularly in the Niger delta region, natural resource-based conflicts among and between farmers, agro-pastoralists and pastoralists are becoming much more common. Formerly, the Niger delta region (about 80,000 sq. km) had a large resource base with abundant cropping and grazing land and water shared by farmers, pastoralists and fishermen from within and outside the region. Farmers (Malinke, Dogon, Samogo), herders (Fulanis - traditional herders originally from Mali or Burkina Faso) and fishermen (Bozos) were in permanent or semi-permanent residence (Sy, 1994). Lands used to be flooded by the end of the rainy season, greatly benefiting agriculture, due to better soils (deposited fertile soil particles) and to adequate moisture for plants (flood-recession cropping of rice and sorghum).

Fulanis, traditionally herdsmen usually followed the rains southward during the rainy season and moved again northward to take advantage of crop residues (rice in the “casiers”11, sorghum in farmers’ fields), of the bourgou (*Echinocloa Stignina*-a water plant consumed by cattle) and the pasture along the river when the water level becomes lower.

Farmers cultivated crops during the rainy season and raised small animals. Their cattle were mostly entrusted to Fulanis who removed them from the area during the rainy season. During the dry season, farmers benefited from manure during the herds’ stay on their fields. Barter usually existed between the different classes of resource users: farmers trading cereals for milk and manure from Fulanis, who obtained water and pasture access; meanwhile, Bozos traded fish for the products of the others.

A Changing situation

During the Participatory Landscape/Lifescape Assessment (PLLA)12, villagers indicated that the Niger River as well as one of its main tributaries, the Bani River, supplies less and less water each year because of the decreasing rainfall (SANREM, 1999). The pattern of natural resource use began to change a few decades ago as a consequence of climate change and human activities progressively depleting the resource base. The government “casiers” operated by farmers face severe water shortages that prevent them from cropping rice.

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11 Small pieces of land attributed to farmers by the government and managed by governmental services in charge of rice cropping development.
12 This PLLA was conducted by a SANREM multi-disciplinary team (see chapter 2) before the current research started.
More importantly, this area of the inland Niger delta of Mali, which used to be the largest flood-plain pastures in West Africa (about 16,000 sq km), lost two-thirds of its total area due to the drought cycle begun in the late 1960s (CABO, 1991; SANREM, 1999, opt. cit.).

Crop yields have decreased and farmers have had to expand cultivated area, not only to compensate for the drastic yield decline, but also to increase total production in an attempt to keep pace with the increasing population. This extensive agriculture is made possible by the availability of animal traction (oxen, horses, and donkeys) but has, in turn, resulted in the virtual disappearance of fallow, the traditional means of restoring soil fertility.

Over time, unsuccessful fishermen have become farmers (Lae et al. 1994), increasing the pressure on agricultural resources, especially croplands. Herders also encountered progressively more difficulties finding grazing land for animals during the dry season along the river and/or on the farmers’ fields.

In addition, herders had less and less chance to prevent crop damage caused by their animals because of crop area expansion across their migration routes. The depletion of a natural resource-base has resulted in high rates of livestock mortality during drought with little opportunity for a later herd reconstitution.

For these reasons, many herders have also become farmers keeping all of their livestock manure for themselves. Similarly, low crop yields over time have led farmers to a diversification strategy adding livestock that remains on farm year round.

Progressive resource depletion has compelled these stakeholders to give up or to modify their traditional activities in favor of new practices. Nowadays, each year, fishermen can fish for only a shorter and shorter period since water in the river hardly reaches a level allowing them to do so (Daget, 1994).

Given the changing conditions of production, stakeholders diversify their activities in order to reduce associated production risk. These changing strategies have increased the frequency of open conflicts.

A new social structure as a result

The evolutionary process described above ended up with the appearance of four categories of natural resource users. Moreover, a new social structure evolved, accompanied by new linkages between stakeholders. The four main categories of stakeholders can be depicted as follows:

(a) **Farmers**: their main activity still remains farming characterized by a more and more extensive and often less and less sustainable production system. This group also include some unsuccessful fishermen;

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13 Daget and others showed the decrease in the rate of flow of the Niger River and its tributaries over time.
14 The term “Farmers” means that this category of producers have farming activities as their main activities; it does not imply they are not conducting any other activities. It rather means they are predominantly farmers.
(b) **Agro-pastoralists**: they raise animals along with farming activities as a risk reduction strategy. Their former traditional activity was either herding or farming: in the process, former farmers include more and more animal raising in their production plan. Former herders (fewer) intensified their farming activity in the same strategy of diversification in order to reduce risks;

(c) **Sedentary pastoralists**: their herds are of larger size than those of the agro-pastoralists’. Their herds usually graze within or outside the commune but the whole household does not migrate. These sedentary pastoralistsy usually carry out farming activities that are relatively marginal compared to the above groups but are more important than the transhumant pastoralists’.

Due to current harder production conditions, the sedentary pastoralists settled down and started to develop more and more farming and other income generating activities;

(d) **Transhumant pastoralists**: they are moving inside and/or outside the commune seeking water and pasture for their animals. The transhumance schedule consists of moving around the river (and other water points) during the dry season and moving away during the raining season.

Various adjustments have often led to conflicts. More and more farmers are continuously using the same land for their extensive cropping systems; this leads to the exhaustion of the soil and increases chance of conflict with other farmers over time.

Moreover, less land is now available for herding, a land-extensive activity in the traditional system. Nevertheless, herders continue to represent a high proportion of the population. Hence, the incidence of conflicts is increasing between farmers and herders. These conflicts over damage by animals or over the use of the **bourgou** are often deadly. Conflicts over **bourgou** develop when, for example, farmers want to harvest and store it in order to feed their animals later in the dry season while the transhumant herders prefer to graze animals **in situ**.

### 1.4. The poverty-natural resource degradation duality

There exists a relationship between poverty and natural resource degradation. This relationship has been much debated and has given rise to different views on the driving forces. Many examples exist which show that poverty may induce poor natural resource management, whereas a depleted natural resource-base is clearly a source of poverty. For the case of the Niger delta region, production conditions as deterministic factors of natural resource degradation are examined in chapter 3, along with the effects of poverty as a result of an unsustainable resource management practice.

The two-way relationship between poverty and natural resource degradation calls for policies that break the vicious cycle. A policy option could be based on
the assumption that either poverty comes first as the reason of the process of natural resource degradation--or that this degradation is the trigger to the impoverishment process.

In our approach, we deliberately choose to emphasize the causal effect of poverty on resource degradation; by doing so, we acknowledge the positive role of poverty reduction on improved natural resource management. Reducing poverty will end up with a positive effect on natural resource management. Improved natural resource management provides sustainable practices and reinforces poverty reduction in the mid and long term. Furthermore, the positive impact of poverty reduction on natural resource management may also result in conflict mitigation or resolution, since conflicts are generated or aggravated by unsustainable natural resource management (see Chapter 2) due to their progressive degradation.

*The decentralization or the institutional window*

Local institutions are generally perceived as a good way to transfer responsibilities to local populations; in this vein, the Mali government opted for local governance through decentralization, as an approach to promote development. The Madiama rural commune, the study site of our research, see chapter 2, is one of the local collectivities\(^\text{15}\) that were created as administrative units. These collectivities received from the central government full responsibility for development issues (see chapter 7 for a discussion of the expected role of rural communes to implement policies or institutional changes). Local people’s participation is generally expected as a necessary condition for the fruitful functioning of local institutions and the implementation of successful policies. At the level of the commune, potential conflicts can also be identified and actual conflicts avoided or resolved by discussion in which all stakeholders participate.

1.5. **Research questions and hypotheses**

The study analyses the access to and use of natural resources by different groups within villages in the Niger River delta region, and their derived implications for poverty and inequality that are likely to give rise to social conflict. We therefore assess:

(i) the economic interactions and social interweaving between different types of rural households at community-level (Chapter 3 provides a descriptive overview, while Chapter 4 gives an empirical simulation);

\(^{15}\) This term refers to the administrative units created in the process of the decentralization, especially the communes.
(ii) the nature and character of social conflicts arising from differential access to natural resources (Chapter 2.2-2.4 provides a descriptive analysis, while Chapter 4 gives an empirical illustration);

(iii) policy options for managing these conflicts (outlined in Chapter 6) that might become available; the framework of decentralisation and enhanced participation in local community-led development are discussed in Chapter 7 as policy implementation instruments.

To delimitate the research issues, the following scheme is set up and illustrated in Figure 1.2: the starting point is poverty which at present gives stakeholders no other choice than overusing natural resources and competing for the use of the scarce resources which may cause conflicts.

![Figure 1.2: Relationships between local institutions and community-based natural resources management](image)

The structure of social relations between stakeholders changed. Formerly, the different economic groups lived in harmony, shared common interests, supplemented each other and negotiated. This all has changed. Individual interests and harsh competition prevail. Now that the stakeholders are in a competing and conflict situation, the commune may be an important instrument to cope with the new relationship and handle these conflicts. The rural commune stands for a local institution created by government and empowered with full responsibility for local development and for a better natural resources management in particular.
The nature of the property of natural resources (they belong to the community as a whole) requires a management scheme based on the community’s leadership, sustained by people’s participation. The commune, entitled with such a responsibility can reach its goals if and only if (i) people’s participation is effective and (ii) some necessary inputs are provided. In the context of our study, these inputs do not refer to material inputs but rather to knowledge (through discussions, extension, research), which makes the complex issues transparent and any relevant action well justified and sustainable. Satisfactory people’s participation and the above adequate inputs are the instruments that can make the rural commune well functioning as a local institution (see chapter 7 for a discussion on institutions and people’s participation as leverage tools to the implementation of social changes).

Relevant and sustainable actions are understood to reduce poverty through better natural resource management, which in turn decreases conflicts. Our study is based on the recognition that:

(a) Economic growth and subsequent poverty alleviation could reduce the prevalence of such conflicts. Pro-growth policy and investment decisions require a comprehensive understanding of the linkages between stakeholders as well as between economic activities within the local economy of the commune if they are to positively impact targeted groups of natural resource users; and,

(b) Local people’s participation as stated above is one of the cornerstones to natural resource management and development actions although adequate approaches need to be developed in order to set up empowered participation.

Such approaches should be preceded by a firm political will.

In order to study the complex issue of poverty interweaving with natural resource management in the process of the decentralization as an approach to conflict mitigation and local development, we will use some tools which are often applied in economic analysis (Social Accounting Matrix and site specific Computable General Equilibrium model). Our study aims in particular to explore in particular to what extent these tools can be useful indeed to analyze and understand the complex issue. We are focusing on the inputs block of Figure 1.1 particularly on knowledge, albeit people’s participation is crucial; our approach does, however, does not explicitly deal with decentralization but with inputs which can support the decision-making process in the commune.

Relevant questions in our study are (i) what policy and institutional changes would increase incomes for the various production groups? and (ii) what would be the implications for resource use (or abuse) from these changes?

The main hypothesis made in our research is as follows:

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16 Economic growth leads to poverty reduction and better resource management.
Increasing incomes of the different groups through technical, policy or institutional changes is likely to improve natural resource management, which could in turn reduce conflict occurrence.

1.6. Objectives of the study

The overall objective of this study is to analyze policy impacts which could impinge on natural resource management in the Madiama commune in the Mopti region, one of over 700 communes created in the process of the democratization in Mali.

Specifically, the study aims to identify (i) technologies and/or policies that are likely to change incomes for various groups and corresponding trade-offs between groups and (ii) the implications of the identified changes on natural resource use or abuse.

It is expected that the results reached in this research be useful to the commune of Madiama, in its decision-making process related to local development in general and particularly regarding natural resource management.

1.7. Overview of the thesis

The thesis consists of eight chapters. The next chapter discusses the link between environment and rural poverty and the subsequent relationship between poverty and natural resource management; it then (i) describes the conflict situation in the Niger delta region of Mali i.e. the incidence of conflicts in the inner delta of the river Niger in Mali, their typology and characteristics and (ii) examines the role of technological and social innovations on natural resource management. Chapter 3 presents the regional settings and the methodology of data collection, while the social accounting matrix (SAM) as an approach highlighting linkages between stakeholders and possible causes of conflict (income distribution, factor use) is described in chapter 4. The justification of the SAM is given along with its policy relevance. Chapter 5 examines the commune computable general equilibrium (CGE) model for farm-households as a tool applied to the Madiama commune in order to assess the impact of policies on natural resources use. Chapter 6 examines policy simulations: after calibration of the model, policy scenarios are analyzed mainly in terms of (a) factor use, (b) income levels and distribution and (c) welfare. The assessment of such variables is expected to give the direction of policy impacts (negative or positive) and their potential consequences on natural resource management. Chapter 7 deals with implementation issues related to the examined policies in the context of decentralization. Finally, chapter 8 summarizes the main findings, highlights policy implications for the commune and discusses some questions
which could not be answered in the study.