Summary

of

Conflict, Social Capital and Managing Natural Resources

The Inland Delta and hinterlands of the Niger River, like many natural resource systems throughout the world, are transitioning to more intensified agriculture and animal husbandry production. These dominant sectors serve as the engines of sustainable economic development that provide food security and alleviate poverty. Although open range, opportunistic grazing management by transhumant herders has been a way of sustaining life for centuries in this region, increasing population pressure, changing political structures, declining and erratic rainfall, and degrading natural resources have forced both agricultural and herding communities to transform their production systems and the social relations on which they are based. Unfortunately, this transformation has brought about violent natural resource-based conflicts which have become increasingly common over recent decades.

The Sustainable Agriculture and Natural Resource Management (SANREM) Collaborative Research Support Program (CRSP) began the Phase II (1998-2004) of its activities in West Africa with the objective of advancing NRM in the Sahel by addressing what was increasingly being perceived as the major stumbling block to progress in community-based NRM, local conflict over access to and use of natural resources. We immediately realized that as a research program we had no comparative advantage in conflict resolution *per se*. However, we did feel we had something to contribute through the development and testing of a model institutional framework by which communities could learn to work together to improve management of both their natural resources and the conflicts embedded in their exploitation. This community-based NRM would be both good science and good development.

Overview of the Book

This book describes the process and results of the SANREM Program in West Africa, detailing its approach, components and outcomes. Working with our partners in Madiama, SANREM has succeeded in developing an approach that leads to sustainable social and economic development while minimizing NRM related conflicts. Evidence from the commune indicates that since SANREM began its activities, conflicts have been reduced as the community has begun to work together on priority problems. While still a work-in-progress, SANREM has developed a replicable process that will lead to successful locally controlled participatory decision-making and the decentralization of development services and community initiatives to improve resource management throughout the region. The contributors hope that this book will stimulate further work and development toward this important end.

The first part provides an overview of the landscape and lifescape in which the SANREM project intervened.

In chapter 2, Cissé *et al.* introduce the social and historical context shaping the lifescape of the Inland Delta of the Niger, the core of Mali's 5th Region. Various ethnic groups have co-existed in this area for centuries, generating livelihoods with complementary systems of production. The chapter discusses how recent changes in agricultural and pastoral production

systems have unbalanced this symbiosis and increased competition for scarce resources, thereby leading to land tenure confrontations that are not as easily resolved as they were in the past. In addition, decentralization and democratization have complicated the situation in which the modern state and civil society have been superimposed on the modified, but not displaced, customary governance systems. The discussion concludes, with some qualifications, that NGO-driven opportunities for local dialogue and problem solving hold considerable promise for rural Mali.

In chapter 3, Badini and Dioni present a detailed description of the landscape types and soils of the Commune of Madiama. Combining knowledge gained from informal surveys, field observations, biophysical monitoring, transects, remote sensing, and pit holes, the chapter characterizes soil types and distributions, climate and hydrology, cropping patterns, land use systems and potentials. The database on these landscape types, their location, potentials and constraints is at an appropriate scale for use by village, commune and regional level planners, as well as for providing input to biophysical models to evaluate technologies (as in chapter 11).

In chapter 4, Ballo and Ouattara describe the systems of animal husbandry within and around Madiama, thereby broadening the perspective of the landscape/lifescape scale. The chapter characterizes each of three livestock management types (sedentary, semi-transhumant, and transhumant) involving cattle, oxen, milk cows, sheep and goats. Pastoralists are either transhumant or resident, and often tend to the herds of local farmers much of the year. The pastoral resources available to the commune are limited and though traditional grazing of crop residues and fertilization of soil exists, there is increasing loss of organic matter. The chapter concludes that under Mali's new Pastoral Code, conditions could improve, but improvement will require the concerted efforts of agriculturalists and pastoralists.

In chapter 5, Wynne *et al*. combine remote sensing and ground truthing in the analysis of land use change during a fifty-year period (1952-2002) in the Commune of Madiama. The chapter documents the dramatic shift in land use from pastoral to crop-based production systems.

The second part of the book describes the elements of SANREM West Africa's multi-pronged approach to development intervention. The intention is not to provide a history per se, but to highlight the essential and potentially reproducible elements of the interaction between researcher and community. Each chapter in section two presents components modeling the conduct of a successful community-mobilizing development intervention.

In chapter 6, Earl and Kodio describe how the SANREM team introduced themselves to members of the Madiama community through the Participatory Landscape/Lifescape Appraisal (PLLA), an informal set of participatory survey methodologies that bring out not only important information about the natural resources of Madiama and the production systems shaping the population's livelihood, but also its primary concerns and priorities. In particular, they note the desire of the communities for improved soil fertility and pasturelands in order to increase productivity and incomes, and the underlying concern about conflict.

In chapter 7, Moore *et al.* describe the development of the commune-level NRMAC providing the social infrastructure that is both adapted to the exigencies of recent governmental decentralization and compatible with customary governance structures at the village level. They argue that it is not sufficient to simply assemble a group of men and women representing various ethnic groups and occupational categories, but it is also necessary to develop each member's individual capacities (functional literacy, leadership skills, association management, knowledge of codes and laws, etc.) in order to stimulate mutual trust and network building (social capital formation) between villages and clans and to help them to define their mission. Of particular

importance is training in conflict management to build individual self-confidence and to provide a credible and valued service in the eyes of villagers.

In chapter 8, Goebel *et al.* provide an overview of an alternative conflict management approach and discuss how it differs from common approaches to conflict resolution. The approach is based on building conflict management and consensus building skills rather than simple conflict management, per se. The training program consists of a series of workshops focused on building skills and empowering local leaders by their learning a sustainable process for facilitation and management of diverse conflict situations. This process has been central to the evolution of the NRMAC from a group of village representatives to a committee with a Commune-level mission to improve NRM in the face of resource competition.

In chapter 9, Bingham introduces the Holistic Management™ (HM) Model, an approach developed specifically for open range animal husbandry, but well adapted to provide intuitive analyses, insights and decision-making information for community-based management of natural resources. Consistent with the SANREM approach, this holistic methodology was introduced to scientists and community members in order to facilitate diagnostics of and behavioral change in the management of the natural resource base in the Commune of Madiama. He describes how HM has been a source of tension between scientists and HM promoters, but has also led to innovative attempts at changing resource management within the community.

Following on these capacity building interventions, the third part presents the results of various research activities involving the development and testing of technologies and decision-making tools appropriate for the community and environment of Madiama.

In chapter 10, Crane and Traoré compare indigenous perceptions and models of soil fertility management with those of modern soil science. The differences between these perspectives are discussed along with the cultivators' perceptions of the scientific research conducted in Madiama. The authors argue for implicating end users in technology development from the beginning so that folk knowledge can guide scientific research and research findings can be better communicated to farmers to increase productivity.

In chapter 11, Badini *et al.* demonstrate the use of a combination of results of data collected from three years of on-farm field trials and long term simulation with CropSyst Modeling to evaluate crop rotations, and organic and inorganic fertilizer practices for yield efficiency, stability and soil sustainability over a simulated 30-year period. Organic fertilization produced the best results in the analysis and the chapter concludes by recommending increased efforts in the development of strategies to produce and apply more manure and other organic fertilizers.

In chapter 12, Wyeth *et al.* pursue the issue of sustainability of technologies for enhancing soil fertility from economic and financial perspectives. This analysis takes into account the results of three years of on-farm trials and combines those findings with the output of the computer modeling analyses of Badini *et al.* (chapter 11). Their results suggest that corralling livestock in the fields, spreading manure and micro-dosing with chemical fertilizer are adoptable within the range of farmers' risk preferences.

In chapter 13, Brewster *et al.* model the economic linkages between different groups of natural resource users and analyze the effect of the potential growth strategies. Using data from the PLLA (chapter 6) and an extensive household and enterprise level data set, a Social Accounting Matrix (SAM) model for the Commune of Madiama was developed. Application of this model demonstrated that the largest impacts from exogenous changes in demand are associated with rice and livestock sectors. Furthermore, impacts are shared differentially among

socioeconomic groups with agropastoralists benefiting most and the transhumant group benefiting least.

In chapter 14, El Hadj *et al.* describe research in response to a request by Peul village women to deal with *Cassia tora,* an invasive plant that is unpalatable for grazing animals. As pasture lands have degraded, *Cassia tora* has spread throughout their fields out competing other plants. However, this noxious plant has potential as dry season forage when ensiled. The authors describe their analysis of the forage potential and their work with village women to develop ensilage techniques adapted to local conditions.

In chapter 15, Abaye *et al.* investigated the regenerative potential of pastureland in two villages through a controlled experiment with tethered grazing of small ruminants. This work builds on the Holistic Management ™ (chapter 9) insight that animal impact is not simply a function of numbers of livestock or duration of grazing time in order to provide management indicators that optimize the potential of forage regeneration/biomass production rates, plant biodiversity, and animal performance. The chapter concludes that grazing vegetation down to a 3cm height on any particular parcel is likely to limit forage regeneration.

In chapter 16, Moore *et al*. address the issue of social capital as a factor of development within Malian civil society. Social capital is investigated with a focus on embedded and autonomous social relations at the commune and village levels. Using household survey data from the Commune of Madiama, they investigate the extent to which the NRMAC provides a social infrastructure on which to build community-level social capital. The analysis demonstrates the importance of building on traditionally valued social relationships and combining them with linkages across groups for the management of conflict situations. They conclude that the NRMAC does indeed provide a platform for building inter-ethnic and multi-village social capital.

In chapter 17, Moore *et al*. review how the four pillars of SANREM (participation, landscape scale, multiple stakeholders, and interdisciplinarity) were applied in the Commune of Madiama. In the list of lessons learned, they highlight the difficulties involved in establishing and maintaining full participation of and communication between all stakeholders in the context of power relations and traditionally excluded groups. Building social capital and co-management agreements is a long term and iterative process requiring that project and government development agents be well-trained and integrated within the community in order to empower the population to act on its own behalf.