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CONTRIBUTION TO CULTURE-BASED CURRICULUM DEVELOPMENT
IN AGRICULTURAL AND EXTENSION EDUCATION:
PERCEPTIONS OF SOIL MANAGEMENT AND CONSERVATION
BY FARMERS IN FUUTA JALON, GUINEA, WEST AFRICA

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Jonathon Keith Landeck

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CONTRIBUTION TO CULTURE-BASED CURRICULUM DEVELOPMENT IN AGRICULTURAL AND EXTENSION EDUCATION: PERCEPTIONS OF SOIL MANAGEMENT AND CONSERVATION BY FARMERS IN FUUTA JALON, GUINEA, WEST AFRICA

By

Jonathon Keith Landeck

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ABSTRACT

CONTRIBUTION TO CULTURE-BASED CURRICULUM DEVELOPMENT IN AGRICULTURAL AND EXTENSION EDUCATION: PERCEPTIONS OF SOIL MANAGEMENT AND CONSERVATION BY FARMERS IN FUUTA JALON, GUINEA, WEST AFRICA

By

Jonathon Keith Landeck

Soil management and conservation practices in the Fuuta Jalon highlands of Guinea are often discussed with little regard to farmers' environmental perceptions and the cultural factors which influence land use. Therefore, an ethnographic case study of two villages in this region was completed during 1988-89 to test a process by which farmers' perceptions of soil management and conservation may be elicited and understood in terms of these cultural factors: Agronomic (vegetation, organic matter, soil properties, topography, weeds, seeds, tillage, crop rotation, equipment); Social (education, health, human relations, tradition); Economic (labor, capital, land); Religious (Islam, spiritualism), as well as Historical, Political, and Aesthetic factors.

The research examined three issues germane to agricultural land use in Fuuta Jalon and elsewhere: 1) What farmers know and do not know about soil management and conservation. 2) How farmers learn about soil management and conservation. 3) How farmers organize themselves for soil management and conservation. The methodological process tested in this case study has potential for three practical applications: 1) As a curriculum development tool for the training of agricultural extension educators. 2) As a tool for curriculum development in youth and adult education programs. 3) As a planning tool for community-based agricultural research and development programs.

Research results are organized into twenty soil management domains which are grounded in field data obtained during 12 months of participant observation and semi-structured interviews of farmers in two villages, Tahira and Bussura. The data provide information on the respective roles of available technology, socio-political power relationships, social learning processes, and social organization in land use management. The twenty soil management domains represent chapters of a community sourcebook on agricultural land use and reflect the environmental perceptions of farmers in Tahira and Bussura.

Information exchange between agricultural extension educators and farmers in these and other communities can proceed on the basis of the knowledge documented in the sourcebook. Based upon the methodological process tested successfully in this case study, other such sourcebooks can be developed by agricultural extension educators in Guinea and elsewhere as one aspect of their pre-service or in-service training program.

Dedicated to Kathryn and Ellen.

ACKNOWLEDGEMENTS

There are many names which should fill this page including the farmers of Dara Pelli district, my colleagues from the University of Conakry, the members of my dissertation committee, and the hundreds of other people who helped in one way or another to make this study successful. Financial and administrative support for the field work was provided by the University of Conakry, the Institute for International Education/Fulbright Fellowship program, and the United States Information Service in Conakry. Their assistance will forever be appreciated.

Above all, very special recognition and my most sincere feelings of gratitude are offered to Dr. O. Donald Meaders, whose omnipresent wisdom and moral support guided me through my doctoral program at Michigan State University.

Finally, words alone are an inadequate thank you to my wonderful spouse, Kathryn, whose granite patience and never ending love are truly my inspiration.

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INTRODUCTION

This dissertation is a case study of soil management and conservation as perceived and understood by farmers in two villages of the Fuuta Jalon region of Guinea. The field work was realized in collaboration with three Guinean colleagues, faculty members at the University of Conakry[1]. The pronoun "we" is used in this dissertation to denote us, the four researchers who completed this study in the villages of Tahira and Bussura during 1988 and 1989.

During the field work, we frequently told the farmers of Tahira and Bussura, "We hold the pen, your knowledge fills the pages." In this spirit, the voices of the people who shared with us what they know about soil management and conservation remain audible. These people made this research possible.

In this dissertation are presented the research problem, the theoretical framework for the research, a review of research methodology, a description of the study site, the research results accompanied by discussion, and conclusions. As expected, the data demonstrate that soil management and conservation in Tahira and Bussura is not only agronomic in nature, but economic, social, spiritual, historic, and political as well. This suggests that the perceptions and practice of soil management and conservation by Tahira and Bussura farmers reflect the cultural bases of agriculture in these villages and that these cultural bases may be integral to agricultural research and development there. With that suggestion in the forefront, this case study attempts to illustrate an educational process by which culture-based agricultural research and development may be initiated at the village level using farmers' perceptions of their cultural and agricultural environment.

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[1]The colleagues are Ibrahima Sory Seck, Abdoul Karim Barry, and Souleymane Donghol Diallo.

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A NOTE ON ORTHOGRAPHY

More than 300 vocabulary words in Pular, the *lingua franca* of the Fuuta Jalon region of Guinea, appear in this dissertation. To spell these Pular words, the Roman alphabet is used in this dissertation with special characters added to denote certain word sounds when necessary. Phonetic Pular words and letters in this work are written in `monaco font`. French and Latin words are in italics.

For the most part, the orthography used in this dissertation to spell the Pular words written within was adapted at a meeting of experts on transcribing a number of West African languages, held in 1966 in Bamako, Mali (CRDTO, 1971). The mechanics of the orthography have been explained by Fagerberg-Diallo (1987), whose work is summarized as follows:

> Each letter in written Pular has only one sound value, in most cases, and every letter that is written is pronounced, including doubled letters such as oo and pp. Three sounds, represented by the characters Ɓ / ɓ, Ɗ / ɗ, and Ƴ / ƴ, are perhaps best explained when heard[2]. Vowel sounds in Pular can be either short or long. Short vowel sounds are represented by one letter, a or e. Long vowel sounds are represented by two letters, aa or ee. A long vowel sound is a drawn out sound version of its short vowel counterpart. Pular vowel sounds rhyme with the vowel sounds in the following English words: a (as in "hot"), e (as in "get"), i (as in "bead"), o (as in "road"), and u (as in "shoe"). Other special sounds in Pular are represented by Ŋ / ŋ (pronounced like the "n" in sing) and Ñ / ñ

[2]Author's note: The Ɓ/ɓ sound and the Ɗ / ɗ sound approximate what might be called, in rather pedestrian terms, a staccato B / b and staccato D / d, respectively. In order to produce the Ɓ / ɓ sound, a speaker draws in air through their lips while pronouncing "buh" (which rhymes with "huh"). For the Ɗ / ɗ sound, a speaker places their tongue lightly on the roof of their mouth, near its front, while drawing in air and pronouncing "duh" (rhymes with "huh"). The Ƴ / ƴ sound is even more enigmatic, pronounced with one's tongue placed lightly on the roof of the mouth, near its middle, while drawing in air and uttering "jeh" (rhymes with "heh"). These rather crude, simplistic explanations are the author's and should not be attributed to Fagerberg-Diallo (1987), a noted Pular linguist. In any case, Pular sounds are best appreciated when heard.

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(pronounced like the "ni" in onion). In addition, the Pular Ɔ / ɔ character represents a sound equivalent to the "ch" sound in English. Other key pronunciations in Pular are presented below. The Pular sound represented by ay rhymes with the English word "eye" while ey rhymes with "hay". In Pular, there is also iy (as in "tree"), oy (as in "toy"), uy (as in "buoy"), aw (as in "how"), ew[3], iw (as in "few"), ow (as in "foe"), and uw (as in "queue"). In her work, Fagerberg-Diallo (1987) offers a much more comprehensive and scholary overview of this pronunciation system than is presented in this summary.

A glossary describing some of the Pular words that are used in this dissertation is provided in Appendix A. This glossary includes Pular words that appear more than once throughout the dissertation text as well as some key phrases that may require an explanation beyond that given in the text. Some Pular words that appear in the body of the dissertation are explained with footnotes. The definitions for Pular words used in the text and glossary have been synthesized from the works of CRDTO (1971), Fagerberg-Diallo (1987), Mombeya (1971), Sow (1966; 1968), and the author's study and field use of Pular. Scientific and Pular names of trees and grasses are taken from the works of Bah (1975), Bonfils (1951), Diallo (1972), Diallo (1976), Ly and Schenk (1986), and Osborne (1989), in addition to the information provided by Guinean professionals and the farmers of Tahira and Bussura.

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[3]Author's note: Fagerberg-Diallo (1987) uses the English word "meow" to illustrate the sound of the Pular ew. In my experience, it is difficult to isolate the ew vowel-consonant sound from the context of a word. For example, for the word hewtugol ("attaining"), the hew sound is similar in rhyme to a combination of the English word "hey" and the English letter "u", spoken rapidly together. Likewise, for the word dewal ("religiosity"), the dew sound is similar in rhyme to a combination of the English word "day" and the English letter "u" spoken rapidly together.

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PROBLEM AND PURPOSE

The basic problem that prompted this research is the soil erosion potential of the Fuuta Jalon highlands in Guinea. For the past 50 years, a perception of many agronomists, soil scientists, social scientists, geographers, and others has been that soil erosion in this geographic region is a threat to the quality of the entire West African river system, whose principal sources are found in Fuuta Jalon (Bonfils, 1951; Boulet and Talineau, 1986; CRED, 1985; Cueto and Khouma, 1986; Derman, 1973; Diallo, 1986a; Diallo, 1986b; Diallo, (undated); Dugain and Fauck, 1959; FAMA. 1962; Freeman, 1987; Gupta, 1987; Heermans and Williams,1988; Heusch, 1984; Isbecque, 1985; Maignien, 1958; Maignien, 1960; McGahuey, 1985; Pepler, 1960; Richard-Molard, 1944; Rouanet, 1952; Suret-Canale, 1970; UNESCO, 1981; Vieillard, 1939). Despite the plethora of opinion regarding actual and potential soil erosion in Fuuta Jalon, this issue remains debatable.

Whatever may be the outcome of such a debate, it is true that no scholarly scientific work had specifically addressed the Fuuta Jalon soil erosion issue from a sociological perspective when the field work for this case study was initiated. Certainly, no other studies are examining this problem using the same methodology as employed in this research. A number of scholars and writers have observed that the technological and sociological facets of soil conservation are integrally allied, including Ashby (1982; 1985), Bennett (1978), Blaut et al. (1959), Coughenour (1984), Mbithi and Kayongo-Male (1978), and Nowak (1983a), among others.

One attempt to address this issue in Guinea occurred in 1959 at the Third Inter-African Soils Conference held in Dalaba, Fuuta Jalon. There it was clearly noted that the technical and social aspects of soil conservation are inseparable

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and that extension education programs are keys to soil conservation in Fuuta Jalon. One recommendation offered at this conference was "the development of ethnographic, sociological, and psychological studies of African rural environments with a view to collecting necessary information for the specialized training of agricultural extension staff and for their work (Pepler, 1960)." The research presented here, an ethnographic case study of soil management and conservation in a small-scale watershed in Fuuta Jalon, realized nearly thirty years after the Dalaba Conference recommendation, is nevertheless intended as an initial step for acting upon the Dalaba recommendation.

It is a fairly elementary procedure for scholars and technicians to read about and understand the perceptions of soil management and conservation held by agronomists, social scientists, administrators, and other professionals. However, this case study presents the perceptions of soil management and conservation held by another set of stakeholders in soil management and conservation, the farmers of two remote villages in Fuuta Jalon. Nevertheless, it is a good bet that this dissertation will not be read by most, if any, of the farmers whose perceptions of soil management and conservation are contained in this manuscript, regardless of the language in which the data are or will be presented. It is worth noting here that the issue of farmer literacy, as much as any fundamental social or agronomic issue, ought to be a central concern for agricultural development in Fuuta Jalon, if not elsewhere.

With that issue and other related problems in mind, this ethnographic case study was originally intended to test a methodological process by which the perceptions and knowledge of soil conservation and management by a community of farmers may be elicited and interpreted with respect to land use. Such a methodological process has potential for at least three practical applications: 1) The process could be used as a learning tool in pre-service or

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in-service agricultural extension educator training programs. 2) The process could be used as a planning tool in the design and development of soil management and conservation programs. 3) The process could be applied as a guide to the development of curricula for youth, adult, and literacy education programs and texts that utilize environmental themes.

With these potential uses in mind, this study examines three issues germane to land use in Fuuta Jalon and elsewhere: 1) What farmers know and do not know about soil management and conservation. 2) How farmers learn about soil management and conservation. 3) How farmers organize themselves for soil management and conservation.

Information obtained from this study can contribute to the development of local, regional, and national environmental policies and programs. In the process of obtaining the information presented in this manuscript, particular emphasis was placed upon a methodology that would enable "cultural outsiders" (including agricultural extension educators and university-based researchers) to a farming community better understand why farmers in the community use the land as they do. To this regard, the field work data provide information on three sets of cultural parameters including: 1) The agronomic, economic, social, historic, political, religious, and aesthetic "cultural factors"[4] that influence soil management and conservation in a specific locale. 2) The respective roles in soil management and conservation of technology, political power relations, social learning processes, and social organization, the "cultural elements" that ground land use patterns to a particular community. 3) The

[4]It is tempting to use the term "facets" (i.e. cultural facets) instead of "factors", as noted by J.Y. Marchal (1983) who, referring to G. Sautter's ideas on the interaction between nature and society, said that "each facet is characterized in a particular way by the superimposition of human and physical facts". To this, Blanc-Pamard and Milleville (1985) suggested that to identify and explain these "facets" researchers should learn local knowledge systems and local perceptions as well as recognize and analyze the milieu in thematic terms such as soil, vegetation, topography, etc.

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critical relationship between individuals' environmental perceptions, their environmental knowledge, and their values and beliefs about their natural and social environment.

With attention to these cultural parameters, this research examines both sociological and technological aspects of soil management and conservation. A major portion of this case study includes ingredients for the development of a sourcebook on soil management and conservation in the communities of Tahira and Bussura. The development of community-based sourcebooks has been suggested, proposed, or alluded to by several writers (Pepler, 1960; Richards, 1980; Warren and Meehan, 1980; Whyte, 1977). In the chapter of this dissertation entitled CONCLUSIONS, future directions for agricultural extension education that would make use of such community-based sourcebooks in the development and implementation of culture-based learning curricula are suggested.

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THEORETICAL FRAMEWORK

Definitions of culture

There may be as many definitions of "culture" in the world as there are people. Some scholars consider culture to be a panoply of language, ideas, perceptions, experiences, beliefs, traditions, sciences, arts, technologies, and institutions (Frake, 1962; Unruh and Unruh, 1984). Another school of thought is that the principles by which people perceive and interpret their environment reveals how information is coded and retrieved and how decisions are made (Kelly, 1955), and that these principles are representative of culture.

Several concepts of the word "culture" that are useful to this study were reviewed by Morris Freilich (1989). Freilich noted, first of all, the linguistic roots of the word "culture", which he identified as *cultura* or *cultus*. These two terms originally referred to "cultivation", as in soil tillage, which should be of interest to agricultural extension educators. Freilich recalled one Marvin Harris definition whereby "culture" is a set of language units. Freilich also noted Wescott's reference to the "cultural bases of human uniqueness and divinity", our powers of abstraction and insight. Kroeber, observed Freilich, suggested that the perception, knowledge, and understanding of the cultural ideas of art, technology, and the like are passed from generation to generation, but not the cultural elements themselves. Schneider's theory that culture is a system of symbols and meanings best understood by studying societal norms was cited by Freilich as useful for relating culture to patterns of action. In addition, Freilich credited Geertz with the concept that people impose meaning upon experience through the qualities of their culture.

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Hunn (1989) reviewed other definitions of culture, including Goodenough's idea of culture as the information a person should know in order to act appropriately in normal social contexts. Hunn (1989) promotes a view of culture as a system of information that serves as a blueprint for a way of life.

Obviously, an entire dissertation could be written on various definitions of culture. Indeed, each definition of culture presented here is comprehensive and useful. But, for the purpose of this research, a definition of culture that accommodates individual as well as group interpretation of the world is most useful. Such a definition of culture supports the idea that how a person views the world and gives meaning to daily life reflects the culture of that person.

To be sure, how an individual or a group of people perceives the world may not be the ultimate definition of "culture". Each person views the world differently yet some of us nevertheless share common perceptions and beliefs. Some of us believe, for example, that agricultural extension educators ought to learn to understand and share the myriad world views held by farmers. Such a shared understanding might help agricultural extension educators to better relate, both verbally and spiritually, to the farmers whom they represent. Because a key to constructive agricultural extension education is effective communication between farmers and agricultural extension educators, the ability of agricultural extension educators to relate verbally and spiritually to the farmers they represent might truly be important. A premise of this research, explained in the following section, is that sharing cultural grounds upon which to establish a basis for communication between agricultural extension educators and the farmers is a worthwhile pursuit[5].

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[5]To this regard, it is worthwhile to note that one root for the word "communicate" is the Latin word *communicare*, which means "to make common" (Webster's New World Dictionary, 1962).

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Culture-based curriculum development

The development of curriculum, where "curriculum" is defined as a strategy for learners to acquire purposeful knowledge and skills (Unruh and Unruh, 1984), ought to proceed under the assumption that peoples' motivations for learning are derived from the significance of the curriculum content (Unruh and Unruh, 1984). Given this assumption, a curriculum for learning and information exchange about soil management and conservation should attempt to relate soil management and conservation issues to other community concerns as much as possible. An agricultural extension educator whose focus is soil management and conservation must therefore know how to identify and understand other such community concerns. One method for identifying and understanding community concerns is to know how community members perceive the social and natural environment (i.e., world) within which they reside and operate. When these perceptions are elicited and understood by agricultural extension educators, these educators will also have begun to understand the culture of the community. A methodology is thus required by which community members' environmental perceptions can be elicited by agricultural extension educators working within a community.

Frake (1962) wrote that culturally significant and cognitive environmental features must be communicable between persons in the standard symbolic system of the persons' culture, namely language. For this reason, the essence of agricultural extension education curricula, an "environment for learning" (Sinclair and Ghory, 1985) where farmers and extension educators exchange agricultural information, should be language-based. This means that the words used by farmers to express their thoughts and opinions about their agricultural environment should be the basis for curriculum development.

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For developing culture-based agricultural extension education curricula, a concept of curriculum development that accords with a model of education outlined by Warren and Meehan (1980) is useful. The model proposed by these scholars includes an initial research phase during which a cultural description of the community to be served by the curriculum is prepared. As Warren and Meehan suggested, the goal of the initial research phase is to determine themes that are appropriate and relevant to community issues. This approach was emulated during the field work in Tahira and Bussura.

In any farming community, relevant issues abound. For this research, the the general issue of soil management and conservation was selected prior to initiation of the field work. It was a reasoned that soil management, if not soil conservation, would be a central concern of farmers at the study site. Alternatively, general issues such as the community water supply, health care, or house construction, for example, might have been chosen for examination. It was hypothesized that more specific issues and themes allied to soil management and conservation would arise in discussions with community members when soil management and conservation was the selected topic. As Warren and Meehan (1980) implied, such themes can be incorporated into community education programs. The same themes as those which are of critical concern to a community can also be incorporated into training curricula for agricultural extension educators. This strategy of curriculum development for community education and for agricultural extension educator training may be called "parallel curriculum development".

The application of a parallel curriculum development strategy to training programs for agricultural extension educators entails setting learning objectives that enables these educators to better understand farmers' perceptions of their total agricultural environment. In addition, agricultural extension educators

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should understand the role of community social structure in the exchange of information. Within farming communities like Tahira and Bussura, information exchange generally occurs through a "kith and kin"[6] network (Rohrer, 1986). This communication system reflects the structure of community interpersonal relationships, the options and constraints allied to these relationships, and the history of the relationships (Hansen, 1979).

Likewise, this dissertation research on developing culture-based curricula follows a social theory of learning drawn from a relational model of curriculum development (Asoveh, 1981; Hansen, 1979; Robinson, 1981; Verduin, 1980; Young, 1971). This theory and model underscore the significance of relating or linking community social structure to the content of community learning programs. The theory suggests that the organization and use of community knowledge in learning programs should accord with what community members value as knowledge, who influences what is valued as knowledge, the availability and utilization of such valued knowledge, and community learning processes (Young, 1971).

This research advances current theory of agricultural extension education through its contribution to developing a "sociological perspective to soil degradation", as advocated by Ashby (1985) and others (Ashby, 1982; Bennett, 1973; Blaut et al., 1959; Coughenour, 1984; Dunlap and Martin, 1983; Firey, 1984; Mbithi and Kayongo-Male, 1978; Nowak, 1983a). It is hoped that this research will encourage the adoption by agricultural extension educators of a "sociological perspective" to soil management and conservation that will complement their technical skills and improve their capacity to exchange information with the farmers they represent and serve.

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[6]"Kith" refers to "friends and neighbors".

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Environmental perception research in agricultural extension education

The theories that support this research are based upon the assumption that farmers' environmental perceptions are linked to land use. A number of scholars have directly or indirectly examined this assumption in recent times in Africa, sometimes starting with an inventory of African farmers' knowledge about soil management. These scholars include Benneh (1973), Ford (1982), Gallais (1965), Guggenheim and Fanale (1976), Igobzurike (1971), Kowal and Kassam (1978), Mbithi and Kayongo-Male (1978), McC.Netting (1968), Savonnet (1958), Thomson (1980), Vieillard (1939), and Watson (1972), among others. However, there are few scholarly works that specifically address the use of such knowledge for agricultural extension education programs and curricula, as this dissertation research intends to do.

In Guinea, a recent study of the Gambia River Basin, the upper portion of which begins and flows in the Fuuta Jalon highlands, raised the question of whether or not the perception of soil erosion by farmers in that region is a major constraint to soil conservation there (CRED, 1985). In the Blue Mountains of Jamaica, which is topographically similar to Fuuta Jalon, research on the cultural determinants of land use showed a major factor of soil erosion to be a "lack of perception of erosion, its causes, consequences, and control" by farmers (Blaut et al., 1959) . In Kenya, Mbithi and Kayongo-Male (1978) drew similar conclusions regarding the perception of soil erosion by rural residents. For the United States, Nowak (1983a,b) noted that low estimation of soil erosion as perceived by farmers is a critical agricultural issue and suggested that the promotion of soil conservation on the basis of productivity alone is insufficient.

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environmental resources and acknowledgement of the interdependence between biophysical features of the environment and the social organization for managing natural resources (Ashby, 1985). The work of other writers (Bennett, 1984; Dunlap and Martin, 1983; Holdgate, 1984; Whyte, 1984) leads one to suggest that an understanding of farmers' environmental perceptions by agricultural extension educators can be a key to soil conservation in an agricultural milieu like the Fuuta Jalon highlands.

Also critical to soil conservation is education because knowledge and information shape human values which, in turn, influence peoples' behavior (Wharton, 1963). But the provision of knowledge and information to farmers by agricultural extension educators does not necessarily guarantee that farmers' soil management and conservation practices will change as these educators might wish. Therefore, agricultural extension educators need first to understand why farmers practice soil management and conservation as they do (Nowak, 1983a; Stavis,1979).

The failure of agricultural extension educators to understand the basis of farmers' land use patterns is often related to certain "socio-cultural distances" (Singh, 1981) between farmers and extension workers that may inhibit effective communication and information exchange. To bridge any such socio-cultural gap between farmers and agricultural extension educators, a systematic understanding on the part of extension educators of farmers' perceptions of the local agricultural environment may be a useful tool. Whyte (1977) developed an excellent guide to research on environmental perception, suggesting that such research should contribute to understanding farmers' rationales for land use decision-making.

Two concepts are useful for understanding farmers' decision-making about land use: "Selective perception", the cognitive process by which people

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interpret sensory messages in terms of their existing attitudes and beliefs (Rogers and Shoemaker, 1971), and "bounded rationality", a mental mechanism by which people confront and deal with only selected components of their most pressing needs at a given moment (Simon, 1983).

When mindful of "selective perception" and "bounded rationality", cultural outsiders to farming villages, agricultural extension educators included, may find it easier to understand the motivations of farmers to use the land as they do. If truly rational, which we assume farmers to be, then local patterns of land use should represent an adaptation to environmental conditions or reflect learning processes that influence such adaptation (Simon and March, 1958). Moreover, adaptive behavior will likely be grounded in a local knowledge base from which information is taken and used for decision-making.

Another scholar of environmental perception is Downs (1970), whose schema for geographic space perception can be synthesized as follows. First, sensory information is received by through a system of physiological perceptual receptors (eyes, ears, nose, hands, etc). This information becomes cognitive if and when its truth or validity is recognized by an individual as being consistent with their accepted and established knowledge. The meaning of any such information is determined by the interaction between the individual's value system, attitudes, and images of the world. Based on this information and its meanings, the individual makes decisions expressed overtly as behavior.

Downs (1970) identified three approaches to the study of environmental perception and cognition which have been adapted and modified for use in this case study: geographic, affective, and structural approaches, terms which are not the same as those employed by Downs. The geographic approach to the study of environmental perception and cognition, as applied to our research, addresses community farmers' spatial perceptions of landscapes in relation to

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their land use behavior and expressed in local land classification and soil management practices. Geographic elements of environmental perception and cognition may be understood and analyzed in terms of the landscape "catena", a concept used by soil scientists with reference to "the interlocking soils on a landscape (Wilding et al., 1983)."

Based upon the idea of catena, the Catenary Concept was pioneered in 1936 by Milne in his work on land capability in East Africa, an original aim of which was to develop a practical guide for East African land use (Conacher and Dalrymple, 1977). Since Milne, soil scientists have continued to develop the concept of catena (Bushnell, 1942; Muir, 1962; Wilding et al., 1983). This concept has been applied to local landscape classification in West Africa by at least two field researchers (Ford, 1982; Kintz, 1981) and, in Madagascar, by Blanc-Pamard (1986). The Catenary Concept was used in this dissertation research to elicit farmers' perceptions of soil management and conservation with reference to various landscape positions.

The affective approach to the study of environmental perception and cognition, as applied to this research, addresses farmers' cultural ideals and values that relate to soil management and conservation. The structural approach to the study of environmental perception and cognition, as applied to this dissertation research, addresses farmers' technical knowledge base, access to technical knowledge, and community learning processes. In this case study, structural elements such as access to technology, political power relationships, learning processes and institutions, and the social organization for soil management and conservation are examined.

Ashby (1985) observed that the soil management decisions made by farmers are based in part upon their perceptions of the value of different soil types and the processes affecting soil fertility. In addition, the adoption of soil

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conservation techniques is believed by Ashby (1982) and others (Firey, 1984; Mbithi and Kayongo-Male, 1978) to be influenced by land tenure, economics, access to information, personal experience, other peoples' opinions, historical factors, security and sufficiency concerns, and farmers' personal perceptions and attitudes about relations between people and the environment.

For this dissertation research, an attempt is made to proceed from the "ground up" in order to understand the general and specific issues related to soil management and conservation in Tahira and Bussura. The foundation for this research is the knowledge and perceptions that farmers in these villages already possess. This approach to the development of agricultural extension education and program planning curricula is a potential policy option.

Various hypotheses related to the development of such culture-based curricula can be examined with reference to scholarly literature and field work. One hypothesis is that culture-based curricula for agricultural extension education at the farm level will create a learning environment that facilitates knowledge succession, the process by which new knowledge is built upon accepted knowledge and concepts (Bransford and McCarrell, 1974; Freire, 1973). This learning process would be appropriate whether applied to farmers learning about what research and extension have to offer, or to the training of researchers and agricultural extension educators who learn how farmers operate in their agricultural environment. Agricultural development planners can also benefit from this learning approach by formulating their strategies in a planning environment that, in word and deed, explicitly regards farmers' perspectives and opinions as paramount.

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Application of the theoretical framework

Several definitions of culture and the theories and concepts that support a culture-based approach to curriculum development in agricultural extension education have been reviewed. These theories and concepts represent the framework upon which this dissertation research was structured and guided. This framework holds that how people perceive the world around them reflects their culture and that, in order to share information for educational purposes, people of different cultures should try to understand each other's world view.

The achievement of mutual understandings between culturally dissimilar actors in agricultural development requires a genuine intention to accomplish this objective on the part of all actors and a structured orientation to this end. The harboring of genuine intentions is the responsibility of both individuals and institutions. To achieve the objective of cross-cultural understanding for the purpose of agricultural development, using the methodology employed in this research, those individuals who establish agricultural policy would have to concur that environmental perception research has a role in agricultural development. It would also be encouraging if environmental perception research was used, in some form, by agricultural extension educators who participate in farm-level agricultural development. To this regard, information intended to encourage agricultural extension educators to take their cues from farmers, then plan and act accordingly, is provided in this manuscript.

With respect to the relationship between agricultural extension educators and farmers, the initiative in developing mutual understanding should be taken by agricultural extension educators, one role for whom is to understand the needs of farmers and act as their representatives in the agro-political structure of a nation or region. The verity and validity of this role is likely influenced by

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the extent to which farmers identify agricultural extension educators as representing farmers' interests. The development of empathic relationships between farmers and agricultural extension educators is critical to an accurate understanding of farmers' interests by agricultural extension educators. Moreover, the seminal roots of empathic relationships between farmers and agricultural extension educators can be developed in extension educator training programs, given the appropriate learning curriculum.

It may be suggested that the methodology employed in this research, based upon the theoretical framework outlined above, is applicable to agricultural extension educator training programs in Guinea and elsewhere. The methodology might also be useful to culture-based community programs in youth development, adult literacy education, or agricultural research and demonstration. Envisioned, above all, is a core training activity for prospective agricultural extension educators by which the methodology of this research is utilized, scaled to training objectives and expected outcomes, in short-term, village-level "field experiences" for agricultural extension educators.

In this dissertation, an attempt is made to illustrate the nature of the information, knowledge, and perspective sought by agricultural extension educators who would undertake a purposeful field experience. The goal of such a field experience would be an enhanced understanding by agricultural extension educators of farmers' perceptions of their agricultural environment. It is hoped that such an understanding on the part of agricultural extension educators would improve their capacity to develop constructive, empathic relationships with the farmers they represent and serve through the mutual exchange of cultural and agricultural information. It is also hoped that culture-based curricula for use in agricultural extension education programs would offer a sense of ownership to farmers who participate in such programs.

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RESEARCH METHODOLOGY

The ethnographic case study

Given the objectives of this research, it was decided that a case study of a specific watershed in Fuuta Jalon would be the most appropriate point of departure. In determining to use the case study method for this research, the opinions of Stake (undated) were considered valuable. Stake notes that, in a case study, researchers attempt to look for relationships between observable behavior that fit, contradict, or have no relation to a multiple working hypothesis. This approach allows for very close examination of the parts that make up the bounded system being studied. The choice of what to observe is based upon research objectives without disrupting the unity of the bounded system. That is, observations are made on the system without fragmenting the system. The whole system, and not just parts of the system, are considered. The case itself, rather than a population of cases, becomes the research focus. Generalization, though perhaps valid, may not be at all germane to the purpose of the study. The research goal is to understand a particular case, in order to identify critical links in the dynamic parameters of the whole system.

Stake observes that the question of whether or not the case under examination is representative of a population of cases is not critical. That is, the reseearch objective is not always to generalize. As for this research in Tahira and Bussura, the objective may be to gain a concrete perspective on an issue that may, in fact, be all too commonly generalized. For example, there are many experts who claim that Fuuta Jalon farmers give no thought to soil conservation or that their soil management strategies are archaic.

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Even if it were true that prudent soil management and conservation strategies by Fuuta Jalon farmers are the exception rather than the rule, deviant behavior is sometimes studied in an attempt to gain an enriched perspective on what is considered normal. Sometimes, as in the case of this dissertation research, the research objective may be simply to point to how an enhanced understanding of a particular whole system may be developed. Moreover, whether or not the chosen case is typical of Fuuta Jalon does not devalue the suggestion that the methodological tools employed in this case study may better equip agricultural extension educators to consider certain factors, perceptions, and unquantifiable limitations that could influence the goals and objectives of agricultural development in Fuuta Jalon.

The multiple working hypothesis during the field work in Tahira and Bussura was that the soil management and conservation strategies of farmers in these villages involve more than just agronomic elements. On a daily basis over twelve months, using participant observation and semi-structured interviews, and supported by archival research and other documentation, the hypothesis that agronomic, economic, social, religious, political, historic, and aesthetic factors interact to color the perceptions of soil management and conservation by Tahira and Bussura farmers was tested.

Because an investment in time was made for this research (24 hours per day for 12 months), we were able to study and understand the Tahira and Bussura farming system as a whole system in which the agronomic factors are not isolated from the social factors, nor the social from the historic, nor the historic from the religious, and so forth. The intention was not to generalize the research results over the entire Fuuta Jalon. Any such generalization would not be grounded in the most pivotal element of a farming system, the people who farm. Rather, it was thought that certain key elements related to farmers' cultural

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and agricultural world would emerge from the data over the course of the field work in Tahira and Bussura. As expected, due to the methodology employed, twenty prevalent cultural and agricultural domains with respect to soil management and conservation in Tahira and Bussura were identified. These cultural and agricultural domains, presented in RESULTS AND DISCUSSION as "soil management domains", do not represent the definitive structure of soil conservation and management as perceived by Tahira and Bussura farmers. Rather, these domains should be thought of as benchmarks on the mental maps of Tahira and Bussura farmers with regard to their soil management and conservation strategies.

The research methodology chosen for this field work was oriented to the twin issue of soil management and conservation, a converse of the central problem of soil erosion. The methodology was also oriented to the potential role for education, training, and information exchange in soil conservation and management activities. It will be suggested how the research data can be used in curriculum development for agricultural extension education.

The field work results do not merely reflect the data which were gathered for this dissertation because, as researchers, we were also able to learn a great deal about how farmers in Tahira and Bussura view their agricultural world. This educational benefit is an important by-product of the case study method. Stake believes that executors of the case study should benefit from a "cognitive experience" in addition to the sometimes mechanistic process of data collection. This benefit can be valuable to agricultural extension educators who would replicate the methodology of this case study in a scaled down manner as part of their pre-service or in-service training program. This experience would better enable the extension educators to "think like farmers" or, at least, to think differently from how they thought prior to the experience.

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As Stake suggests, the learning experience that results from use of the case study method is "naturalistic", based on experience within the system one is learning about, rather than "scientific", which is based on empirical experimentation and induction. As agricultural extension education professionals, we should decide how extension educators ought to think[7]. Should our way of thinking scientific or naturalistic, or a balance of the two orientations? The case study method offers prospective extension educators an opportunity to exercise new "ways of thinking" in the process of learning about farming systems and about the farmers they represent and with whom they exchange information.

During the field work in Tahira and Bussura, the opinions and perspectives of a wide spectrum of informants about certain issues were frequently sought. This procedure, observes Stake, has some of the effects of replication. Just the same, throughout our field work we maintained the position that every opinion and point of view was valid, no matter how odd or how much of an outlier it might seem to be. As Stake implied, the question should be asked, "For what end is the research valid?" If the *raison d'être* of the research is education, then no odd opinion is unimportant. Much to the contrary, unconventional wisdom is useful for provoking discussion in a learning environment. Unconventional wisdom can be an element of the cognitive dissonance that educators call upon in moving toward a "learning moment[8]".

Simply because agricultural extension educators may be surprised by what farmers articulate should not be reason enough to discount the value of these opinions. Rather, agricultural extension educators should rejoice upon hearing unorthodox opinions which, after all, represent new information.

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At a meeting with a group of agricultural extension workers with whom we discussed the results of the field work, we were surprised by a response to one question asked of those in attendance, "What do you think the phrase taking care of the land means to Tahira and Bussura farmers?" The extension workers were assured that there were no right or wrong answers to this question, only opinions. The first extension worker to reply said, "We can't tell you what the farmers think about taking care of the land, but we can tell you what we think about it." This observation, seconded by other extension workers in attendance, underscores the problematic issue of agricultural extension educators' knowledge of farmers' perspectives.

As for the "ethnographic" in ethnographic case study, Wolcott (undated) observed that this term can refer to a research process or a research product. It is a "picture of a way of life of some group of people" (Wolcott, undated). By this research methodology, the researcher is the primary research tool. Nevertheless, an ethnography also relies upon a "multi-instrument approach" using, in the case of this dissertation research, participant observation, interviews, and documentation. According to the principles of ethnographic methodology, as much time is allowed for data analysis and interpretation as is used for data collection.

The ethnographic research approach, wrote Wolcott, is applicable to the development of detailed subject descriptions and enhanced understandings of existing conditions or situations. As such, the method is not always useful for formulating policy quickly. In the long run, however, after other supporting studies founded upon ethnographic research have been completed, long-term policies can result from basic, ethnographic research. Ethnographic research can also indicate what areas of future research would be useful for solving a particular problem. In the case of this dissertation research, that problem would

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Like the case study *per se*, ethnographic research methods seek an "understanding of the particular as an example of the several", noted Wolcott. In theory, the classes of issues and events that emerge from an ethnographic study may be easily understood due to a thorough examination of a particular case. As Dobbert (1982) suggested, an ethnographer looks for and explains patterns of behavior that constitute social structure as well as patterns that are part of the cognitive or conceptual repertoire of the society being studied. More simply, ethnographers attempt to understand a situation from the point of view of the participants, as attempted and realized in Tahira and Bussura.

Field work methods

A guiding principle of social science research stipulates that data should be interpreted and analyzed within the context and socio-cultural framework of the community investigated (Leiter, 1980). This principle holds that a community's social realities ought to be understood by researchers from the point-of-view of community members (Leiter, 1980). This dissertation research uses that principle to understand the socio-agronomic realities of soil management and conservation in Tahira and Bussura as reflected in the environmental perceptions of farmers in these villages. The information obtained from this research can be used as the basis for a community sourcebook on soil management and conservation.

To develop the framework for this sourcebook, we passed a total of 240 days and nights in Tahira and Bussura over a period of twelve months, from April, 1988 to April, 1989. In addition, a total of three months were spent in either

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Labe, 40 kilometers southwest of the study site, or Conakry, the capital of Guinea. Prior to our arrival in Guinea, archival research was conducted in Dakar, Senegal, for a total of two months. This archival research continued in Conakry and Labe, prior to, during, and following on-site field work.

We selected a study site based upon a number of criteria including, evidence of or potential for natural and accelerated soil erosion processes at the site; topographic diversity in the natural landscape; a community population of 300 to 500 people; existence of a local agri-pastoral economy (crop and animal husbandry); community understanding, acceptance, and approval of the research; and that the study site should not be located near a paved road, unless paved roads were the rule rather than the exception. We also wanted to conduct our study within a sub-watershed of the Gambia River basin, due to potential cooperation with Belgian agronomists in the region.

After an initial two weeks in Conakry discussing research plans and meeting with administrative authorities, we took a five-day reconnaissance trip to Labe, situated some 400 kilometers northeast of Conakry by road. In the dry season, in a private car, this trip is a grueling 12 hours on potholed roads. In the rainy season using public transport, the voyage is commonly 24 hours long. The pocked pavement essentially ends at Labe[9], and forays into the countryside beyond Labe are tedious, dangerous, and tiring, despite the very beautiful mountainous landscape.

During this reconnaissance trip to Labe, we were introduced to regional and local administrative officials. At each office visit, the research objectives were explained and input and suggestions were elicited from officials as to how to

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best proceed with the field work. We then returned to Conakry for additional archival research and preparation for installation at some field site.

During the time in Conakry, topographic maps were used as a tool to narrow our potential study sites to two or three choices. General areas that were, by and of themselves, small-scale but entire watersheds within the larger Gambian River basin were identified. Three potential study sites were pre-selected, the choices largely based upon available topographic data. Each of the three sites were located within the Koubia *préfecture*, which does not include the city of Labe, but does include much of the Gambia River basin.

Upon our return to Labe, one of the sites was rejected early in continued discussion with government administrative officials because it was planned as the target of an in-coming rural development project. A second site was rejected upon the advice of the Koubia *préfet*[10], who singled out the abnormally low population density in that particular area as a rational for not working at that site. It was then decided that should the third potential site meet our site selection criteria, we would look no more for sites but attempt to begin the field work. One reason for this decision was the dearth of available topographic maps. Another reason was the difficulty of mobility in the Gambia River basin terrain, making travel both time-consuming and exhausting.

Fortunately, the third study site was the best geo-physical example of a small-scale watershed among the three potential study sites. This watershed, about 16 km^2 in area, corresponds more or less to an administrative unit, the *district* of Dara Pelli. The watershed includes two streams, the Taybatawol and the Bussurawol, which have their sources in the upper slopes. On the distant plain of the watershed the streams converge to join the Gambia River.

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Two meetings were scheduled with the community leaders of Dara Pelli district. The first of these meetings took place on a Saturday market day in Pilimini, the center of the *sous-préfecture* in which Dara Pelli district is located. Here, we discussed the research agenda with the Secretary of Economics and Finance (and acting president) of Dara Pelli district, a resident of Tahira. Also present at the meeting was an elder from Bussura, along with several other elders from various hamlets in Dara Pelli district. It was the two villages of Tahira and Bussura which we had tentatively targeted prior to this meeting as possible study sites after reviewing the most recent census figures. In addition to having the right sized population, the village of Tahira was located at a mid-slope landscape position while Bussura was situated near the slope bottom. We hypothesized that some aspects of land use might be particular to the farmers of each respective village. In light of the mutual proximity of the two villages (1 - 2 km), differences in land use or environmental perceptions between Tahira and Bussura farmers would merit further investigation.

Following the discussion of our research agenda and objectives with community leaders at the Saturday market, we were invited to Tahira the following Wednesday. On that Wednesday, a considerable number of Dara Pelli residents, men and women, were on hand to participate in the meeting. In attendance were mainly people from Tahira and Bussura in addition to notables from surrounding villages. In the same manner as repeated prior to each of 104 interviews that would be conducted over the next 12 months, we explained to local residents that we were based at universities and that we had come to the watershed to learn. We further explained that our interest was not only how farmers in Fuuta Jalon farm but what these farmers thought about farming. The reason for this sort of inquiry, it was explained, was that non-farmers in Guinea and elsewhere do not understand enough about what Fuuta Jalon farmers <u>think</u>

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about farming. It was reasoned that such an understanding might be helpful for moving farming ahead in Fuuta Jalon and elsewhere. It was also noted that our intention was to ultimately publish this information in four languages (English, French, Pular, Arabic).

As it turned out, the decision by Tahira and Bussura authorities about whether to invite us to spend the year in Tahira and Bussura had already been taken soon after the previous meeting, four days earlier, at the Saturday market. Likewise, by the time of the second meeting with local officials, our sole criterion to be met was that the community understand, accept, and approve of the research. We determined this to be the case judging by the comments of Dara Pelli residents and discussion at the village meeting.

During our initial three months in Dara Pelli district, we concentrated on participant observation, making daily notes of life and activities in the villages of Tahira and Bussura and allowing the members of each community to become comfortable with our presence. We went frequently to the fields during this time, for it was the period of cutting and clearing fields for the initial year of a two to three year cropping cycle. In addition, we prepared a set of questions for what would be a first round of interviews. From an initial set of 16 possible questions, we pared the number to 12 questions. It is important to remember that we were recomposing the questions in neither English nor in French, as had been done in the research proposal, but in Pular. This process involves more than direct translation, for some of the concepts presented in English or French do not readily translate into Pular. Examples of such difficult-to-translate concepts are soil conservation, land improvement, soil fertility, soil erosion[11], land owner, and land value.

[11]The concept of soil erosion (i l u g o l l e y d i) is synonymous with *soil surface runoff*. Only once, well into the field work, did someone in Tahira or Bussura refer to the notion of soil

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The core set of questions (in English and Pular) are as follows:

1. How does "good land" differ from "poor land"? (Ko honno leydi bonndi e leydi moyyundi serti?)

2. What does "taking care of the land" mean to you? (Ko hondun dankitagol leydi ndiŋ firani oŋ?)

3. What does "ruining the land" mean to you? (Ko hondun aybingol leydi ndiŋ firani oŋ?)

4. What does "improving the land" mean to you? (Ko hondun wurnitugol leydi ndiŋ firani oŋ?)

5. What does "soil erosion" mean to you? (Ko hondun ilugol leydi ndiŋ firani oŋ?)

6. What does "land owner" mean to you? (Ko hondun joom leydi ndiŋ firani oŋ?).

These six questions may be thought of as "semantic-based", which implies that specific "technical terms" are presented to respondents who are asked to explain what the term "means" according to his or her understanding. The phrase "mean to you" as used in the questions above is derived from the verb firude ("to signify"). We most often preceded each interview question with the phrase "in your opinion", which translates easily and very well into Pular as "e miijo moŋ" (lit. "with your thought"). By using these two phrases in posing our interview questions, our intention was to communicate the idea to respondents that their perceptions and viewpoints were the most important aspect of our work.

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movement or slippage *per se*, in using the verb juurude (to disperse). This person, a young boy, in fact, said that when hillsides are cultivated from the top downward, as opposed to beginning at the bottom of the slope, the soil tends to move down the hill. When we tried to employ this term as a way to express soil erosion, respondents indicated that the term made little sense. In any case, perhaps a better reason for why farmers begin at the bottom of the slope when tilling and seeding in one operation is that it's easier to cover the seed with soil and provide better soil-seed contact as they move up the slope during planting.

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The next six questions (presented below) of the core twelve were not "semantic-based" in the same sense as the previous six (We retained the same ordering of questions for all 64 interviews conducted in the first round). Although we continued to frequently use the phrase "in your opinion" to precede these questions, the questions were not hinged upon a critical concept or word. Rather, we were attempting to elicit general to specific information about socio-economic aspects of soil management and conservation. It should be noted here that, during the interviews, each of the 12 core questions were always followed by five to seven questions on average which, as much as possible, were related to the preceding responses. Quite frequently, an additional question was asked in order to cross-check new information acquired from a previous interview.

7. What makes taking care of farmland difficult for you? (Ko hoɗuŋ sattani oŋ telemma ka dankitagol leydi remeteendi?)

8. What would make farming easier for you? (Ko honno hoyiranayno oŋ telemma ka demal ngal?)

9. What makes farmland valuable? (Ko hoɗuŋ tiidinta leydi remeteendi?)

10. What does Islam counsel with respect to taking care of farmland? (Ko hoɗuŋ diina lislam yamiri telemma ka dankitagol leydi remeteendi?)

11. Do your farming techniques and your parents farming techniques differ? (Telemma ka demal ngal, pehe moɗoŋ and pehe mawɓe moŋ no serti?)

12. How do people learn to farm? (Ko honno tagaaɓe ɓeŋ beydora gandal telemma ka demal ngal?)

These twelve questions were tested prior to their use. We first tested the questions with the help of a local politico-religious leader in the neighboring

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village of Dara Pelli, simply to find out if the questions made any sense at all. Some, though few, aspects of the questions were modified as a result of this trial. We considered further testing of the questions in another, neighboring hamlet, but decided instead to ask the residents of Tahira and Bussura to form two expert committees of three people each, one committee of men and one committee of women, to test the questions "in-house". Meeting separately with each of these four committees, we explained very carefully and precisely that, over the next three months, we would be interviewing people one-by-one and asking the questions presented above. We asked the committee members to help us to ensure that the questions were clearly understandable and that we were not committing any *faux pas* in asking any of the questions.

These meetings with the four committees (two per village) were conducted using a "quasi-interview" format, meaning that notes on the discussion were taken. The principal intent of the note-taking was to verify that the responses represented peoples' perceptions of soil management and conservation. The quasi-interviews were also an opportunity to compare our note-taking among ourselves. Moreover, we were able to identify which questions were likely to draw numerous replies and which were difficult to answer.

It was originally thought that 100 people should be interviewed, 50 men and 50 women. After nearly 40 interviews were completed, it was apparent that some of the information obtained was fairly predictable, although new information was continually received. After a total of 40 interviews were completed, a goal of 80 interviews was set. But, when 64 interviews were completed (16 men and 16 women from Tahira, and 16 men and 16 women from Bussura), we interviewed no more people. At that point, responses included little or no new information and considerable data had been verified. Above all, the interviews were halted because we had developed a very good

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For all respondents, notes were taken during their interview after asking permission from them to do so. No tape recorders were used. Each interview lasted approximately 90 to 120 minutes and all interviews were conducted in peoples' homes. After each interview, the responses were reviewed to clarify our collective understanding of what the respondent had communicated. After about ten interviews, we began to feel quite confident of our interviewing techniques and became more comfortable with each succeeding interview.

In reviewing each interview, in order to direct and organize our thinking, the interview responses were coded in terms of the seven cultural factors previously mentioned: agronomic, economic, social, religious, political, historical, and aesthetic. By "code" is meant that a factor was assigned to each complete thought expressed in response to the interview question. Agronomic, for example, was assigned to responses that referred to such things as farm equipment, soil fertility, rainfall, seeds, surface runoff and erosion, trees, and the like. Economic was assigned to issues related to money, markets, availability of labor, credit, and so forth. Social referred to health and health care, education, relations with one's neighbors, community solidarity, and the like. Religious referred to issues associated with Islam as well as with animism and sorcery. Political referred to government policy and programs, for the most part. Historical was assigned to responses that referred to past events. Aesthetic was reserved for responses that addressed the arts and appreciation of nature. Responses were thus given a score that reflected, in a very rudimentary way, their cultural nature. Each factor counted "one" point. Often, a response was comprised of a combination of several factors. Examples of this coding system are as follows.

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In response to the question, "What does improving the land mean to you?" a woman from Bussura said, "If you plant trees (you improve the land) because if you want fruit at any time, you can pick it. Thus, you can help people and, at the same time, help the land live". We coded this response as Agronomic-Economic-Social because it referred to planting trees (agronomic), to supply-and-demand (economic), and to human relations (social). As another example, in response to the question, "What does soil erosion mean to you?" a man from Bussura replied, "In the past, Alla made this problem even worse than it is today. But, as Alla has now reduced the rainfall, he has also reduced the erosion and, thus, erosion and runoff have not been seen in awhile". This response was coded Historic-Religious-Agronomic because it refers to the past (historic), to Alla (religious), and to the rains (agronomic).

We used this scoring system only as a means to orient our thinking with regard to the type of data being collected. We refused to use the resultant "scores" as an indicator of which factors were more important than the others, for two reasons. One, the questions themselves were biased in favor of one factor over another. The obvious example of this bias is the question that asks what Islam counsels farmers about taking care of the land although, in fact, every question had its own bias, whether agronomic, economic, social, historical, or political, or a combination of these biases[12]. Two, this coding system is externally imposed and restricts the characterization of interview responses to pre-conceptualized categories without allowing the responses space enough to emerge as or into their own categories. Moreover, we found that there were too many "gray areas" with respect to the seven factors and the real nature of the responses. In addition, we found ourselves at times reading

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After about 40 interviews it was felt that this coding system could be abandoned and that we should concentrate instead upon categories that emerged naturally from the responses. We continued this exercise until all 64 interviews were completed simply as a matter of course. However, we did not use the coding system in the second set of interviews, opting instead to discuss among ourselves the responses in terms of their apparent nature.

Because we determined the coding system to be less than appropriate to our purposes, in RESULTS AND DISCUSSION the interview data are not presented entirely in terms of the seven cultural factors, although these factors are discussed as soil management domains. Nor are the data discussed as answers to each of the questions and scenarios. Instead, responses are discussed across all inquiries in terms of the respondent-grounded themes that emerged from the interviews.

The second set of interviews was comprised of four scenarios, two of which addressed the basic human needs of food and water, and two of which addressed two mechanisms commonly believed by experts to catalyze agricultural development, experimentation and credit. For these interviews, we decided to interview 40 farmers, 20 men and 20 women (10 men each from Tahira and Bussura, 10 women each from Tahira and Bussura). Some of these farmers (18) had been interviewed during the initial set of interviews and some (32) had not, depending upon their availability. The four scenarios that we presented are as follows, in English (The translations into Pular were not standardized, but the essential scenario was consistently presented.):

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1. Suppose that you notice streams and sources drying up, becoming more muddy than is normally the case. What do you think would be the reason for this phenomenon and what might be done to change the situation?

2. Suppose that you notice the crop yields begin to decrease over a period of five years or more. What do you think would be the reason for this phenomenon and what might be done to change the situation?

3. Suppose that someone with money decided to give you, as a gift, enough money, like 50,000 GF[13] (about 100 dollars) to do what you would like to do with regard to agricultural experimentation on seeds, weeds, fertilizers, plows, animals, trees, and the like. The only condition would be that the money must be used for farming. With what would you like to experiment?

4. Suppose that someone with money made 50,000 GF (about 100 dollars) available to farmers as a loan, with two conditions. One, the loan had to be applied to the improvement of farming. Two, no reimbursement whatsoever would be necessary until after the second cropping system. If you accepted such a loan, for what would you use the money?

Both rounds of semi-structured interviews are the central information sources for this research, complemented by participant observation and discussions with farmers. These two interview rounds were followed by a demographic survey of Tahira and Bussura residents.

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[13]GF means Guinean Francs. At the time, one dollar was about equal to 500 to 600 GF.

Meetings of field work

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Meetings of field work closure with the farmers of Tahira and Bussura

For the final phase of the research, a series of four meetings were held with Tahira and Bussura residents to share the results of the interviews (at least as well as could be synthesized at that point) and to elicit suggestions from them as to how the research might be put to use. The four meetings consisted of one meeting with the men of Tahira, one with the women of Tahira, one with the men of Bussura, and one with the women of Bussura.

Our input to each meeting began with a reiteration of our purpose which was, in brief, to understand what the farmers of Tahira and Bussura know and think about soil management and conservation. The synthesized results of the interviews were shared with those who attended the meeting, question by question. We asked those in attendance two questions: First, what is their general opinion of the interview results? Second, how might the information provided by the interview respondents be useful when compiled in book form (i.e., this dissertation or a subsequent work).

As for discussion beyond responses to these seminal inquiries, we were quite careful to not pose leading questions but were, instead, aware of asking questions which grew directly from the observations of those people attending the meetings. Prior to the meetings, we had envisioned a scenario by which all the people of Tahira and Bussura would consider the research results interesting enough to decide to use them to develop an agricultural extension education program in the villages. Of course, this scenario was ideal and was not allowed to to dictate the orientation of our questioning.

Brief summaries of the four meetings are presented in RESULTS AND DISCUSSION. These meetings were barometers to gauge the potential utility of the research methods employed in the field work. This genre of meetings

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held with local people to share and discuss information received from them should be, without question, obligatory for any research agenda at the village level. It is regrettable that only four of these meetings were held because they were truly informative and, for the most part, quite encouraging with regard to the prospects for agricultural extension education in Tahira and Bussura.

Analysis of data

To reiterate the field work procedure, during a ten-month period in 1988 and 1989, a total of 104 interviews of farmers in Tahira and Bussura were conducted, 52 interviews with men and 52 interviews with women. This includes first-round interviews of 64 farmers (32 men and 32 women) followed by second-round interviews of 40 farmers (20 men and 20 women)[14]. From these 104 interviews, nearly 3300 units of information on farmers' perceptions of soil management and conservation were obtained.

For practical reasons in analyzing the interview data, these units of information are called references. This term was chosen because each unit of information represents a respondent's reference, in their responses, to a topical theme such as trees and grasses, human relations and resources, or religion and spirituality, for example. Each reference represents a complete idea as expressed by a respondent in his or her reply to an interview question, regardless of whether or not the reply directly addressed the question. Two examples of references are provided below.

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[14]Of the 40 farmers interviewed in the second round, 18 had also been interviewed in the first round. In all, 86 different adult farmers were interviewed at least once, 44 women and 42 men, or about 60% of the adult population in Tahira and Bussura. Eight women and ten men were interviewed twice, one time per interview round. However, only 12 adult men in the two villages were not interviewed at all while 51 adult women were not interviewed at all.

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In response to the question, "What does taking care of the land mean to you?", one person replied, "If we plant fruit trees we are taking care of the land. Whatever we grow we take care of." This person continued, "When we plant fruit trees it's not only for the person who plants them because it's not only that person who eats the fruit." The first part of this reply (underlined) is called a reference because it refers to and encapsulates a complete idea. The second part of this reply (not underlined) is considered to be a second reference because it too refers to and encapsulates a complete idea, though different from the first idea.

As another example, in response to the question, "How do people learn to take care of the land?", one person replied, "If you are a farming novice and want to learn how to farm, you can call together a group of people and they'll show you what to do. The rest is up to your own intelligence. A lot depends on your courage, too. If you want to learn to sow seed, you try it and the group will try it and we'll compare how the seeds spread out over the soil." This complete idea is one reference. The person continued, "Someone can bring techniques from other places and people will ask about them and then see themselves if it's a good thing or not." This complete idea (underlined) is a second reference.

We separately analyzed the responses to each of the twelve, first-round interview questions as well as the responses to each of four, second-round scenarios. In this analysis, references were grouped into thematic response categories, depending upon the nature of the responses. Some examples of responses categories include human relations and resources, trees and grasses, religion and spirituality, landscape and topography, fire and burning, tradition and habit, crop rotation and fallow, knowledge and study, weeds and weeding, and machinery and equipment.

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Some response categories are represented in nearly all 16 interview questions / scenarios (twelve first-round questions and four second-round scenarios). Some categories are represented in only two or three of the questions / scenarios. When the appropriate categories for each reference for all interviews and scenarios were determined, the categories and their references were pooled and sorted across all questions and scenarios.

With thousands of references organized into the appropriate thematic categories, it becomes easier for cultural outsiders to Tahira and Bussura to understand Tahira and Bussura farmers' individual and collective perceptions of soil management and conservation. After considerable study, review, and editing, we are able to present a comprehensive, composite overview of how farmers of Tahira and Bussura perceive soil management and conservation .

The purpose of this research was not, for example, to count the farmers who think that trees and grasses are more important than manure and mulch, nor count those who feel that labor is a greater constraint to soil conservation than agronomic knowledge. Issues like these do emerge from the reading. Rather, our objective was to offer readers a perspective on the multi-faceted issues that affect how and what farmers think about soil management and conservation. When cultural outsiders such as literate agricultural extension workers, urban-based development experts, or university researchers understand the factors that color farmers' world views, then communication and rapport between and among these parties may be improved.

In the section that follows, RESULTS AND DISCUSSION, the observations garnered from interviews and interactions with Tahira and Bussura farmers, supplemented by observations made over a period of twelve months at the study site, are presented. The perceptions of soil management and

conservation by these farmers were assigned to one of twenty response categories, called soil management domains, listed below.

These soil management domains represent themes that emerged from farmers' responses to 16 interview questions, as described above. The soil management domains were not pre-selected. Instead, each individual response given to us by each of 104 interviewees (18 of whom were interviewed in each interview round) was carefully studied to determine the nature of that response. The soil management domains, in this sense, are inherent in the responses themselves. Responses of a similar inherent nature were grouped together to comprise one of the domains listed below.

Due to our methodology, each datum obtained from the interview responses is truly grounded in the community because each response represents an authentic perception of soil management and conservation as articulated by a community member. The resultant soil management domains are given below and examined further in RESULTS AND DISCUSSION:

Human relations and resources	Fire and burning
Leaves and fertilizers	Tradition and habit
Work and labor	Wild and domestic fauna
Trees and grasses	Crop rotation and fallow
Religion and spiritualism	Crop production and harvest
Soil properties and utilization	Seeds and sowing
Rain and water	Knowledge and study
Landscape and topography	Health and survival
Tillage and cultivation	Weeds and weeding
Money and markets	Machinery and equipment

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DESCRIPTION OF THE STUDY SITE

Cultural and physical geography

The Republic of Guinea is located on the western coast of Africa, north of Sierra Leone and south of Senegal and Guinea-Bissau[15] (Appendix B). Guinea is about equal in land area to the state of Oregon[16] in the United States (U.S. State Department, 1985a). However, the population of Oregon is about 2.6 million people (Rand McNally, 1985) while Guinea's population is about 5.7 million people (U.S. State Department, 1985a), including the 1.6 million people who live in the Fuuta Jalon region[17]. The population growth rate in Guinea is estimated at 2 - 2.5% (Heermans and Williams, 1988).

Islam is the principal religion in Guinea, claimed by 75-85% of the people (U.S. State Department, 1985a,b). In the Fuuta Jalon region, virtually 100% of the population is Muslim. There are at least 16 differentiated ethnic groups in all of Guinea (Van Chi-Bonnardel, 1973). The most numerous of these groups are the Manding, who include the Susu, the Malinke, and the Sarakoole people, a total of approximately 1,500,000 people. The Manding speak Mande, a term comprising the distinct dialects spoken by these distinct ethnic groups. Along with the Fulbe people, who inhabit the Fuuta Jalon highlands and speak Pular, the Manding account for 65% of the total population of Guinea (Van Chi-Bonnardel, 1973). There are some 25 African languages or dialects in Guinea. French is the official administrative language but the rate of literacy in the

[15]This places Guinea between 7 degrees, 30 minutes and 12 degrees, 30 minutes north latitude, and 8 degrees and 15 degrees west longitude (Diallo et al., 1987).

[16]The land area of Guinea is 246,048 sq. kilometers, or approximately 95,000 sq. miles (U.S. State Dept., 1985a).

[17]This population figure, taken from a 1982 national census, is more than doubled from 750,000 people in 1943 (Heermans and Williams, 1988).

French language among Guinean people has been estimated at 35% (Van Chi-Bonnardel, 1973) or less (Rand McNally, 1985).

The Guinean government has designated four geographic regions within the nation (U.S. State Department, 1985b). These are 1) the western coastal strip, about 50 miles wide, known as Maritime Guinea; 2) the southeastern tropical rain forest, or Forested Guinea; 3) the eastern savanna, or Upper Guinea; and 4) the Fuuta Jalon highlands, known as Middle Guinea, with an average altitude of 1000 meters. As of 1983, the population of Middle Guinea was 1,595,007 (at 29.0 people per km^2), or 28% of Guinea's total population and 27% of its rural population (Ministère du Développement Rural, 1986).

In Middle Guinea, or Fuuta Jalon, three basic geomorphological divisions are found (Diallo et al., 1985): the central plateau (600-1500 meters); the intermountain zones (300-600 m); and the plains and foothills. The study site for this dissertation research was located in the central plateau. This zone is located between 10°10" N and 12°30" N latitude. The entire area of the Fuuta Jalon region is about 56,000 km^2 (Gupta, 1987), or approximately 20% of the total land area of Guinea.

The climate of Fuuta Jalon has been classified as Soudano-Guinean or Guinean-Foutanian, described as a montane sub-climate characterized by intense summer rains and cool to hot drying winds from November to April when rainfall is minimal or absent (Maignien, 1958). According to weather data from 1950 to 1980, an annual total rainfall of 1200 mm to 2000 mm (48 to 80 inches) is the precipitation range of Fuuta Jalon[18]. The rainfall totals generally increase from north to south. Most of the rainfall in the Fuuta Jalon occurs during the period from June through August.

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[18]In comparison, Michigan's annual precipitation is approximately 35 inches, including snowfall.

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For the Labe area, centered approximately 40 kilometers southwest of the study site, the climate is described as sub-humid with a five-month dry season, characterized by an annual average rainfall of 1600-2000 mm (Gupta, 1987). The average annual rainfall in Labe during the period 1931-60 was 1690 mm, as compared to 1723 mm during 1960-69, and 1480 mm during 1970-77 (UNESCO, 1981). Freeman (1987) reported the mean annual rainfall at the Labe airport as 1670 mm, with a standard deviation of 246 mm. At Pita, about 70 kilometers south of Labe, the standard deviation is 327 mm for a average annual total of 1719 mm (Freeman, 1987). Despite adequate rainfall to produce cereals, the ability of the Fuuta Jalon massif to store rainfall is limited by the seasonality of rainfall, the general impermeability of its rocks and lateritic surfaces, and the aridity of its dry season (Freeman, 1987).

At the study site, the villages of Tahira and Bussura, precise rainfall data for 1988 was not available. Total rainfall for the year was around 1600 mm, more or less an average year. As for rainfall distribution throughout the 1988 growing season, an unexpected three-week dry spell in May following corn planting provoked worry on the part of farmers but in June the rains resumed with minimal damage to corn crop development. A second drought period in late September and early October adversely affected some late-planted upland rice. Season-ending rains in October and November were slightly above normal but did not hinder the harvest of the principal cereals.

According to Gupta (1987), the Fuuta Jalon region was probably covered long ago by a dense forest of primarily Parinari excelsa, or kuŋa in Pular. This tree is today considered an indicator of site suitability for growing upland rice in the first year of crop rotation after fallow. Much of the formerly dense forest to which Gupta referred has been cleared for agricultural use. Today, in Fuuta Jalon, barely 1% of the land is classified as forest reserve (Gupta, 1987).

Nevertheless, there reportedly remain over 800 permanent or intermittent natural springs of water in Fuuta Jalon (Gupta, 1987). In addition, a number of major rivers trace their headwaters to the Fuuta Jalon highlands. These rivers include the Senegal, the Niger, the Gambia, the Koliba, the Konkoure, the Koulountou, the Tinkisso, the Kaba, the Lolo, the Mongo, the Kolente, the Fatala, and the Cogon (Gupta, 1987). As for the Gambia River, about 70% of its flow originates in Fuuta Jalon and totals some 12,000 km^2 within Guinea (Freeman, 1987). This total includes Dara Pelli watershed where the study site for this dissertation research was located.

Because so many rivers take their source in Fuuta Jalon, the region is consistently called the water tower (*château d'eau*) of West Africa in virtually all the pertinent literature. This title has made Fuuta Jalon a focal point of discussion on soil erosion and conservation in West Africa in the 20th century.

Richard-Molard (1944) identified three types of parent material found in Fuuta Jalon: ferruginous[19] sandstone, dolerite (igneous basalt), and schist (micaceous metamorphic rock). The soils of Fuuta Jalon have been grouped into five major classes in accordance with the French classification system, as follows (Gupta, 1987): The skeletal soils are those characterized by a surface horizon less than or equal to 10 cm thick over either sandstone, dolerite, or hardened ironstone outcrop or outwash (*cuirasse*). The ferrallitic[20] soils are relatively thick (10-50 cm or deeper) and characterized by an accumulation of iron sesquioxides[21], silica leaching, and diagnostic horizons that are either

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[19]The term "ferruginous" refers to a condition in which silica has been lost from the mineral system, usually by leaching, where kaolinite is the dominant clay, and where base saturation is variable depending upon the climate (Duchaufour, 1983).

[20]Ferrallitic soils are similar to ferruginous soils but altered to a greater degree by climatic factors, namely leaching, such that clay accumulation is not pronounced and base saturation is generally quite low (Duchaufour, 1983).

[21]"Sesqui" indicates one and a half. Thus, the term "sesquioxide" refers to the ratio of oxygen to a metal (1.5 to 1) as for the oxygen versus aluminum or iron in aluminum oxide or iron oxide.

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gravelly, hardened, or mottled. The region's hydromorphic[22] soils are formed over unconsolidated material, often low on the landscape, and include a profile to 50 cm deep that is frequently saturated with moisture. These soils often have three distinct horizons, including a zone of clay accumulation. The alluvial soils of the floodplains consist of stratified sediments deposited at regular intervals. Other soils, called *sols peu évolués* ("soils little evolved") tend to erode because they are found on landscape sites where their parent materials are close to the surface and subject to frequent modification.

Much more important to Fuuta Jalon farmers than the French soil classification system is their own system of soil and landscape classification. Gupta (1987) correctly notes that at least three general types of landscape positions are recognized by farmers in the Fuuta Jalon. These are f e l l o (pl. p e l l e), which are the hill/s or mountain/s; d o ŋ o l, the plateau; and a ŋ n d e, the intermountain plain. Each of these landscape types may include one or more specific soil types or other topographic designation identified by Fuuta Jalon farmers using vernacular terms (Gupta, 1987). A fourth category, b o o ɯ a l (pl. b o o ɯ e), can be included as a landscape position. Gupta (1987) describes the b o o ɯ a l as a rocky, iron-rich outcrop or denuded area on slopes or plateaus having no agricultural use and little value as pasture. Dugain and Fauck (1959) described b o o ɯ a l soils as skeletal with a lateritic[23] crust.

The b o o ɯ a l has long been discussed in the French-language agronomic literature, as has the *cuirasse*, a denuded ironstone outcrop or landscape zone. Maignien (1958), an expert on the process of *cuirassement*, claimed that many

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[22]Hydromorphic soils are those whose genesis is principally determined by water saturated conditions such that oxygen is absent from the system for extended periods thus resulting in the reduction of iron (Duchaufour, 1983). Hydromorphic soils are often found at relatively low landscape positions and can have a fairly high clay content.

[23]The term "lateritic" refers to a hardened landscape condition that formerly consisted of soil material abundant in iron, aluminum, and manganese hydroxides.

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ironstone soil zones are extensions of former agricultural fields or result from the detrimental action of cattle herding on soil landscapes. This hypothesis is debatable. Maignien (1958) also wrote that fire accelerates *cuirassement*, but is not necessarily its cause. In a classic work, Maignien (1958) offers an excellent comprehensive overview of the role of climate, topography, vegetation, parent material, and time on *cuirasse* formation.

The primary soil type on the fello is hansaŋere (pl. kansaŋe), soil that results from the transport of materials originating from hillsides, cliffs, and slippage of upper landscape positions (McGahuey, 1985). Hansaŋere is relatively thick, mobile, light, heterogeneous, and comprised of sandstone or dolerite boulders, gravel, and finer materials (McGahuey, 1985). Dantaari (pl. dantaaje) soils originate from materials that accumulate at the base of slopes, weak inclines, and subhorizontal surfaces (McGahuey, 1985). These soils are ochre, reddish, or grey in color, with a silty appearance yet often containing significant amounts of clay. The hollaande (pl. kollaaɗe) are shallow, clayey soils of plains, often flooded in the rainy season. This soil was absent at the study site but is found within ten kilometers of Dara Pelli district. Dunkiire (pl. dunkiije) soils occur along watercourses. They are light, humid soils, often tree-covered. Parawol (pl. paraaji) is a humic, riverine, clay soil of low areas (Dugain and Fauck, 1959; Richard-Molard, 1944).

The soils of Fuuta Jalon are generally low in phosphorous and potassium. Nitrogen is by and large supplied by organic materials, the result of fallow periods, manure applications, and leaf mulch. Soil acidity (pH < 5.5) or, more accurately, aluminum toxicity due to low pH, is a major inhibiting factor to crop production. This soil condition in the Fuuta Jalon is described very well, in considerable detail, by McGahuey (1985), who discusses the role of organic matter in maintaining the fertility levels of Fuuta Jalon agricultural soils.

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Political administration in Guinea

Since 1986, Guinea has been organized administratively at three levels (Ministère du Développement Rural, 1987). At the local level, the basic political administrative units are *districts* in rural areas and *quartiers* in urban areas. In principle, the *district /quartier* model allows the local population to manage their traditional lifestyle with liberty. In the rural areas, each *district* defines its own geopolitical limits and is administered by a nine-member, elected District Council[24] (Rondot, 1986). Within each *district* there also exists a Council of Sages composed of at least four members whose function is to symbolize the permanence and coherence of the local communities and to offer advice at times of critical decision-making[25] (Rondot, 1986).

In the Guinean political model, several *districts* make up a *communauté* and, in urban centers, a number of *quartiers* comprise a *commune*. This political structure, fairly well established, is intended to complement the existing administrative structure by which a group of *districts* or *quartiers* make up a *sous-préfecture* [26]. In Guinea, there are 345 *sous-préfectures*, including 104 in Middle Guinea (Ministère du Développement Rural, 1987). The villages of Tahira and Bussura are part of the *sous-préfecture* of Pilimini.

The *sous-préfectures* (or *communautés*) are projected to be autonomously financed for purposes of rural development. Each *communauté*, composed of several *districts*, is to be led by a Community Council of representatives from the

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[24]The nine offices are president, vice-president, secretary of economics and finance (i.e. treasurer), secretary of rural development, secretary of rural management, secretary of health and social action, secretary of youth and sports, secretary of security, and secretary of communications. In Dara Pelli district, each of these offices were filled, but two officers were the most active political actors. These were the president, a merchant-farmer from Feto Baya who was away for much of the year conducting business in Dakar, Senegal. The treasurer, more than the president, led Guinean government politics in Dara Pelli district.

[25]In Dara Pelli district, the Council of Sages were mainly composed of local religious leaders.

[26]At present, a *sous-préfecture* and a *communauté* are essentially one and the same.

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various District Councils in the area (Ministère du Développement Rural, 1987). For the most part, the District and Community Councils are at least nominally in place in each Guinean *sous-préfecture*.

At the next level, a number of *sous-préfectures* make up a *préfecture*. The *préfecture* is administered by a *préfet*, the only government representative at this level. There are 36 *préfectures* in Guinea, including 10 in Middle Guinea. For urban or rural development administration, the *préfet* presides over a Prefectoral Development Committee, composed of representatives from each *commune* or *communauté* and other public organizations in the *préfecture*.

A certain number of *préfectures* comprise each of the four geographic regions of Guinea previously noted. Each region is administered by its own Resident Minister who is much like a government cabinet member or governor directly representing the national government.

In summary, the villages of Tahira and Bussura are within the *district* of Dara Pelli, the *sous-préfecture* of Pilimini, and *préfecture* of Koubia, whose administrative center is the town of Koubia. However, Dara Pelli district is closer in distance to the city of Labe, the administrative center of the Labe *préfecture*. Koubia *préfecture* includes 6 *sous-préfectures* and 36 *districts* while Labe *préfecture* includes 13 *sous-préfectures* and 48 districts. Koubia *préfecture* measures 4000 km^2 compared to the 2200 km^2 of Labe *préfecture*. By 1983, the population of Koubia *préfecture* was 98,053 (or 24.5 people per km^2) while the population of Labe *préfecture* was 253,214 (115 people per km^2) (Ministère du Développement Rural, 1987).

The history of Guinea and Fuuta Jalon is epic and cannot be fully honored by a general summary. A sketch of some major historical features of Fuuta Jalon can nevertheless provide context for discussing soil management and conservation in this region. To briefly recap 1000 years, the land that is now

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Guinea was the far reaches of the Ghana, Mali, and Songhay empires during the 10th to 16th centuries (U.S. State Department, 1985a; Van Chi-Bonnardel, 1973). By 1700, elements of an Islamic state were already established in present-day Fuuta Jalon. In the early 18th century, the Islamic j i haad[27] in the Fuuta Jalon began to dominate the Guinean political landscape.

By the middle of the 19th century, the French had developed a significant presence in Guinea, culminating in 1896 with an invasion by French troops of the Fuuta Jalon region which, by that time, had become a bonafide Islamic state. For eleven years prior to this invasion, the territory of Guinea had been subject to *de facto* governance by the French Ministry of Colonies (U.S. State Department, 1985a,b) although not officially until 1893 (Van Chi-Bonnardel, 1973). The rulers of the Fuuta Jalon Islamic state, the Fulbe people, tolerated the French presence until 1906, when they began a failed resistance that lasted into the year 1911. Elsewhere in Guinea at this time, notably in the forest zone and the Koundara region near Senegal, others were fighting French control to little avail (Van Chi-Bonnardel, 1973).

In the early 20th century, all French colonies in West Africa were formed into a Federation, a structure that persisted into the 1950s. Each colony was headed by a lieutenant governor who answered to the Federation's general governor. The colonies were divided into administrative units governed by *commandants* who appointed regional and district African administrators, called *chefs de cercle* and *chefs de canton*, respectively (Derman, 1973). Today, the Guinean administrative structure reflects the French influence in spite of Sekou

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[27] This word is not Pular (as the font would indicate) but Arabic in origin. However, the spelling used in this document reflects the pronunciation of the word in Pular. The first j i haad in Fuuta Jalon began around 1727 (Derman, 1973).

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Touré, a man outspoken against colonialism and cultural imperialism who ushered Guinea to independence during the 1940s and '50s.

For nearly 40 years until his death in 1984, Ahmed Sekou Touré was at or near the forefront of Guinean politics. He helped found the Democratic Party of Guinea (PDG) in 1947. This political organization was an arm of the *Rassemblement Democratique Africaine* (RDA), the main political organizing unit for French West Africans at the time. At that time, Sekou Touré viewed the Marxist analysis of class struggle as appropriate to colonial Africa and he pushed for freedom from European political control. At the same time, colonial reforms placed increasing political responsibility with native-born Guineans, while Guinean labor unions allied with French unions (U.S. State Department, 1985a; Van Chi-Bonnardel, 1973).

In 1950, Sekou Touré was able to garner a significant measure of political power as a leader of one union, the *Confédération Générale de Travailleurs* (Van Chi-Bonnardel, 1973; U.S. State Department, 1985a). By 1952, Touré had become general secretary of the PDG and, in 1955, was elected mayor of Conakry (Van Chi-Bonnardel, 1973).

The turning point in the independence from France movement came in 1957, when the PDG won 59 seats in the French Territorial Assembly, a time when Sekou Touré assumed the vice-presidency of the territorial government of Guinea (Van Chi-Bonnardel, 1973). By late 1958, in a well-publicized development, the pan-Africanist Touré felt powerful enough to reject Guinean membership in the French Community as proposed by Charles DeGaulle for all of France's West African colonies. When decision-time arrived, on September 28, 1958, Guinea became the only French colony to vote "no" to community membership and, in effect, to vote "no" to affiliation with the Fifth French Republic and its constitution.

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On October 2, 1958, Guinea proclaimed itself to be an independent, sovereign Republic. A government by constitutional law was formed on November 12, 1958, rendering the political system of the Republic of Guinea democratic, with a National Assembly and an elected President. Sekou Touré and the Guineans quickly became heroes to a broad spectrum of Africans and to the socialist world at large. Less than twenty years later, many Guineans, including the estimated one million people who fled the Guinea in the 1960s and '70s, most certainly have mixed feelings about the Sekou Touré years.

The Guinean saga, in many ways, is one of a dream gone sour. In addition to its political stance towards France, popular across all of Africa, the young Guinean nation was and is today richly endowed with natural resources, including forests, waters, and minerals. By the end of the 1960s, political freedom in Guinea had withered due in part to political paranoia by Sekou Touré and coupled with economic mismanagement. Slowly but surely, the Sekou Touré regime grew infamous for its political oppression and political prisons (Alata, 1976; Kaké, 1987). Unexpectedly, Sekou Touré died in March, 1984[28]. Guinean government control was assumed by Lansana Conté, the current president. For seven years, President Conté has provided patient leadership in setting the Guinean nation on a course by which human and natural resources can be constructive forces in development. Guinean farmers have been earmarked for a major participatory role. To this end, agricultural extension education has a vital role in Guinea in the 21st century.

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[28]Touré died in Cleveland, Ohio, where he had traveled to seek medical treatment.

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Social structure of Fuuta Jalon

Many scholars have contributed to the literature on social norms and agricultural practices in Fuuta Jalon. Among all scholars, two Guineans, Alfa Ibrahim Sow (1966; 1968) and Tierno Mouhammadou-Samba (1971) are in the forefront with their works on religious history and philosophy in the Fuuta Jalon. Most interestingly, both Sow (1966; 1968) and Mombeya (1971) wrote their works in phonetic Pular as well as in French.

Among other scholars, Ousmane Diallo (1961) discussed the social evolution of the Fulße people with some reference to agriculture. Gilbert Vieillard (1939; 1940), a French administrator in colonial Guinea wrote knowledgeably about culture in Fuuta Jalon. The geographer Richard-Molard (1944) is noted for detailed essays on the geo-physical and socio-economic aspects of life in Fuuta Jalon. Suret-Canale (1970) produced a general but comprehensive socio-geographic reference to Guinean history, beginning with the colonial period from the early 19th century and through the early years of independence in the 1960s. Dupire (1970), in her voluminous work on the social organization of the Fulße people, referred frequently to a specific locale in Fuuta Jalon proximate to the study site of this dissertation research. Two American anthropologists, Derman (1973) and Roberts (1991), studied the political, social, and agricultural economy of village life in Fuuta Jalon.

In Fuuta Jalon, there are four major Fulße families[29]. These are the Jalluuße, whose historic center in Fuuta Jalon is Bodewal, the Dayeeße, historically centered at Dayatu, the Ferooße, who originate in Wanyo, and the Uuruße, from Koyin. Today, the Jalluuße family name is Jallo (Diallo in the

[29]This information is taken from an unpublished, anonymous manuscript provided by a World Bank official who is Guinean.

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French spelling), the Dayeeße are Bari (Barry or Bary in the French), the Ferooße are Sow, and the Uuruße are Ba (Bah) or Balde. All of these family names were represented among residents of Tahira and Bussura.

The first wave of Islamic immigrants to Fuuta Jalon arrived in the region near the end of the 16th century and the beginning of the 17th century. These Islamic immigrants, most of whom were Fulße from present-day Senegal and Mali, came to Fuuta Jalon primarily to find new pasture lands for their cattle rather than as participants in the Fulße-led jihaad. The Fulße found the Jallonke people already inhabiting the region. The Jallonke were animist agriculturalists. Many Jallonke people were later forced by lack of choice to flee their Fuuta Jalon homeland during the jihaad.

The Pulli people, who were animist cattle herders, were also living in Fuuta Jalon when the Islamic Fulße started to immigrate to the region. Like many Islamic Fulße immigrants, the Pulli were cattle herders *par excellence* who had moved into the region around the 15th century or earlier in search of pasture (Dupire, 1970). According to Guebhard (1909), the Pulli and the Fulße probably bought pasture rights on hilltops and meadows from local farmers in exchange for cattle products. It is likely that a mutually beneficial economic relationship developed between the cattle keepers and the Jallonke agriculturalists of Fuuta Jalon, similar to the system that exists throughout West African savanna zones today, whereby milk and manure are exchanged for grain and access to forage and palatable crop residues on farmers' fields.

By 1725, the genuine devotion to Islamic principles by Fulße leaders availed itself as a reason by which they might establish military, economic, and socio-cultural dominance over the Jallonke and Pulli peoples. After 20 or so years of jihaad, when the Fulße victory over the Jallonke and Pulli seemed

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Tekira and Bussura taxes

inevitable[30], Fulɓe leaders established a constitutional confederation that united the nine traditional Fulɓe provinces (diiwal pl. diiwe) in Fuuta Jalon. Derman (1973) summarized the political structure of the Fuuta Jalon Islamic state, noting that the head of the confederation, the Almaami Fuuta, would be based in Timbo; that the Almaami Fuuta and head of Timbo province would be one and the same individual; that only direct descendents of a province head could become province heads; and that each province head was constitutionally equal in political stature to the other province heads.

Derman (1973) and Sow (1968) provide overviews and information on the evolution of the Fulɓe religious aristocracy, founded in the Seriyanke and Seydiyanke families, which were based in Timbo province.

Derman (1973) reviewed the structure of the traditional province at the local level, a structure that persists today in Dara Pelli district in form though not ostensibly in function. As in Dara Pelli district, the traditional religious and political center for a cluster of villages is a selected mosque located in one of the villages (Derman, 1973). The village where this mosque is located is called the misiide (pl. misiddaaji or misiddeeji), an Arabic word similar to the concept of parish center (Mombeya, 1971). In Fuuta Jalon, misiddaaji are commonly situated near upper landscape positions where cattle-owning, Koran-wise Fulɓe originally settled. In Dara Pelli watershed there are two misiddaaji, one each in the villages of Dara Pelli and Taybata[31], both of which are located in upper landscape positions.

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[30]However, guerilla-type warfare continued to be waged against Fulɓe rulers throughout the 18th and 19th centuries by the Jallonke and Pulli resistance after the jihaad was won. Disgruntled Fuuta Jalon religious leaders at times quarreled with each other during these years (Sow, 1966; 1968). Moreover, the French sent their military to Fuuta Jalon near the end of the 19th century to quell Fulɓe resistance to colonialist intentions (Derman, 1973).

[31]Topographically part of the Dara Pelli watershed, the village of Taybata is administratively a part of the *district* of Pilimini, which is also the center of the *sous-préfecture*. Under the Sekou Touré government, the villages of Tahira, Bussura, and Taybata were part of the same political unit. Tahira and Bussura taxes were collected at Taybata, for example. Political practices and certain

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Commonly found at lower landscape positions are villages formerly known as runde (pl. dune), villages whose majority population is made up of servile people (Mombeya, 1971). These villages are situated closer to good farmland as compared to villages near the upper slopes[32]. The runde, a by-product of the jihaad [33], is a social phenomenon discussed at length by Derman (1973), whose early work in Fuuta Jalon focused on serfdom and peasantry[34].

Residents of a runde are rundeeɓe. In the past, some rundeeɓe were Fulɓe serfs referred to as maccuɓe (s. maccudo)[35]. Politely translated, these words mean "serf / s". Use of these terms was strongly discouraged by the Sekou Touré government. In Fuuta Jalon today, the correct way to refer to the idea of maccuɓe is to say huuwooɓe, meaning "workers"[36], in broad terms.

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uses of power by Taybata leaders strained relations between Tahira and Taybata such that the watershed was administratively realigned by mutual consent under the Lansana Conté government. Individual allegiance to the two local misiddaaji with respect to Friday prayers and major feast days is divided among Tahira residents.

[32]That is, so-called runde villages, a term not used in a glib or cavalier manner today in Dara Pelli district, are nearer to streams and riversides, or bottomland, for the most part.

[33]It is generally agreed among scholars that most people of the dune, referred to as rundeeɓe, are non-Fulɓe descendents of former Fulɓe servants and slaves. Apart from the jihaad, the evolution of the master / serf relationship between Fulɓe and non-Fulɓe of Fuuta Jalon, starting from what was likely a mutually beneficial economic relationship of grain and milk exchange, is not entirely clear. Similar relationships between Fulɓe and their non-Fulɓe neighbors developed at about the same time in other parts of West Africa (Derman, 1973, citing several authors), including the Yatenga and Liptako regions of northern Burkina Faso (personal observation). Derman (1973) concluded that serfdom was part of the Fuuta Jalon since at least 1750. Dupire (1970) claims that the institution of serfdom existed in Fuuta Jalon prior to the Fulɓe conquest, and was practiced by both the Jallonke and the Pulli.

[34]One hypothesis for the development of Fulɓe / non-Fulɓe master / serf relations would be that, during the several generations prior to the onset of the 1727 Fulɓe-led jihaad, the combination of Koranic knowledge, Arabic reading and writing skills, and cattle wealth on the part of certain Fulɓe were effective tools of power useful against the spiritually animistic, agriculturalist, autochthonous people. It is generally agreed that the Fulɓe-led jihaad exacerbated established master-serf relationships in that conquered pagans were forced to flee Fuuta Jalon, be killed, or convert to Islam and serve the Fulɓe victors.

[35]My colleagues pointed out that another word, the verb majjude (to lose or to be lost), and majjere (ignorance), may be historically linked to the development of the pejorative terms maccudo (pl. maccuɓe). The pronunciation of maccudo and majjudo (someone "lost" or "ignorant" of knowledge) is similar. Serfs were generally inhibited access to Koranic study.

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For most of the 20th century the French had prohibited the practice of slavery in Guinea even as they forced many Fuuta Jalon inhabitants to harvest latex from wild rubber trees. And, despite the atrocities credited to the Sekou Touré regime, he was an acknowledged vocal champion of equal status for all people, especially for women. Nevertheless, social class stratification persists in Dara Pelli district today[37]. The historic truth of serfdom is a sensitive issue that Tahira and Bussura farmers deal with honestly but guardedly. One elderly man from a former serf family, commenting on the social status and interpersonal relationships of former huuwoobe and "their Fulbe"[38], noted with diplomacy that these people now belong to each other.

It appears, nevertheless, that the socio-political status of members of former serf families remains relatively low. A potentially effective way to redistribute the balance of power in the stratified social structure of Dara Pelli district would perhaps be religious education. Local residents are well aware that knowledge of the Koran is an avenue to power. The juuliirde (place of prayer) at Bussura has recently been refurbished and one of the brightest young Koranic scholars in the district is from Bussura. In fact, a concern of Bussura residents is how to keep this young man in the village to teach Bussura children the Koran, given that his skills are in great demand[39].

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[37]Those scholars interested in a more detailed description and analysis of the important phenomenon of social stratification in Fuuta Jalon are strongly encouraged to read the works of Dupire (1970) and, particularly, Derman (1973), whose 1967 case study in the Poopodara region accurately reflects many socio-agronomic realities that exist today in Dara Pelli district.

[38]The expression "their Fulbe" (Fulbe maabbe), like "my Pullo" (Pullo am), turns the semantic tables on the issue of who owns whom. This expression was heard on several occasions during interviews and informal conversations. It seems to be a rather tongue-in-cheek way to accept and express present and formal realities in a gracious manner. The phrase perhaps demonstrates that former huuwoobe take pride in their freedom as human beings and that they are neither ashamed nor secretive about what happened in the past.

[39]About midway through the field work, the Koranic school teacher in Bussura died in Senegal while on seasonal migration for work. One young man from Bussura informed us his peers were already prepared to offer the bright Koranic student a salary of grain and all his other needs if he

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Social history of Tahira and Bussura

Derman (1973) points out that members of the Kal duyaaße lineage were leaders of the Islamic jihaad in their traditional province of Labe. Thus, it is not surprising that Kal duyaaße were the first Fulße occupants of Dara Pelli watershed, given the watershed's relative proximity to the city of Labe. The leader of these immigrants was a certain Mama Sirey from Daaka, today a neighborhood of Labe. Mama Sirey founded Pelli, located several hundred meters south of Dara Pelli which, at the time, had not been settled.

The founder of Dara Pelli was Modi Abdulay of the Ranaaße lineage who migrated from Bunndu, in eastern Senegal, to the village of Dalen in Fuuta Jalon. From Dalen, Modi Abdulay and his family moved several times in short order, ultimately settling with their huuwooße in Sincu[40], later named Salli Wongo. Modi Abdulay finally relocated his family's residence to an area one or two kilometers north of Salli Wongo, thereby founding the village of Dara Pelli, a stone's throw from Pelli. From available information, the founding of Dara Pelli is estimated as sometime around 1830 - 1850. If these dates are accurate, they coincide with a period of history marked by dissension between several provincial Fulße leaders (Sow, 1968). The approximate year of Mama Sirey's founding of Pelli is difficult to estimate as is the number of years in age difference between Mama Sirey and Modi Abdulay.

The respective arrivals of Mama Sirey and Modi Abdulay occurred during the grand historic period known as the Arsilaamaaku, when Islam was the sole basis for the law of the land. These men chose to settle in Dara Pelli

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would remain in Bussura. The same young man indicated that the bright Koranic student would surely be offered Koranic school teaching positions in Labe as well as in Senegal.

[40]The word Sincu is derived from the verb sincude, meaning "to establish a village (or a grain field, often by clearing trees from the land)".

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watershed because they were looking for uninhabited land (ɯulɑ) to graze their cattle, to farm, and to establish their own authority. To these leaders the watershed was considered to be an isolated refuge (ɯeddi) from which they could see others arriving from long distances. Despite this safeguard against unwelcome intrusion, both Mama Sirey and Modi Abdulay encouraged other people to migrate and settle in Dara Pelli watershed. They divided land between themselves using a trail, today the present road to Dongol Sigon, as the dividing line between their claimed properties. They periodically returned to their former villages to recruit others for settlement in Dara Pelli watershed.

Some people who migrated from Dalen to Dara Pelli watershed, like those who settled in Kuraaji[41], were of the Timbooße lineage, led by Karamoko Ŋalla. People of the Ja'iyaaße lineage settled in Tesin. They had migrated to Dara Pelli watershed from Baleeba, near Dalen. The Baße who settled in 'Bunndu Bume[42] were also from Dalen. Other Baße came from Tunni, near Pita, and settled in Taybata. The Ngeriyaaße who settled in Taybata came from Pooreko, near Labe. The Na'iyaaße, from Poopodara, settled in 'Bunndu Kene[43]. Some Seeliyaaße, led by Modi Kalidu, came from Poopodara and Gada Komba, settling in Tahira. The Kuulunaaße arrived from Burawel, near Labe, to settle in Tahira. The Koteeße came from Bowe and Kote Kinsi, near Gawal and Telimeli, and settled in Tahira[44].

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[41] This word is the plural for the tree kura (Parinari excelsa).

[42] 'Bunndu means "source of water" and Bume is the name for a tree, Vitex cuneata.

[43] 'Bunndu means "source of water" and Kene means "open area".

[44] For complementary information about the social structure of Fuuta Jalon, scholars may refer to the following works: Mombeya (1971) summarized the genealogy of the Jalluuße (Diallo) family. Sow (1968) has described the familial genealogy of the aristocracy, the vassals, and the "simple subjects" of Fuuta Jalon, as well as the chronology of major historical events in the region from 1747 to 1896. Dupire (1970) wrote about patrilineage in the social structure of Fuuta Jalon with reference to her study of the Tarambali-Jonfo ɲaaliide in the traditional province of Labe.

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Our information portrays the history of Tahira as rather uneventful (an unlikely scenario) and the history of Bussura as controversial. The issue of which people were the first residents of Tahira is unclear. Four lineages ultimately settled in Tahira: the Kuulunaaße, the Koteeße, the Seeliyaaße, and the Siidiiße. One information source claimed that Tahira's first occupants were Kuulunaaße. Another informant said the first settlers were Koteeße, who were herders from Kote Kinsi, near Telemeli, led by Samba Kote and Modi Usu Kote. The Koteeße, said this source, were followed by the Kuulunaaße, who were of the Uuruße lineage from Koyin, then by the Seeliyaaße from Poopodara and Gada Komba. The Siidiiße were lawße (woodworkers) invited to settle in Tahira because of their weaving and woodworking skills and in order to increase the population of the village.

It is agreed that the original name of Tahira was Saabere[45]. This name was changed to Tahira when the place of prayer (juulirde) was constructed at the time of Cerno Ugaylu, a Koranic school teacher. Cerno Ugaylu originated from Kampaya, today a quartier of Labe, a place where some Kuulunaaße in Tahira claim heritage. After constructing and consecrating the juulirde at Tahira, Cerno Ugaylu returned to Kampaya and entrusted the teaching of the Koran to a certain Cerno Booyi. The man most learned in the Koran in Dara Pelli watershed at the time of this field work, Cerno Amadu from Taybata, reportedly attended Koranic school in Tahira as a young boy early in this century. Cerno Amadu, now near 90 years old, is acknowledged and celebrated locally as a waliyyu, a word derived directly from Arabic meaning "saint", or "friend of God" (Mombeya, 1971).

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[45]Saabere means "former, abandoned farm" which the hamlet probably was when the first settlers of Tahira moved in. In those days, fallow periods were likely as long as 20 years or more. Thus, the land where present-day Tahira is situated may have been, at the time of its "founding", a formerly cropped field out of grain production and into fallow.

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As for the village of Bussura, it is really a combination of two contiguous settlements, Bussura and Jam Weli[46]. The history of Bussura varies according to the information source. One informant from Dara Pelli reported that the hamlet of Teliire, upslope and to the south of Bussura, was settled by the huuwoo6e of Mama Sirey, the founder of Pelli, at a time when the entire watershed was uninhabited. A second source, from Tahira, informed us that Bussura was a runde and that its first occupants were the huuwoo6e of Modi Booyi, a Kal duyaaj o who had settled in Pelli. According to this source, a number of Bussura rundee6e moved to Teliire across the watershed from Bussura, although this informant could not specify if the move was the actual founding of Teliire or if the move occurred after the founding of Teliire.

In consideration of the events that took place throughout Fuuta Jalon during the 400 years prior to French occupation of the region, the information provided by a third informant, an elder resident of Jam Weli, seems the most reasonable and coherent historical scenario. According to this informant, the hamlet of Teliire was founded over 300 years ago, prior to the establishment of Bussura, well before the onset of the Ful6e-led j ihaad in 1727. Jam Weli, on the other hand, is the result of family expansion in Bussura. Jam Weli[47] (also spelled Jaŋ Wel i) is an original name but the name of Bussura was changed from Conki when the local prayer place (j uu l i rde) was erected during the time of Sekou Touré. The name Conki was given to the village by its original residents, Jallonke people who had migrated to the area from somewhere near Koubia. A conk i is an iron handpick used by blacksmiths, suggesting that the original residents of Bussura (then Conki) may have been blacksmiths[48].

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[46]Henceforth in the document, the name Bussura refers to Bussura and Jam Weli together.
[47]Jam means "peace" and Weli means "pleasant" or "nice" (also, "sweet").
[48]Not far from Bussura is an intermittent stream with a laterite bed. This stream is a traditional local boundary between two areas of the watershed. In the rock-hard streambed can be seen many

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Our third informant also claimed that when the *jihaad* reached Dara Pelli watershed, those Jallonke in Conki who accepted conversion to Islam stayed. Some of the converts moved to Teliire and others remained in Bussura. The rest were routed and chased away. Some fled to "tamba wula", bushland proximate to Tambacounda, Senegal, and some went to the Conakry area[49].

Today, Bussura is composed of two families, named Jallo (Diallo) and Kamara (Camara). The founding father of Bussura was Cerno Samba. He had four wives: Jiba, Binta, Maymuna, and Niimatu. Other important family heads at the time of Cerno Samba were Manga Saajumma and Manga Saatinen. Members of the two main families intermarried over time such that, today, Bussura is said to be one "house" (suudu). People affiliated by family to Bussura also live in Keete and are widespread in northern Fuuta Jalon.

We were informed that in Dara Pelli watershed during the early part of the 20th century the French installed Modi Mamadu Lamiin as the local *chef de canton*. Modi Lamiin was succeeded in power by Ceerno Booyi. Cerno Booyi was succeeded by his son, Modi Usuman, who was also followed by his son, Cerno Sirey, sometime in the 1930s or early 1940s. Cerno Sirey remained the chief political head in Dara Pelli watershed for 30 years. Then, Cerno Ibrahima of Taybata took power at the time of Sekou Touré.

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pockets, uniformly rounded out. When we first observed these pockets, they did not appear to be the result of stream water flow. When we asked several people about the pockets, we were informed that the streambed had been the place where blacksmiths would fire laterite to extract iron for making tools. Now the metals used in tool making are purchased as scrap in the markets. A material commonly used and sold for tool making is recycled material from cars.

[49]A fourth informant, a resident of Bussura, reported that the original inhabitants of the area were not migrating Fulbe but Susu-speaking people. His understanding was that, sometime in history, all of the original inhabitants of Bussura died, though he was not certain how they died. He indicated that these peoples' common origin was a place called Sangalan and that he once found near the river some very thick, old earthenware (payannde) made of fired clay, but much greater in size than the type used today.

The 1987 district

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Table 1. Demograp

Demographic Param	
Total population	
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Households[51]	
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People per househo	
Married men	
Married women[53]	
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Mean age, married	
(men)	
(women)	
Cows[55] per househ	

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The 1987 district census indicated a total population of 1807 people in 214 households of Dara Pelli district. A demographic survey of Tahira and Bussura identified a number of social characteristics for these two villages, shown in Table 1.

Table 1. Demographic characteristics of Tahira and Bussura in 1989.

Demographic Parameter	Tahira	Bussura[50]	Total
Total population	181	132	313
(male)	75	62	137
(female)	106	70	176
Households[51]	40	25	65
Female headed households[52]	8	5	13
People per household	4.5	5.3	4.8
Married men	32	20	52
Married women[53]	49	34	83
(% males married)	42.7	32.3	38.0
(% females married)	46.2	48.6	47.2
Mean age, married adults[54] (yrs)	43.8	39.4	42.0
(men)	51.7	47.7	50.1
(women)	39.1	34.5	37.4
Cows[55] per household	1.6	1.2	1.4

[50]Bussura includes the hamlet of Jam Weli.

[51]One household is: 1) a married couple, with or without children; or 2) a married triple, that is, a man and two spouses, with or without children (There were no cases where more than two wives of a one husband lived in Tahira or Bussura, although the third wives of several local men lived elsewhere.); or 3) an unmarried man or woman over 40 years of age (one case); or 4) an married man or woman whose spouse was elsewhere for more than a year's time.

[52]For both Tahira and Bussura, 20% of households were headed by women.

[53]In addition, there were seven widows in Tahira and five widows in Bussura.

[54]Includes one unmarried, head of household adult male from Tahira.

[55]This refers only to cows able to reproduce.

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The low number of people per household may reflect the migration of young men from Tahira and Bussura to urban and rural areas in eastern and coastal Guinea, Ivory Coast, Senegal, Liberia, and Sierra Leone. Men not present in Tahira or Bussura during the period of the demographic survey (February, 1989) but who had been present at some time during the 1988 cropping season were included in the survey totals. The percentage of the population of Tahira and Bussura aged 15 years or less was 47.0% (48.1% in Tahira and 45.5% in Bussura). Thirteen men[56] and no women, or 9.6% of the married adult population in Tahira and Bussura, claimed to have a working knowledge of reading and writing Arabic at some fundamental level[57].

Only one person, a veteran of World War II in France, was apparently able to read French with a measure of proficiency. This man was also the Koranic school teacher in Tahira. There were no young children from Tahira or Bussura enrolled at the elementary school in Dara Pelli during the period of field work. From Tahira, one young man was in high school in Labe preparing to take his entrance exam for the university. Another young man was in Conakry preparing to enter the university in the fall of 1989. There were no young women from Tahira in high school or the university. Nor were there any young men or women from Bussura in high school or at the university.

Though neither Tahira nor Bussura appear to have a great tradition of education, the neighboring hamlet of Taybata is noted for its educational prowess, led by the *wali yyu*, Cerno Amadu. In addition, Taybata's arable land is commonly perceived as the watershed's most productive farmland[58].

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[56] Nine (9) from Tahira and four (4) from Bussura.

[57] In Tahira, there were more young girls than young boys in Koranic school in early 1989. Some married women studied the Koran as young girls but did not continue to practice their writing skills.

[58] One reason for this, we were told, is that Taybata farmers possess a large amount of land relative to their population and are therefore able to utilize longer fallow periods.

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There is abundant literature in English and French on the agricultural system of the Fuuta Jalon region, including works by Richard-Molard (1944), Suret-Canale (1970), McGahuey (1985), Freeman (1987), Gupta (1987), and Derman (1973). These works are accurate with respect to the agricultural production system as practiced today in Dara Pelli district, minor exceptions notwithstanding. The paragraphs of this section describe, in general terms, the agricultural system as observed in Tahira and Bussura during 1988-89.

Freeman (1987; citing Cueto and Khouma, 1986) noted that some 27,000 hectares of agricultural land in Fuuta Jalon have moderate to severe crop production limitations. Freeman (1987) further reported that 82% of lands in the upper portion of the Gambia River Basin, within which Dara Pelli district is located, are technically classified as non-agricultural. Many of these lands are farmed or grazed regardless of their suitability classification.

Cultivated land per capita in Fuuta Jalon has been estimated at 0.16 to 0.37 (Freeman, 1987). The Guinean *Ministère du Développement Rural* (1986) established a standard mean of 0.25 cultivated hectares per person in Fuuta Jalon and a standard average farm size of 1.51 hectares for a family of five[59]. This report notes that, on average, 41% of family farmland in Fuuta Jalon is cropped to a small-grained cereal called f o ñ e (Digitaria exilis) and 16% is cropped to corn. According to the National Division of Research on Agro-Ecology in Guinea, for every hectare of land cultivated in Fuuta Jalon, about three-quarters hectare of land are in fallow (Diallo, undated).

[59]According to Heermans and Williams (1988), demographic data for Fuuta Jalon suggests that, over the past three decades, agricultural lands per capita may have declined even as the population size has increased.

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In Dara Pelli district are two major types of cropland, ngesa (pl. gese) and suntuure (pl. cuntuuji)[60], and two minor types, naako (pl. naakooji) and sardin[61]. The ngesa and the suntuure can be separated from each other by a fence, called a hoggo, or be distant from each other. A household's naako and sardin are often located on the same parcel of land.

The naako is managed primarily by women. Tomatoes (tomaati), onions (basalle), and occasionally cabbage (su[62]) are planted there. Many women buy onion sets on credit from market sources and repay with harvested bulbs.

The sardin is used principally for fruit trees such as banana (banaan), orange (lemmune), mango (mango), avocado (piyaa), papaya (buudii), and lime (kacce). Fruit trees, particularly orange trees but mangoes, papaya, and, occasionally, cola (goro) trees as well, can be seen found in and near the compounds and courtyards of peoples' houses. The sardin is managed by men for the most part, though the women market its fruit. A major weed pest in the sardin is Imperata cylindrica (sooje). To control this rhizomatous weed, farmers deep till (50 centimeters down) with a long-bladed hoe (keri eppi) to sever the rhizomes as much as possible, then search for grasses and leaves for mulch to cover the weeds so they do not resprout. This land can then be planted to bananas, among other crops, which thrive under a mulch system. We were told that, to control sooje, farmers have two options available: mulch heavily or weed constantly.

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[60]Boulet and Talineau (1986; cited by Heermans and Williams,1988) point out that the human population of Fuuta Jalon seems to have increased in recent years, with ancillary increases in household sizes. However, the average size of a suntuure appears to have remained constant while the average size of a ngesa has declined. A 1986 survey of 37 Fuuta Jalon households found the average household size to be about 9 people, the average suntuure size to be 0.5 hectares per household, and the average ngesa cultivated per household to be another 0.5 hectares (Heermans and Williams, 1988).

[61]From the French word for garden, *jardin*.

[62]From the French word for cabbage, *chou*.

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Ngesa land is found on the fello, hansaŋere, doŋol, or dantaari[63] landscape positions discussed earlier in this chapter. Ngesa land can be called soppuuru (pl. coppi), land cut and cleared land for the first year of the cropping cycle, or fakkere (pl. pakkeeji), land in the second or third year of the cropping cycle or land in fallow. There are four principal crops commonly planted on ngesa land. These are foñe, upland rice (maaro), peanuts (tiga pl. tigaaje), and sorghum (bahe). Sesame (bene) is also intercropped with the common ngesa crops. Ngesa land is worked primarily by men and boys with substantial help from women for weeding and harvesting.

On suntuure (pl. cuntuuji)[64] land are grown corn (kaaba), taro (jaabeere), sweet potatoes (putee), manioc (bantara), hot red pepper (ñamaku), peanuts (tiga pl. tigaaje), cotton (hotollo), and cowpeas (ñeɓɓe). Various plant species for making sauces, including leaf amaranth (boro boro), are also planted. The suntuure is primarily worked by women and children. Men do help open seed pockets at planting, and they harvest.

In Tahira and Bussura, a first-time observer could develop the impression that suntuure land is located next to the family dwellings. More accurately, homes are situated within the borders of the suntuure. The entire ensemble of several cuntuuji, enclosed by a single, contiguous fence, is called the hoggo (pl. kolle)[65], also the term for the single, contiguous fence itself. This fence is constructed mainly of wood cut from the nearby forest. Interspersed among the

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[63] Dantaari can refer both to soil type or landscape position.

[64] According to Heermans and Williams (1988), the superimposition of 1979 aerial photos of the Fuuta Jalon over 1952 photos indicates that the most significant land use change in the region in nearly 30 years is an increase in suntuure lands today in areas of higher population. The photos also indicate that little forest area has been cleared to increase the available agricultural land during this time period.

[65] This mixture of terms is not as confusing in conversation as it might at first appear to be. For example, when referring to the hoggo as the ensemble of cuntuuji within which people's houses are situated, a person will say "ka hoggo", which means "at / within the hoggo".

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wood uprights, which stand about chest high, are live trees (i.e. fence posts), usually the tree named k i i d i (Jatropha curcas). Other fences transect the hoggo, often delineating the cuntuuj i of different households[66].

Ngesa land is surrounded by a fence which, like the fence surrounding the cuntuuj i, is built to inhibit animal movement into the cropping area. But, the fence around ngesa land is temporary, maintained only for as long as ngesa land is in production, generally two to three years on the f e l l o and five to seven years or more on dantaari land. While the hoggo protecting the cuntuuj i is well-maintained on an annual basis, ngesa fences are left to negligence and termites after their period of use.

Needless to say, a considerable amount of wood is used as ngesa fencing material, then left to rot as fallow begins. The use of live fence posts for ngesa lands is seen as impractical by most farmers because of the labor required to construct the fence coupled with the need to maintain the fence when the field rests in fallow. In addition, during the cropping-fallow cycle, the borders of ngesa lands are dynamic, not fixed, and dependent upon available farm labor in a given year, soil fertility, site suitability for specific crops on the landscape, and individual and group decisions by farmers as to which lands will be placed in production at the start of a new cropping cycle.

Figures 1 and 2 (Petersen, 1991) on the following pages illustrate ngesa and suntuure cropland in Tahira. Figure 3 (Petersen, 1991) shows a close view of a fence separating suntuure land from fallowed land in Tahira[67].

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[66]It is our understanding that the Sekou Touré government discouraged the presence of fences within the hoggo, reasoning that these fences tend to divide people by lineage or other criteria. Thus, we were told, there once were more interior fences in Tahira and Bussura than are presently found. Some interior fences remain, such as one that marks the boundary between the cuntuuj i of the See l iyaaBe, Kot eeBe, and Kuu l unaaBe families of Tahira.

[67]Note in Figure 3 that the larger diameter, upright fence supports are living trees (Jatropha curcas, or k i i d i).

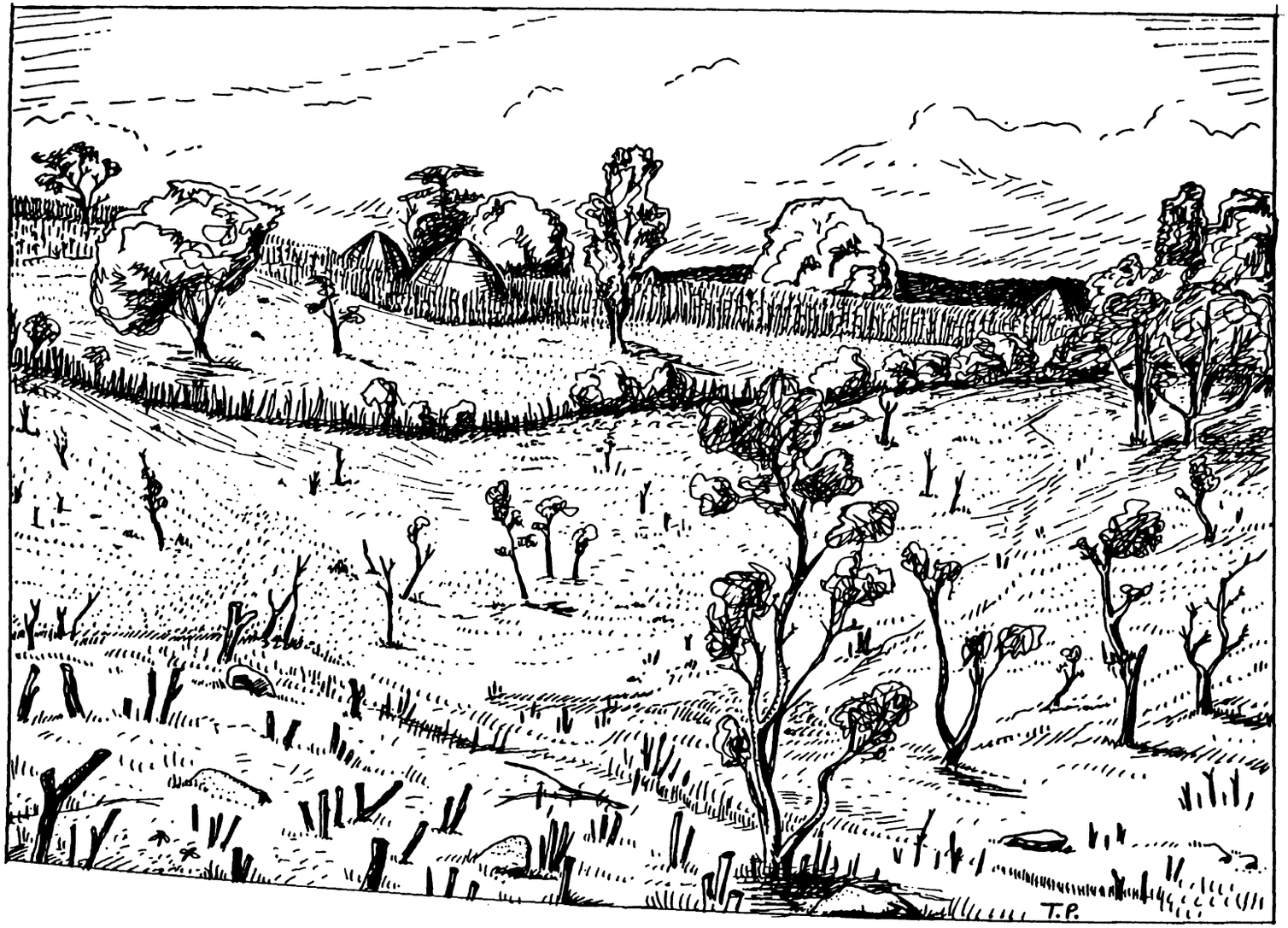

Figure 1. Ngesa land (foreground) and suntuure land (background) separated by a fence (mid-figure, left to right).

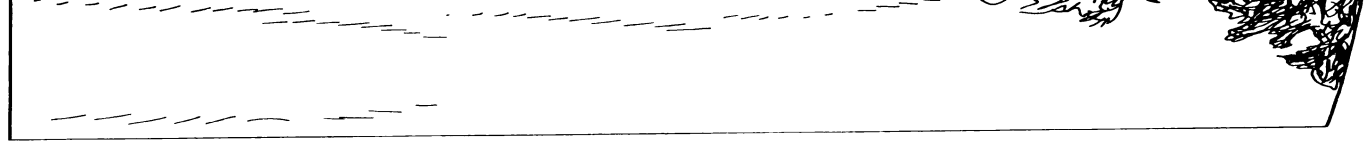

Figure 2. Suntuure land at mid-slope in Tahira.

Figure 3. Close-u

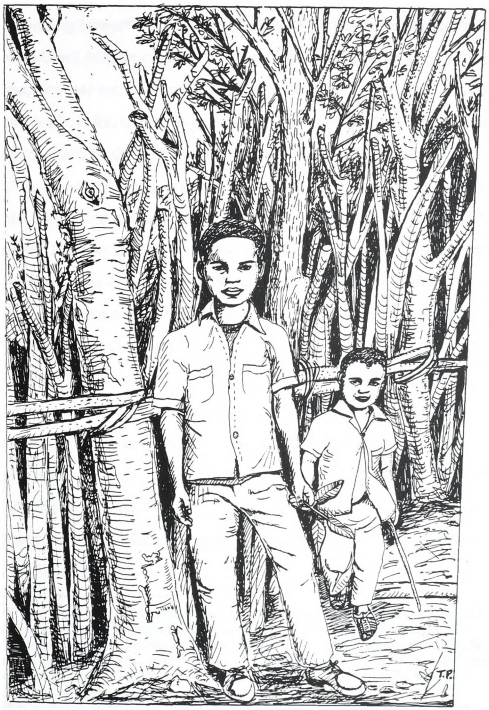

Figure 3. Close-up view of a fence surrounding a corn field in Tahira.

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The year-to-year cultivation of corn in the suntuure, without benefit of a fallow period, is made possible by annual mulching with leaves cut from the surrounding forest[68]. This practice, though perhaps not unique to Fuuta Jalon among West African cropping systems, is nevertheless a technological adaptation *par excellence* to very harsh growing conditions -- steep slopes, stony acidic soils, and heavy rainfall. The practice of mulching is known as foyuŋ, which is also the name given to the leaf mulch itself[69].

The suntuure has long intrigued scholars who have studied and written about agriculture in Fuuta Jalon. The origin of the practice in West Africa is not certain. Derman (1973) wrote that the suntuure has become a critical source of food in Fuuta Jalon since 1900, at least. In Tahira and Bussura, judging from our observations and inquiries, the suntuure may have increased in importance over the years[70].

In general, dantaari soils have the most potential among all ngesa lands for crop production. These soils are usually found on weak slopes, lower on the landscape catena, and are less rocky and more fertile as compared to fello or hansaŋere soils. On dantaari land, some farmers till the soil as deeply as the blade of their hoe permits (10 - 15 cm or so), then leave the weeds and soil exposed to the sun for eight days before sowing. This period of eight days is called lammingol[71].

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[68]We understand that, in some parts of Fuuta Jalon, particularly where trees are scarce, this practice of mulching is discouraged by Waters and Forests Service personnel.

[69]Farmers will sometimes refer to the mulch itself simply as haako, which is both the singular and general plural word for "leaves" (kaakeeji is a specific plural form of haako). Farmers will also employ the verb suddaade (to cover or to hide) when referring to the practice of mulching the suntuure with tree leaves.

[70]For example, in Tahira, cuntuuji have now been established on the outer edge of the hoggo (i.e., the hoggo has been expanded) on very steep slopes, up to 100% (45°).

[71]Lammingol literally means "making sour". One may wonder why the verb welnugol ("sweetening") is not employed to identify this agricultural practice. In the U.S., to "sweeten a soil" generally means to raise its pH slightly through the addition of lime, that is, to make soil less acidic and more basic. In Fuuta Jalon, where soils are generally quite acidic (pH 4.5 to 5.0), it would seem that the last thing a farmer would want to do is to make a soil acidic, or "sour" (by our

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Plows are sought by farmers who cultivate dantaari land but are not readily available in the watershed. Some plows can be found in nearby districts, relics of the marginally successful agricultural training and extension programs of Sekou Touré. Relic plows are now sold or rented by foresighted individuals who managed to confiscate the equipment when the government programs folded or fizzled out[72]. In 1988, we observed only one farmer using a plow to cultivate dunkiire bottomland, doing so on a one-day rental basis.

For most Tahira and some Bussura farmers, the 1988 growing season on fello and hansanere land was the first year of a two to three year cropping sequence on the cut, cleared, and burned areas removed from fallow[73]. In 1988, two distinct areas of perhaps 10 to 15 hectares were cut out of the forest surrounding the villages. Each of these two major cropping areas, both of which were fenced, contained the contiguous fields of seven to ten farmers. The fields of Tahira and Bussura farmers who cleared and planted land that was rented were scattered in other areas of the watershed, primarily on land belonging to Taybata residents. In the 1988 growing season, upland rice, foñe,

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definition of "sour soils", that is). Interestingly, the phrase "no lamai" means "is salty" and saline soils have relatively high pH, although this is probably not the correct explanation for use of the term "lammingol". In Dara Pelli district, the reason for the practice of allowing time for cultivated weeds to decompose is probably to encourage the mineralization of nitrogen in the roots and leaves of the cultivated weeds so that the nitrogen can be used by the crop. As Sanchez (1976) explained, when organic materials decompose, nitrogen mineralization occurs and organic carbon levels in humus increase. The humus provides most of the cation exchange capacity for acidic soils and forms complexes with aluminum and iron oxides. This renders phosphorous fixation by oxides more difficult and makes phosphorous more available for plant growth. This process, as well as direct additions of phosphates to the soil, are what is known for tropical soils as "liming with phosphorous". This would better explain the use of the term "lammingol". While this explanation does not solve this cross-cultural, linguistic discrepancy, it does show once again that interpretations of U.S. and tropical farming systems issues contrast significantly in both cultural and agricultural terms.

[72]Plows are widely perceived by Tahira and Bussura farmers as a potential boost to crop yields. Nevertheless, on the dantaari, said one farmer from Tahira, where the birgaad (BMP; a government program) once cultivated with tractors, it is possible today to see the area of the land that was not cultivated with tractors. In the non-tractor area grow grasses. That land, we were told, yields more grain today as compared to the tractor worked area.

[73]Different farmers gave us different responses as to the length of fallow for these lands, ranging from five to twelve years. Our estimate, based on a synthesis of information from several sources, is that this land was in a nine-year or ten-year fallow.

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peanuts, sorghum, and sesame were cropped together on these freshly cut lands. In 1989, rice was to be dropped from the system and replaced by an increased area cropped to foñe. The same cropping scheme used in 1989 would have been followed in 1990 should a third year of crops have been planted on ngesa land cut and cleared in 1988.

Among Tahira farmers, in 1988, the Kuu lunaaße and Kot eeße families cut and cleared a contiguous area of hansaŋere land on the Tahira side of the Taybata river, along with one Bussura farmer and his sons who rented land in this area belonging to a family from Taybata. The See l iyaaße families from Tahira also cut and cleared forest fallow in 1988 to plant rice, peanuts, and foñe. The ngesa lands of the See l iyaaße, mainly hansaŋere, were not contiguous with those cut and cleared by the Kot eeße and Kuu l unaaße families. As for the S i i di i ße families in Tahira, some of these farmers were obliged to rent ngesa land in 1988 because their fallow lands were not ready to be cut and cleared. Other S i i di i ße, and one family of Dayeeße, had access to their own dantaari land. As for Bussura farmers, their cultivated land in 1988 was primarily dantaari cropped to foñe although several Bussura farmers also rented hansaŋere and fe l l o land.

In the management of ngesa land, the building of fences and the length of fallow periods are integrally related. On sloping soils referred to as fe l l o or doŋo l or hansaŋere, for example, a fallow period of less than seven years is generally not adequate in terms of regenerating soil fertility[74]. A longer fallow period would be preferable to farmers. Those farmers with greater access to land have more options as to how long certain ngesa land could be left in fallow. However, due to the labor required to build fences around ngesa land to

[74]Derman (1973) reported fallow periods of 10 to 12 years duration in the Poopodara region in the mid-1960s.

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control the movement of domestic animals, namely cattle, most farmers in Tahira and Bussura find it necessary or convenient to coordinate between themselves the year in which specific fallow lands will be cut and cleared for cultivation. The fact that burning is used as a land clearing practice compels most farmers to consolidate their ngesa lands and burn together. For this reason, as noted above, ngesa lands belonging to Tahira farmers are not discrete units, each with its own fence, but border each other, with the entire set of fields encircled by a fence of considerable perimeter.

Naturally, this form of field management gives rise to socio-agronomic conflicts when, for example, one farmer is tardy in building or repairing his segment of the fence, or when five out of eight farmers prefer to cultivate a particular tract of land for only two years, while the other three farmers want to try a third year of cropping from that land. When situations such as these arise, farmers in Tahira often invoke the principle of jokkere endam, which literally means "follow-up or continuity of breast milk", but refers to community solidarity. The concept of jokkere endam may well be the fundamental cornerstone of social philosophy for Tahira and Bussura residents.

In Dara Pelli district, in 1988, when several tracts of land were removed from fallow and made into ngesa lands, the work to remove trees from the land began in early March, about two months prior to the onset of the rainy season. First, small trees were removed with a short-handled, curved-blade cutting tool called the himpaare. A well-made, well-sharpened himpaare will fell trees as thick in diameter as the fat end of a baseball bat after four to seven blows. Most woody material to be cleared can be felled with two to four strikes from the himpaare. The himpaare and other common agricultural tools are illustrated in Figure 4 (Petersen, 1991) on the following page.

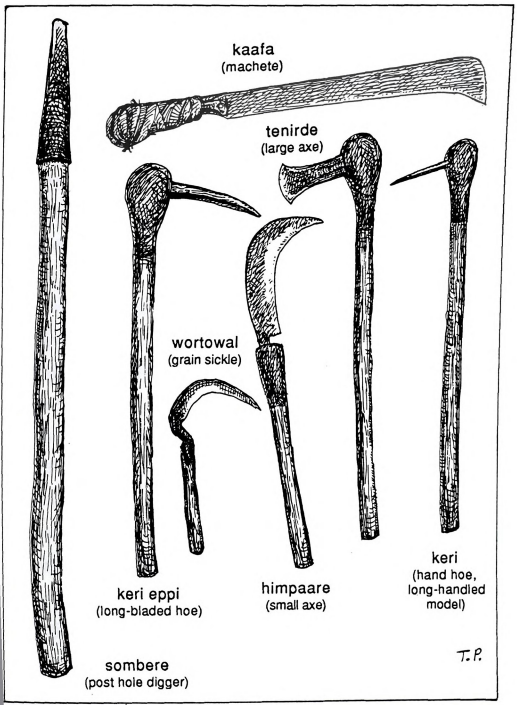

Figure 4. Agricultural tools commonly used in Tahira and Bussura.

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Upon cutting and clearing the forest, many but not all Tahira and Bussura farmers who cultivate the steeper hillsides systematically lay down medium diameter felled trees (those the size of baseball bats), perpendicular to the slope. The cut trunks and branches arranged in this way along the slopes are known as g i r i n j i, illustrated in Figures 5 and 6 (Petersen, 1991) below.

Tree trunks and branches not arranged as g i r i n j i are collected in the fields for burning. After small and medium diameter trees are felled, Tahira and Bussura farmers prune (pollard) the branches of trees with larger trunk diameters. Very few larger trees (those a foot or so in diameter) were felled entirely in Tahira and Bussura in 1988. When this did occur, the farmers who felled these trees assured us that the trees would resprout from their bases as the rainy season progressed. For the most part, the trees did resprout[75].

When Tahira and Bussura farmers cut and clear trees, they dig fire lines around the fields in preparation for burning the debris. Then, fence-building begins as they wait for the right time to burn. In 1988, burning took place on May 16th, following several rains. A comprehensive overview and discussion of field burning is presented in RESULTS AND DISCUSSION.

Worthy of note are the observations of Sanchez (1976) who suggests that the intensity of a burn on cleared land in the tropics is a major variable in the burn's effect on the soil's physical and chemical properties. Sanchez (1976), considered an expert on tropical soils and farming systems, notes that soil pH increases after burning and decreases gradually with time because of the leaching of bases. These basic cations (calcium, magnesium, and potassium) comprise a portion of the chemical constituency of ash and are responsible for increases in the soil's cation exchange capacity.

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[75]A study of potential interest might be to monitor individual trees that do resprout after clearing.

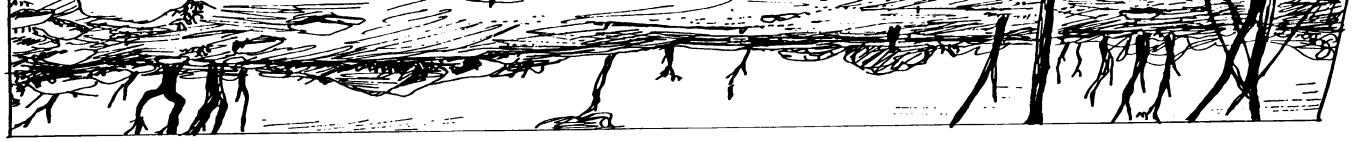

Figure 5. Girinji placed strategically on a sloping field of upland rice.

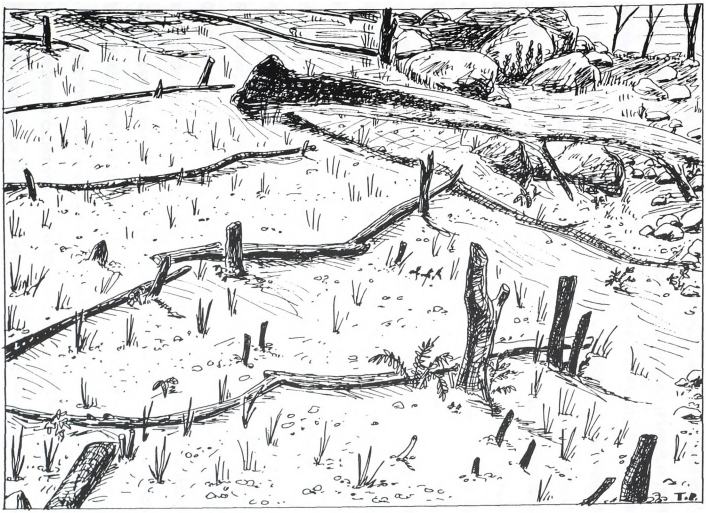

Figure 6. Close-up view of g i r i n j i and young upland rice plants.

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Sanchez (1976) cites research showing that the effect of burning on an Ultisol, the soil taxonomic order within which many Fuuta Jalon soils would be included, diminishes aluminum saturation considerably. Aluminum saturation is the soil chemical property that is largely responsible for low levels of soil fertility in Fuuta Jalon soils (McGahuey, 1985). Sanchez (1976) also noted that burning volatilizes most of the carbon, sulfur, and nitrogen present in plant vegetation, but has little effect on soil organic matter. Finally, Sanchez (1976) points to several studies which indicate that the available phosphorous level of a soil increases upon clearing and burning because of the phosphorous content in the ash. Burning is also quite helpful for eliminating weed seeds and insect and fungal pathogens that lay periodically dormant on both ngesa and suntuure land. This positive aspect of burning is often overlooked by those who comment on the agricultural practices of cash-poor farmers.

In 1988, during the period from March through May when the men of Tahira and Bussura were preparing their gese lands, the women of these villages were well into their field work in the cuntuuji. While men have a few months between harvest (October-December) and field preparation (March-May) to complete other tasks such as fence repair or house building, women's work in the cuntuuji is virtually year-round. This is due to the number and variety of crops grown in a suntuure. Derman (1973) provides an excellent description and analysis of the suntuure in the village of Hollande, near Poopodara. Richard-Molard's work (1944) is also valuable for understanding the very important role of the suntuure in Fuuta Jalon food production.

Land intended to be a suntuure is cleared and may be left idle for two to three years before cultivation. If the land is not left idle after clearing, peanuts will likely be planted for one or two years, followed by taro and manioc. Mulch and manure will be applied annually following the peanuts and, by the fourth

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year, the soil should be ready for corn production. This rotation is also used to revive a suntuure that has fallen into disuse. In Tahira, foñe was sown in an idled suntuure by one woman to suppress grasses and broadleaved weeds.

In Tahira and Bussura, the months of January and February mark the most active period of taro harvest, although some taro will have already been harvested as needed for family consumption. There are two types of taro, or jaabeere, in Dara Pelli district, jaabeere fuuta and jaabeere goba (more simply, goba), distinguished by tuber size and leaf shape[76]. In the past, there was apparently less taro in the Fuuta Jalon cuntuuji as compared to the present situation, but taro increased in popularity in the early part of this century when it was the only crop to resist a series of locust invasions.

We were also told by a Tahira farmer that, at some point in time, farmers discovered that the action of digging up taro helps the corn crop utilize soil water and also helps to mix ñolu into the soil. One woman from Tahira explained that, in the past, farmers would unearth the taro during the hot, dry season (ceedu) and spread it out in the sun to dry until the rains arrived. Otherwise, it was believed, the taro would rot. Farmers later discovered that taro wouldn't rot if not sun-dried, we were told, and so they no longer use this procedure, thus reducing their labor. But, the branches (caldi) of jaabeere goba are cut into pieces the size of a flashlight battery and laid in the sun to dry, becoming kare, which is grated and boiled to eat as needed.

Manioc, or bantara, is harvested late in the dry season, in the very hot months of March and April, ten to twelve weeks prior to the onset of the rainy season. One reason for this late harvest, noted Derman (1973), is that manioc does not store well unless dried. Another reason is that the growth cycle of

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[76]Derman (1973) also reported differences between the varieties as to whether the main tuber or its branches are planted or consumed. We found these differences to vary by farmer.

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manioc is 18 months, which means that manioc planted in September will be ready to unearth in March, one year and six months afterwards.

Corn is the first cereal crop to be planted in the rainy season and the first to be harvested. It is sown three to four kernels per pocket, each pocket about 75 cm apart. Virtually everyone plants corn on the same days. In 1988, it took two days to complete corn planting in Tahira, beginning on April 30th, though several women required three days. This suntuure task is one to which men contribute, opening seed pockets ahead of the women planting the corn.

There are four (dent) corn varieties planted in Dara Pelli district: kaaba dane (white corn), a common 95-105 day variety; kaaba bode (red corn), a long-season, 120 day variety, less commonly planted; kaaba jansiŋe, a short-season, 85-90 day variety not commonly planted; and kaaba suŋala, a multi-colored kernel variety that is not usually sown, being considered a mutant that has inconsistent yields when planted. Corn seed is selected on the basis of ear size, grain fill, and grain quality.

Some women planting corn in Tahira placed a twig from a parasitic plant (sotto) in with the corn seed in their seed holders. The women claimed that the sotto would improve their yields. We were told that the twigs were a "remedy for little things" (lekki piihoyi), which could mean anything from a seed fungicide or insecticide to a talisman against evil spirits[77].

A suntuure of corn with taro is considered better than corn with sweet potatoes (putee) because sweet potatoes compete fairly vigorously with corn for soil moisture. Neither taro nor corn coexist well with weeds. At corn harvest in August, when the ears are husked, the husks are spread around the surface

[77]If these twigs do have anti-fungal properties, for example, it would be an important area of agronomic research in terms of crop stand establishment and seed germination. One farmer even said that he would like to experiment with sotto.

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of the suntuure to decompose. When the rains are heavy, which they generally are in August, the harvested corn is dried inside peoples' houses, placed upon an elevated storage platform (daggal) above fires built on the floors of the homes[78]. After the corn harvest, the suntuure is weeded for vines (delbi) and grasses. In November, the corn stalks are knocked down after the taro leaves have dried, collected into piles during February and March, and burned. The ashes are spread around the suntuure.

Foñe is considered by many farmers and agronomists to be the single most important cereal crop in Fuuta Jalon. In 1984, for example, in Fuuta Jalon, foñe was planted on 725,000 out of 2,767,000 cultivated hectares (26% of the total cultivated area) (Ministère du Développement Rural, 1986). The importance of foñe is significant in Dara Pelli watershed according to our observations and our discussions with farmers. Foñe yields of 300 to 500 kg/ha can be expected (Rondot, 1986) and yields greater than 600 kg/ha would probably be seen as very good (FAMA, 1962). McGahuey (1985; cited by Heermans and Williams, 1988) reported that cereal yields in the Pita region have dropped from this previous level to about 200-300 kg/ha today.

A valuable property of foñe is that it grows on poor soils, although some agronomists interpret this phenomenon as an indication that foñe usurps soil nutrients. As compared to corn, foñe is not particularly nutritious but it is easy to digest, which makes it a preferred staple among older people. The growing period of foñe is fairly lengthy, three and one-half to five months in duration, but most foñe varieties sown by Tahira and Bussura farmers need only three or four months to maturity. Foñe yaawuko ("rapid" foñe) is one of the two short-

[78]Houses generally consists of three rooms. The round central living area with a high wall is encircled by a lower wall that would form a ring-like room around the central living area were it not divided into two half-rings by a second, buttress-like inner wall on each side of the house. The three rooms are the central living area plus the two half-ring areas which act as ante-chambers.

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season (90 days) varieties commonly sown. The other is foñe gaba, also known as foñe kuli, a favorite among Tahira and Bussura farmers but relatively difficult to obtain. Foñe gaba does very well on more fertile soils, unlike most foñe, and will mature at the same time as corn, a rare feat for this cereal. Foñe gaba is the preferred foñe to eat mixed in with soured milk. Longer season (120 days) varieties include foñe bolefonde, which is easily established, tasty, but difficult to prepare; foñe rane ("white" foñe, also known as foñe siraaje); foñe hocca, foñe wulenmaŋ, and foñe kansanbaraŋ, which is particularly noted for its sweet taste.

Rice seed, reported Richard-Molard 50 years ago, is sown by local Fuuta Jalon farmers at various landscape positions specifically suited to certain varieties. We observed that Tahira and Dara Pelli farmers also plant rice (maaro) according to landscape position. Seven rice varieties are sown in Tahira and Bussura, from 90-day varieties to 180-day varieties. The growing period for upland rice ranges from three to seven months.

Richard-Molard (1944) reported that the variety named maaro balehoy is sown on the doŋol, that the variety called maaro kurfin is grown on the aynde, and that maaro sereŋ is grown on the hansaŋere. In Tahira and Bussura, maaro balehoy is called maaro buubusamba, but this is difficult seed to obtain. Maaro demberemeyye is a fast-growing, 90-day variety which, like many short season rice varieties, will only perform well in the most fertile of soils. Maaro demberemeyye is fairly resistant to drought but is also more preferred by birds as compared to other rice varieties. Maaro teddawaare, also known as maaro wenseereŋ (which has a slightly darker grain color) and maaro kuntuŋkasa, receive mixed reviews from Tahira and Bussura farmers. It appears that the yields of these 140-day rice varieties are too inconsistent for farmers to rely on, although they do grow on poorer sites.

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The preferred rice in Dara Pelli District is maaro kurfin. This variety has, in fact, been replaced by a close cousin, maaro kinsanba, a 150-160 day rice. Kinsanba is a reliable producer that adjusts well to a particular growing season's dynamics and is very popular due to its taste. Kinsanba or kurfin both require sites that have considerable ñolu, such as beneath a teli (Erythrophleum guineense) tree or near the bottom of slopes. Another reliably productive rice in the watershed is maaro maahera, a 150-day variety grown near the shoulders and tops of hillsides. Maahera is less drought resistant than kurfin and reportedly requires a fair amount of ñolu[79]. Maahera is a better producer than teddawaare, agree most farmers. Other rice varieties familiar to local farmers are maaro masfooli, a 140-day variety that grows best on highly fertile soils; maaro juukeme, a prolific seeder though the seed is difficult to obtain; and maaro banjul fello, a long season (210 days) variety sown near rivers. Banjul fello was a more popular variety among farmers in the past when clearing stream areas for cultivation was common[80].

In 1988, the rice seed planted by many local farmers had apparently been stored too long and the seed germ (puddili) was killed by heat and aridity in storage[81]. In the house, away from where cooking fires are made, this won't be a problem. Nor will this problem arise if rice seed is stored for one year only on the storage platform. Foñe can be stored for longer periods than rice, up to four years, provided that heat and fire in the house are minimal.

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[79]We received conflicting information on the comparisons between kurfin and maahera.

[80]After the field work at the study site had been completed, while on the way to Conakry, I met a grain merchant in a small warehouse in Labe next to the market who said he once was a rice farmer in Koumbia, 100 kms northwest of Labe, and that he had earned so much income from growing upland rice that he bought a car with the money. He insisted that, should we want to know about upland rice varieties, the Koumbia region is the place to look and learn, because there "every tree is suited to a specific rice variety".

[81]Grain is stored in the ante-chambers of houses where meals are often cooked during the rainy season. The resultant extra heat in these areas can affect seed quality. Farmers told us that rice seed stored for longer than three years runs a great risk of not germinating well.

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Rice yields reportedly average 600 to 800 kg/ha (Rondot, 1986)[82].

As for peanuts (t i ga pl. t i gaa j e), four varieties are commonly planted by Tahira and Bussura farmers. The 90-day, upright (i.e., non-spreading) variety is called t i ga coppo. Another 90-day variety, t i ga l ab i r i ya[83], marked by its red hue and three-peanut per shell yield, is more upright than t i ga coppo. T i ga dar a[84] is an upright, 120-day variety that grows well everywhere except on the dantaar i. Finally, t i ga l ay a[85] is a 120-day, creeping variety.

When land is cleared for a new s un t uur e, farmers commonly plant peanuts first of all to improve the soil[86]. Peanuts are also highly valued as a base for sauces. Its leaves can be dried for use as cattle feed and some farmers mulch their bananas with peanut leaves. We were told that, in the past, the harvest of peanuts at the same time as corn harvest was unheard of. Today, early varieties of peanuts can be harvested at the same time as corn harvest if the peanuts are planted early. In 1988, in Tahira and Bussura, a late August peanut harvest was rare because few farmers planted peanuts before July. In general, the peanut harvest in Tahira and Bussura was not good in 1988. Some Tahira and Bussura farmers had also noted a general absence of peanut seed for sale in June, 1988, and a higher seed price.

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[82]Several years ago, in what Tahira and Bussura farmers perceived as a goodwill gesture, the new government brought rice seed to the watershed to plant, two varieties that the local farmers didn't have. Some farmers still have the seed, we were told, but neither variety performed well. Even worse, people thought the rice was a gift, like when the government handed out blankets to handicapped people one winter. Later, however, the farmers found out that they had to reimburse the rice seed. As the the seed did not produce well, many people were forced to reimburse the government out of their own seed supplies. That incident, we were told, tended to jade peoples' perceptions of the new government's proposed programs.

[83]Although not confirmed, the word l ab i r i ya may refer to "Liberia". That is, perhaps this particular rice variety was introduced to Fuuta Jalon from neighboring Liberia.

[84]T i ga (peanut) d ar a (standing).

[85]T i ga (peanut) l ay a (crawling).

[86]Little specific information was obtained from informants about which soil properties would be improved except to note that peanuts increase soil fertility and organic matter (ñ o l u).

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Whether Tahira and Bussura farmers' perceptions of soil erosion and conservation at present are totally indigenous or result from the forestry and agricultural extension efforts of the colonial and Republic governments is a question to answer beyond the scope of this study. In either case, we can be sure that at least some Fuuta Jalon farmers have been hearing, if not heeding, the soil conservation message that various Guinean governments have been preaching for more than half a century. One straightforward comment on the efficacy (or lack thereof) of such messages was provided by Claisse (1958) at the time of Guinean independence from France:

> We have asked the people to place rocks, under supervision, along the contour in areas where a (strong) slope was apparent. We noticed that this (request) was insufficient and non-operative. The cultivator does not obey this but continues to make small piles of stones, as is their habit, or makes discontinuous lines of stone that cows and rains disassociate rapidly. If we want the operation to be feasible, we must employ means that are immediately accessible by the local population. We're persuaded that the issue of slowly transforming customary practices is one of policy and patient counseling (of farmers) moreso than an issue of a big budget.

The extent to which Guinean policy-makers took these comments to heart in not fully known. However, it is known that Guinean governments have long prescribed guidelines for preventing and remedying crop and pasture land degradation (UNESCO, 1981). The prescribed, preventive measures include 1) establishing classified, protected forest areas[87]; 2) prohibiting the clearing of

[87]This policy has, past and present, met with considerable debate and controversy, with opponents of the policy claiming that the classified forest designations inhibit multiple use options by the local population and increase land use pressures on agricultural lands and pasture that surround the classified forest. There are no classified forests in or next to Tahira and Bussura but the ecosystem within the watershed remains forest-based, despite continual agricultural activity.

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trees from forest galleries along watercourses and slopes greater than 30%, within 10 meters on each side of the river or stream; 3) maintenance of a certain (unspecified) minimum density of trees on cropland; 4) reforestation[88]; 5) stone lines (k o t i) placed along hillside contours to slowly build terraces[89]; 6) surface drainage and diversion canals[90]; 7) sedentarization of cattle herds; and 8) water management and conservation measures.

In his FAO report, Heusch (1984) devoted three succinct paragraphs to traditional soil conservation techniques, including the above mentioned use of stone lines along the contour and drainage canals (reinforced by live fences), in addition to leaving trees in place, and fallow periods. Foury (1958) had observed 25 years previous to Heusch's report that several precautions are advisable when discussing soil erosion in Fuuta Jalon. One, when the forest is cleared that it be done in such a way that the tree stumps remain intact so that they might help reconstitute the (vegetal) cover. Two, not till the soil too much when working it. Three, leave the land in fallow long enough that the trees come back with vigor. Four, correct the slope gradient with earthen or rock structures placed along the contour lines such that the land begins to look like a

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[88]The 1975 Law of Fria (Fria is a town in western Guinea) stipulated that all social ceremonies, such as marriages or baptisms, must be accompanied by the planting of trees by participants. This law was not well respected in Dara Pelli district during the period 1988-89.

[89]These lines of rocks (k o t i) are quite visible in Dara Pelli district, although most are not habitually maintained. However, they remain functional as an anti-erosion measure. This technique was first promoted by the French colonial government and are fairly common. Interviews and conversations with Tahira and Bussura farmers indicate that the establishment of these structures was not entirely coercive. Yet, very few farmers in the watershed today add to or maintain existing k o t i. Those who do use k o t i cite keeping the land in place and gaining more space to cultivate as reasons for using k o t i. Farmers in Tahira and Bussura acknowledge that the prevalence and maintenance of k o t i is less today as compared to previous times. Some of this, we were told, can be explained by diminished encouragement by Waters and Forests Service field agents to place k o t i in grain fields as compared to previous years. Now, g i r i n j i seem to be replacing the k o t i, by and large.

[90]For d a n t a a r i land, farmers in Tahira and Bussura noted their use of surface drainage canals to divert excess water away from the crop and prevent the loss of ñ o l u to the rivers.

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Forty years ago, Rouanet (1951), writing about Fuuta Jalon, noted that the mechanism of soil erosion is related to a decrease or disappearance of three elements: 1) soil depth; 2) humus; and 3) assimilable mineral matter. These three elements, Rouanet pointed out, are needed to support plant life. Furthermore, wrote Rouanet, without vegetal cover, agricultural productivity can be expected to decline. In this respect, low soil fertility in the Fuuta Jalon region may be as much an agricultural problem as soil erosion. However, some agriculturalists believe that the problem of soil fertility in Fuuta Jalon is caused by erosion and a phenomenon that is termed, in French, *bowalisation*, the process by which soils become boowal land[91]. This process is allegedly enhanced by 1) too-hot bush fires that damage soil organic matter reserves and inhibit soil biological activity; 2) use of agricultural equipment like plows on soils whose structure is unsuitable for plowing; 3) poor forest management; 4) overgrazing and overcutting; and 5) cut and burn agriculture.

Maignien (1958) suggested that fire has little or no detrimental physical effect on soil properties if heat from the fire does not penetrate deeply into the soil. He did cite several soil properties or processes that could be negatively affected by fire. These include the evolution of soil microbiota, destruction of the sources of organic matter[92], enrichment in silica of the soil surface horizons due to insolubilization of silica contained in crop residues, selection of pyrophilic

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[91] The French explorer Mollien described Fuuta Jalon as deforested with considerable boowal land as early as the 19th century (Heermans and Williams, 1988).

[92] Maignien (1958) noted that a lack of organic matter diminishes the activity of soil microbiota, which are reservoirs of carbon dioxide in the soil atmosphere. This lends itself to increased oxygenation, making easier the immobilization of iron and aluminum sesquioxides, an important step in the process of *cuirasse* formation.

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species, and destruction of the vegetal cover that protects the soil against erosion. Maignien (1958) thought it difficult to affirm that *bowalisation* is dependent solely upon anthropic actions, claiming that the development of *cuirasse* can make its debut before human beings appear on the scene[93].

It is noteworthy that the early burning of grasslands is, under certain conditions, a government sanctioned soil management practice in Fuuta Jalon, supervised and monitored by agents of the Waters and Forests Service. Often practiced by herders as a technique to resprout dried grasses one to four months after the rainy season, this oft-maligned technique is now an accepted management practice, given several conditions. These conditions are that fire lines be established around areas to be burned[94], that the burning be supervised and monitored by an agent of the Waters and Forests Service, and that the fires be set in December or January[95].

Despite these precautions, one morning in February, 1989, the residents of Tahira and Bussura were alerted by the sound of beating drums, the local fire department. An area of boowal land in a southwestern side of the watershed had caught fire from (heard but not confirmed) a discarded but lit cigarette. Although Tahira and Bussura are both protected by the Bussurawol stream, all able bodied men and boys dug fire lines and threw soil on the edge of the fire for three days and nights. This work is tiring and dangerous because, among

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[93]Maignien (1958) explained that formation of *cuirasse* requires an immobilization of iron and aluminum sesquioxides to provoke induration. This process requires that these sesquioxides be subject to a series of chemical transformations which are regulated by drainage conditions.

[94]The Guinean government also requires that farmers who clear wooded areas for cultivation dig fire lines (firebreaks) around the areas to be burned or face the threat of a fine. Most Tahira and Bussura farmers adhere to this standard, whether seriously or perfunctorily. The procedure does involve considerable labor in addition to the actual land clearing process, yet farmers in Tahira and Bussura appear to be genuinely concerned about fires that may burn out of control.

[95]When this practice was uncontrolled and unsupervised (and, certainly these instances do yet occur today), herders would sometimes burn as late in the dry season as April, which presents a significant risk of relatively large-scale fire damage to residential zones. When cornstalks and other crop debris in the cuntuuji of Tahira were collected into piles and burned in early 1989, I was quite concerned that windblown burning ash would land on the grass roof of my hut.

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other reasons related to smoke and flame, the fairly slow-moving fire flushes out all snakes in its path. Moreover, the fire occurred at a time when many people were building or refurbishing their houses[96], thus taking away workdays intended for this important task. The village deemed responsible for the fire was reportedly fined a total of 20,000 GF, about 35 dollars at the time.

The key question about soil erosion and conservation in Fuuta Jalon is, however, "Has soil loss in Fuuta Jalon been measured?" The answer is "yes" and "no". Few rigorous studies of soil loss directly from agricultural fields in Fuuta Jalon have been realized but studies of stream sedimentation have been completed by which soil loss from fields can be estimated.

A study by the Organization for the Development of the Gambian River Basin (OMVG - *Organisation pour la Mise en Valuer du Fleuve Gambie*) suggests that at present sedimentation rates in the upper Gambia River Basin in Fuuta Jalon a proposed dam downstream would lose about 0.5% of its live storage capacity over 100 years (Heermans and Williams, 1988). By the worst-case scenario, the dam would fill up in 170 years and by the best-case scenario it would fill up in 16,667 years (Heermans and Williams, 1988).

According to Heusch (1984), the French government's international scientific research organization (ORSTOM) estimated the rate of erosion from all lands in Fuuta Jalon as two metric tons per hectare per year. Weischmier, author of the Universal Soil Loss Equation, set a soil loss rate of twelve metric tons per hectare as the "danger zone" of soil erosion (Heusch, 1984).

Goodson (1987) compiled sedimentation and soil loss rate estimates from nine studies in Fuuta Jalon. Sediment yields range from 2.1 to 2000 metric tons

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[96]The year 1989 was a banner year for house building in Tahira. None were built in 1988 yet four were constructed in 1989. About two months worth of person-labor are required to build one house, usually the result of at least two people working together at a time.

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per square kilometer per year. In short, evidence is inconclusive as to the severity of stream sedimentation from agricultural soil loss in Fuuta Jalon.

Heusch (1984) suggested that soil erosion in Fuuta Jalon appears to be most problematic where the population exceeds 50 people per square kilometer. Most of the erosion is due to the action of water, although some wind erosion does occur. Isbecque (1985) remarked that much of the natural erosion in Fuuta Jalon probably occurred during the Quaternary Period and that, overall, there is not too much transport of sediment today in the region except on cultivated soils where levels of organic matter are low.

Boulet and Talineau (1986) believe that considerable exaggeration in the past as to the extent and severity of soil erosion in Fuuta Jalon has occurred. However, these experts also believe that "soil chemical erosion" is not negligible in the regions, given that runoff does occur and probably transports minerals in solution. They wrote that it is important to think in terms of techniques to increase soil surface roughness as a way to inhibit runoff.

Mathieu (cited by Heermans and Williams, 1988), like many agronomists , suggests that declining soil fertility, not soil erosion, is the major agricultural problem facing Fuuta Jalon farmers, due to shortened fallows, decreased soil organic matter, and reduced nutrient cycling on acidic soils. Mathieu observed that sheet erosion on cultivated upper slopes does occur, but that most of the serious erosion may be associated with road building and poorly implemented soil conservation measures (Heermans and Williams, 1988).

Heermans and Williams (1988) suggest that a primary erosion problem in Fuuta Jalon is the erosion of rural peoples' ability to sustain their livelihood from the land. Our observations in Tahira and Bussura indicate that soil erosion is not as severe a problem as reported in the literature or in other areas of Fuuta Jalon visited, such as closer to the cities of Pita and Labe. The potential does

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exist for widespread erosion, given that considerable cropping occurs on slopes of greater than 30 degrees, the cutoff gradient by Guinean law for cultivating steep slopes[97]. Extensive areas of upslope boowal land in and around Dara Pelli watershed provide a surface upon which overland flow of runoff is launched towards lower landscape positions. Most signs of gully erosion are seen on footpaths that weave through fields and bushland.

Overall, in Tahira and Bussura, three erosion trouble spots were observed, two of which were in agricultural fields. The first of these sites was located in an upland rice field where, sometime in the past, rock and soil had slumped, creating a small depression in the hillside 15 meters in diameter. The farmer who cultivated the area told us that it was once a wild animal refuge and did not believe that the land was threatened by erosion. Close inspection revealed that the erosion process was already well underway on this land.

A second erosion spot, the worst observed, was an area of about five hectares between Bussura and Keete where farmers had previously cultivated on a 25°-35° slope that leveled out at the Bussurawol stream. This land supported little vegetation nor did the soil appear to have a significant A horizon. However, the site was fairly well covered by foñe crop residue.

The third location was situated just beyond the limits of Bussura on a former tax collection road[98], now in disuse by four-wheeled vehicles. This land area covered perhaps two hectares and was located close to the Bussurawol stream. The site did not support much vegetation and appeared to have an exposed B or C horizon. A more recently utilized tax road leading to Taybata, now in disuse, also exhibited signs of severe gully erosion.

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[97]This law is not enforced with rigor in Dara Pelli district by the local Waters and Forests agent. We observed several instances of cropping on slopes that were greater than 45° (100% slope).
[98]The road where Sekou Touré government vehicles would arrive at the village to collect cereal grain and livestock as taxes in-kind.

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On the Taybata side of the Taybatawol stream, one farmer grew upland rice on slopes greater than 100% (45°) down to the riverside but was not fined. Another farmer who had rented land from a Taybata family, cleared land across a narrow, intermittent stream that feeds the Taybatawol. He was reportedly fined 5000 Guinean Francs (GF) by the local Waters and Forests agent[99]. The sorghum yield on this land was likely among the best in the watershed judging by the stand quality and the diameter of the plant stalks.

Other than these instances, Dara Pelli watershed was remarkably free of apparent erosion. It is perhaps inevitable that Tahira and Bussura farmers would cultivate slopes too steep to have low erosion potential because much of the watershed landscape is steeply sloped hillside. Nevertheless, it is noteworthy that the majority of farmers who cultivated these steep slopes in 1988 used g i r i n j i (referred to previously). This soil conservation measure appears to be somewhat effective for inhibiting soil erosion during the initial year of a cropping after clearing, despite gaps that occur between the g i r i n j i and the soil surface. The observable effectiveness of g i r i n j i during the second year of a crop rotation remains open to question.

Several farmers noted that, in the second year of the cropping sequence on n g e s ɔ land, the use of mulch from leaves that resprout from stumps serves the same function as k o t i or g i r i n j i for keeping soil ñ o l u in place, though this mulch is burned and reduced to ashes. Some farmers did suggest that many k o t i were put in place before and during the Sekou Touré regime under a threat of fine for non-adherence. Today, we were told, the Waters and Forests Service are more interested in illegal cutting of trees than in k o t i. In Figure 7 (Petersen, 1991) below, poorly maintained k o t i are illustrated.

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[99]A fine of 5000 GF was approximately equal to $10.00 at the time.

Figure 7. Poorly maintained kot i on ngesa land.

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It should also be noted that, in clearing land, Tahira and Bussura farmers do not cut tree trunks flush with the soil surface but leave 15-30 centimeters of stump from which the trees resprout during the course of the rainy season. It appeared that most trees were not killed in 1988 by the process of cutting and clearing. To be frank, it was found that Tahira and Bussura agricultural practices contradict what Bonfils (1951) postulated forty years ago, that Fuuta Jalon farmers have no concern for soil conservation. In fact, Tahira and Bussura farmers' perceptions of soil management and conservation can be quite sophisticated, as evidenced in the observation below by a Bussura woman. Other such observations are given in RESULTS AND DISCUSSION.

> There's a difference between topsoil (hoore leydi or ndelo leydi) and subsoil (ndanka). Rain falls first upon the ndelo then passes through to the ndanka. When the powerful, hard rains come they take away the topsoil and leave only gravels (koccu) from the subsoil. The hard rains carry soil to the streams. If the ndelo runs off or erodes we won't have a good yield. But runoff doesn't always wreck the land. At times, the water runs off but the land stays in place, even if the land has been worked.

Land tenure

The issue of land tenure in Dara Pelli district is a potentially volatile social issue. Land ownership rights are not well-defined (at least by non-Guinean standards) and in Tahira and Bussura this issue is entrusted to a general understanding among local residents as to what constitutes land ownership, to the judgement of local elders, and to the decisions of local administrative authorities. The Guinean government is presently revising the national civil

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land code[100]. In Tahira and Bussura, a number of variables have set the stage for future conflict between members of rural communities regarding access to land. These variables include perceptions by the descendents of former nobles and serfs as to which land belongs to whom, the importance of *suntuure* land to which women maintain only user's rights, continuing male labor migration to the cities, and access to religious and political power.

During the year of research in Tahira and Bussura, two land rights disputes arose, both of which were by-products of farmers clearing the nearby forest for the first year of a three-year cropping period. The issue in both disputes was similar, the location of field boundaries. Both disputes were resolved after a week or so of discussion between the parties involved[101]. The resolution in one case was a compromise in which the disputed territory was divided in half between the two parties. In the other case, the individual who claimed that the parcel had been a gift from the family of the other party in the dispute ceded his claim to the land in the name of community solidarity (*jokkere endam*).

Several scholars, including Derman (1973), Dupire (1970), Frechou (1965) and Keita (1970), have written about land tenure in the Fuuta Jalon. Keita (1970) reviewed the evolution of land ownership rights prior to, during, and following the colonial period in Guinea. She identified a basic rule of land ownership in Guinea, that the first occupants of a parcel of land are the original land owners and thus have a justified claim to the land[102].

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[100]As of May, 1989, the Guinean government was reportedly ready to release the provision of a newly revised land code. As of February, 1991, this new land code had not yet been made public, to my knowledge.

[101]We were told that local citizens prefer that land disputes be resolved by the parties involved before the issue is sent to the local elders and well before the issue reaches the government authorities for resolution. This preference perhaps reflects a desire by local citizens to maintain social and political control over a local issue.

[102]Throughout Fuuta Jalon, this basic rule was violated in the name of Alla during the *jihaad* of the 18th century when many Jallonke people were driven from their land by the *Fulbe*.

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Keita (1970) wrote that a local level priority with respect to land ownership rights is the maintenance of social order. For this reason, those people who put the land to use are accorded ownership rights, even if temporary. Keita (1970) argued throughout her thesis that, during the 20th century in Guinea, the French-derived system of granting individual land ownership titles while preserving the right of the State to eminent domain has been in conflict with the African concept of land tenure by which collective, family-based land rights takes precedence over the rights of individuals and the State.

Keita (1970) traced the evolution of various land laws and decrees in Guinea up until the year 1970, when her thesis was completed. The net effect of several changes in the civil land code during this century is that, today, the land in Fuuta Jalon belongs officially to the Guinean government.

In the early part of this century, traditional village leaders were replaced by elected local representatives of the people and these representatives were responsible for administering land on behalf of the government (FAMA, 1962). Despite the colonial government's legal position, the notion persisted that the recognized original land user, the person who first cleared the forest, is the original property owner and all property rights are transmitted to that person's descendents. Any changes to the status of land ownership from that point must be supported by community consensus. Moreover, as long as the recognized owner, or family of the owner, continues to cultivate the land (with allowance for fallow periods), then the land is considered theirs. The recognized owner is even permitted to sell or rent out the land. But if the land falls into disuse, except for land in fallow, it is liable to reclamation by the government under its reserved right of eminent domain to all lands (FAMA, 1962). This proviso could be retained in the new Guinean civil land code.

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Rondot (1986) points out some earmarks of land tenure in Fuuta Jalon, most of which are applicable to Tahira and Bussura. For example, women receive land through marriage from their husband's family and are considered to be the owners of the land they cultivate for as long as they work that land (Rondot, 1986). Also, the descendents of former Fulße nobles loan out their property to descendents of serfs and other landless people (Rondot, 1986). Although the master-serf system was officially abolished and prohibited by the Sekou Touré administration, Rondot (1986) observed that "old slaves or men of caste must still demand of old nobles' descendents to loan them land under certain conditions, so that they will not be left without access to any land." Other aspects of land tenure in Tahira and Bussura appear in the observations of residents of these two villages, summarized as follows.

Male children inherit their mother's suntuure. If there are only female children in a family, it is possible that one of these (girls) will someday own the suntuure outright. But, if she marries and has male children, ownership of her suntuure will ultimately fall to one or more of her male children. Women who do own land generally obtain it from their father but these cases are rare. When there are no male children in a family and the male household head dies, a brother of the deceased is usually next in line, often a brother who has the "same mother, same father" as the deceased individual.

We were told that, in Dara Pelli district, land rental contracts are not made between only two people. There are always other people who witness what has surpassed regarding the rental agreement. The renter is expected to "take out" what amounts to 10% of the harvest, known as the farilla[103], to remit or offer to the owner. The farilla used as rent is commonly taken from the foñe

[103]One informant poetically described the farilla as "four measures out of forty".

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or rice harvest. Often, the renter takes out their farilla and offers one-half to the owner and the other half to someone in need. The farilla is offered as either grain or money[104]. On occasion, a land owner will refuse the farilla from the renter or perhaps suggest that it be given to a person in need, or to the local Koranic school teacher. In addition to the farilla paid as rent for borrowed land, by Islamic custom farmers take out a farilla from their harvest, whether or not they farm rented land, for people in need[105].

A land owner might rent land to the same individual for two years but when the land is cultivated again after, for example, eleven years of fallow, the land will likely be loaned out to someone else. Normally, if a farmer borrows land, when the land is placed into fallow the contract is terminated and the land

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[104]Unconfirmed rumors in Tahira persisted that, for the 1988 growing season, two different farmers were required by land owners to pay 10,000 GF (about $20.00) in advance of the cropping season for the right to cultivate rented land.

[105]A farilla taken out of the harvest to fulfill religious obligations is commonly a portion (10%) of the corn harvest. Neither sorghum (bahe) nor sesame (bene), which are intercropped with rice, should be use as the farilla. There is also no farilla taken from the peanut harvest because during the process of planting and harvesting peanuts, people give them away to others, passersby, for example. The farilla should be given to people who have little material wealth and also to the local Koranic school teacher (karamoko). People in Tahira and Bussura usually give their farilla to someone who is ill or impoverished, we were told. Some people give their farilla to visitors. Above all, said a young Tahira farmer, those people who have little material wealth or who are orphans should be recipients of the farilla. Even the poorest of people are obligated to take the religion-based farilla from their harvest, even if the harvest is low. Some sources claimed that Islam does not require the farilla from people whose granaries are empty. Many farmers in Tahira and Bussura believe that if they do not take out the farilla, whatever food they eat henceforth will not be good for their health and that not taking out the farilla renders people susceptible to a poor physical condition for farming the following year. Some people take out the farilla at the time of harvest, right in the field, while others wait until the harvest is taken back to the house. Several respondents even noted that one purpose of such tithing is to help ensure that one does not experience a"bad death" (maayde bonnde), that is, a death that leads them to eternal damnation. One man, speaking about the muddo, a sacrifice (sadaka) equivalent to two cupped handfuls of grain, offered the following explanation:

"We should take out two handfuls of grain (muddo) at the end of the fast and give it to someone in need. These two handfuls will be multiplied at the end of the world when the fires engulf people and the earth. One grain given as muddo will turn into mountains of grain and block an individual person from the fire. Each person should take out two handfuls of grain on the eve of Ramadan (the Islamic month of fasting) to sanctify the fast. One can also give the muddo to other family members."

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Several Tahira and Bussura residents explained that buying and selling land is not really a legitimate transaction because Alla created the land. The act of selling the land would thus be a fundamental error (paljol) in behavior. Other informants said that Alla owns the land but entrusts it to people for their use. Therefore, to sell land would be like someone who asks you to watch and safeguard their cow and you say "sure" but then sell the cow.

The issue of suntuure ownership appears to be somewhat divided along gender lines in Tahira and Bussura, but women agree that males inherit their suntuure, and that women's ownership only means access to land and management of the harvest[106]. Of 31 people whom we specifically questioned about suntuure ownership, most of whom were men, over half said that women were the owners. Their observations included the notion that women own the suntuure and men own the ngesa, due to their respective work on these lands. However, there is consensus that, in the case of divorce, it is men who repossess the suntuure. Some women are able to reserve all or part of the suntuure for the future wife or wives of their son(s). Some men (husbands) may reserve a part of the suntuure for a second wife. All respondents said that, without their husbands consent, women do not have the right to loan out or sell all or part of the suntuure that they farm .

The fact that men build the fences around the cuntuuji lends credence in the eyes of Tahira and Bussura residents to the claim that men, not women, are the owners of the suntuure. This reasoning is underlain by a realization that,

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without fences, cuntuuji lands are virtually useless in the face of foraging domestic animals, namely cattle. Many informants who said that men own the suntuure nevertheless noted that women own the crops that are produced on the suntuure they work. Some informants said that men truly own the cuntuuji but, ostensibly, the women own these lands because they work there to produce the crop. One man said that, behind closed doors, the man owns the suntuure, meaning he makes the ownership decisions. Women, said informants, cannot truly own land because they move away from their birthplace to live in the household (galle) of their spouse. One tongue-in-cheek remark by a woman from Tahira asked rhetorically whether or not women are born to "spoil" (bunginde)[107] the household of their husband's family, not the household of her own parents. This remark implies that all men and women of Tahira and Bussura understand that the husband's family wealth and assets remain with his family, virtually without question.

In short, land ownership is linked to inheritance and most land is obtained at birth, at least for males. Inheritance of land usually originates in a man's father or grandfather or great-grandfather who first cleared a certain parcel. Because most of Tahira and Bussura families have been settled for at least 100 years, land inheritance is generally clear, as one man explained:

> The first people to settle and farm in this area were those who chased out the wild animals (kul loy buruure). The first arrivals, even if they didn't farm, distributed the land to those who wanted to work it. Since that time, all land has been claimed and is passed onto succeeding generations. If someone wishes to cultivate other than where they normally farm, without asking permission, it might lead to discussion all the way to the government if not solved by the elders (mawbe).

[107]The verb bunginde means to make another person proud of themselves, even to be so good to another person that they are spoiled by the goodness. This term can also be used in the same way as the American expression "to wrap someone around your finger". However, to spoil someone in this way is also seen as a demonstration of respect for the person spoiled.

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The fact that land ownership via inheritance is reasonable clear renders the issue of land tenure a volatile issue. This is because many families of former serfs farm the most productive land, the dantaari, just as their predecessors had farmed the same land, being subjects of the Kalduyaaɓe. One young man from Bussura, which is recognized by some as a former runde, believed that if agricultural land on the hillside was (hypothetically) no longer productive, and the Kalduyaaɓe from Pelli decided to reclaim ownership of the productive dantaari land now primarily farmed by Bussura residents, the options of the Bussura farmers would be limited with respect to "clear title". He conjectured that, in such a case, the dantaari land would be divided up between the Bussura people and the Kalduyaaɓe from Pelli, with little room for litigation. In this case, he added, the most intense discussions would center upon the land closest to the watercourses.

Perceptions by Tahira and Bussura residents of Kalduyaaɓe land ownership in the watershed are rather translucent. One farmer said that the Kalduyaaɓe, who reside in Pelli, might claim ownership of all of the local land but, in fact, what they really own is the plain (aynde) on the other side of the Dara Pelli mountaintops. It is generally agreed, at least among Bussura residents, that the Kalduyaaɓe originally became owners of the land through their religion-based hold on political power, complemented by their leaders use of force in the name of Alla. However, a number of Bussura residents doubt that the Kalduyaaɓe would be able to sustain a claim of widespread land ownership when confronted by stiff, local social pressure to maintain the more recently established *status quo* regarding land use and ownership. All in all, the prevailing viewpoint seems to be that the Kalduyaaɓe truly do own the land but as long as people can rent land to cultivate then true ownership really doesn't matter too much for now.

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One Bussura resident offered this perspective on *l'affaire* Fulße, as he phrased it (muraadu Fulße).

> In the past, the land was owned by the Fulße, the Kalduyaaße. It is said that we own the land, but that's not *really* the truth. We were the serfs of the Fulße and, consequently, we "own" (jeyi) some land next to where the Kalduyaaße of Pelli have their land, an area where our mawße habitually cultivated. In the past, the Kalduyaaße didn't work this land but they did own it. The fact is, they didn't have the physical strength to work this land. Today, we have a limited freedom to do what we want on that land, but we really can't do absolutely anything, like plant fruit trees, for example. The Kalduyaaße could put a stop to anything if they want to. Today, for example, we give them rice for use of the land and they'll turn around and give the land to someone else the next time it's cultivated. There are some places that we simply can't own. It's only us at Bussura who work the dantaari, yet we are still the property of the land owners, in effect. Really the Kalduyaaße own most of the land here. If they want to take it back, they could.

Another young man from Tahira explained his viewpoint of the Kalduyaaße situation as follows:

> There are inequalities here with regard to power. There are people who say they have more power than me because their mawße were the first here. But, the land is a common good and all people have souls and are thus equal. In the past, the Fulße herders took the land away from the Jallonkeeße then redistributed it to new arrivals. Those who arrived last received less land and had less power. In this way, the power of my parents was limited and, now, so is mine.

When the dust of the land tenure issue settles and clears, the most common, socially acceptable, viewpoint of Tahira and Bussura farmers with respect to land ownership remains the principle of "first come, first served." This viewpoint is revisionist if one acknowledges the Jallonke to have been in the Fuuta Jalon region well before the arrival of the Fulße and the onset of the jihaad.

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Nevertheless, this viewpoint grants land ownership to those people who are credited as descendents of the first people to arrive and settle in the watershed after the jihaad. Because the Fulße came in the name of Alla, their actions are considered as justified. They even solicited and received newcomers and loaned land to new arrivals until these people were well established in farming and these are considered to be good acts which, of course, they are. In any event, it was explained, the very first Fulße settlers could not claim to own all of the forest land because they were simply unable to clear all of the land for farming with their limited labor.

In summary, if a family cultivates the same land over several generations, the land is generally considered to be theirs. Nevertheless, even if a family cultivates the same parcel of land for three or four consecutive years, this is no guarantee that they own that land. However, if someone has worked a piece of land for 20 or so years, there is no easy way to reclaim the land back from them. But many women work their suntuure until they die and never own it.

As for the boowal, the people of Tahira and Bussura believe that no one, except perhaps the Kalduyaaße, owns this land because it isn't cultivated but, instead, is used for pasture. If a person would want to cultivate this land or settle there they would have to discuss the scenario with the people of whichever hamlet is closest to that boowal. Some informants suggested that Alla and the prophet Mohammed own the boowal because it is not worked, while others would add this land to the government's property list.

Agricultural and extension education in Guinea

Agricultural extension education in Guinea is in flux today after an erratic political history under the Sekou Touré regime. It was during this period that the

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government assumed major responsibility for both farmer education and the provision of agricultural inputs. An indication of Guinea's intended agricultural policy in the nation's early years was offered by a presidential representative to the 1959 Third Inter-African Soils Conference held in Dalaba, Guinea, in Fuuta Jalon. After making reference to the negative effects of colonialism on the equilibrium of traditional agricultural system in Fuuta Jalon, and then criticizing the lack of adequate investment in traditional Guinean agriculture by the French during the 20th century and its consequent paralyzing effect on food production, the speaker continued (Diallo, 1960):

> We certainly can't deny that some techniques of soil conservation were developed (for Fuuta Jalon) during the (colonial) period. But we are obliged to agree that the results of scientific research, just as for the administrative efforts deployed, have revealed themselves to be powerless in the face of the devastation (of resources) that is growing like a plague. The question that we rightfully ask . . . is if it is technically possible to introduce into sub-Saharan Africa specific methodologies, inspired by those used in the temperate zone, which permit increased harvests at the same time as soil conservation. We understand that repeated failures . . . have led to a certain skepticism. . . . But such failures have often been due to insufficient advance studies, unfamiliarity with traditional practices, and, above all, the introduction of (techniques) without considering their adaptation to soil and climatic conditions.

The speaker suggested, as a starting point to solving the problems of agricultural production in Fuuta Jalon, an investment in human resources, including an education campaign at the local level to address the issues of bush fires, preservation of forests, and the protection of uplands and water sources. The speaker further called for "reciprocal adaptation of scientific techniques to peasant (farmer) initiatives" in addition to eliminating parasitism by traders on profits from agricultural production. As it would later turnout, such

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The speaker insisted upon the "complete defense of the Guinean peasants' (farmers') interests", an idea contradictory to such taxation-in-kind, and pointed out that a major Guinean agricultural policy objective was to restitute to farmers the profits from their efforts. In speeches and on paper, Sekou Touré was the farmers' champion. In the fields and in reality, the Touré administration became the bane of many farmers.

Sekou Touré was a man of ideas who clearly wanted to move agriculture ahead in Guinea. One ambitious programs with respect to agricultural extension education in Guinea under Sekou Touré was centered on the establishment of local institutions known as the Production Brigades, or birgaad in Pular. According to Barry (1975), the 1961 Development Plan for Guinea included a scheme for modifying the traditional socio-economic organization and structure of the agricultural sector. Basically, the objective was to "break the limitations of small agricultural exploitations and reorganize this rural economic form upon a modern, collective base (Barry, 1975)". To this end, 500 Agricultural Production Cooperatives (CAP) were planned as the production units for this new rural organization. Crop production for each CAP would be realized from collective fields totaling no greater than 200 hectares of land. Guaranteed commercialization of crops grown on the CAP was a goal along with popularization of modern agricultural mechanization. Each CAP was to be complemented by a Center for Rural Modernization (CMR), described by Barry (1975) as "a model enterprise for the training of peasants (farmers), the

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[108]From the French word *norme*, or standard, as in standard tax contribution. According to Heermans and Williams (1988), the norma was 60 kilograms of rice per year per adult. In our field work, we understood that this figure was 50 kilograms of cereal per year per family member over 14 years of age, although some farmers insisted that young children were taxed as well.

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demonstration of new (agricultural) materials, and the extension of modern methods such as plows and tractors, which were furnished by the government."

This initial effort met with disappointing results due to a number of infrastructural constraints, including poor management and administration. Sow (1975) suggested that a major reason for the failure of the CMR program was that program administrators used the available technology and salaried laborers to help themselves moved forward economically, instead of using the technology and the laborers for program objectives.

So, in 1965, the Guinean government unveiled a new program, called Agricultural Production and Consumption Cooperatives (COPRAG). This program, essentially a continuation of the CAPs, brought in more tractors, pesticides, and fertilizers, but failed due to insufficient technical manpower and poor financial management (Barry, 1975). The Guinean government then declared that future agricultural cooperative efforts should proceed along three central principles: 1) adherence to a socialist political philosophy; 2) adherence to the principle of "to each according to his or her labor"; and 3) targeting poor people as the beneficiaries of cooperatives at the exclusion of opportunists.

To help implement the cooperative program, two agro-political institutions were created in 1966 (Dicko, 1972). These were the Local Revolutionary Power (PRL) and the Colleges of Rural Education (CER[109]). The purpose of the CERs was to cause profound change in the mentality of farmers in order to develop agricultural cooperatives (Keita, 1970). These institutions, one political and the other educational, supported a Production Brigade, whose objectives were crop production and marketing, rural sanitation, literacy and adult education, and development of a local militia. Production Brigades were

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[109] Another author (Keita, 1970) reported that CER meant *Centres d'Education Révolutionaire* (Centers of Revolutionary Education).

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conceived as a means to improve the living conditions of rural people, with particular attention to the modernization of agriculture via mechanization and collectivization (Barry, 1975). There were two types of Brigades: A and B. Sow (1975) reported a third type of Brigade, Type C.

According to Sow (1975), Type A generally consisted of 15-20 people whose projects were financed 100% by the government with the provision that reimbursement would be made on the basis of annual payments. Type A Brigades focused on cash crops like tomatoes, peanuts, and tobacco (Barry, 1975). Type B focused upon the association of productive activities as defined by the members of the Production Brigade (Barry, 1975) and were oriented toward cereal crops (Sow, 1975). Type B Brigades were eligible to receive technical assistance from the Guinean Democratic Party (PDG), in other words, the government, and were not required to supply the PDG with a pre-determined production quota. Type C was known as the Family Brigade and were also eligible to receive government assistance (Sow, 1975).

The Production Brigade program was also a failure. Barry (1975) suggested four reasons for its failure: 1) The program was not founded upon an economic analysis of techno-social conditions of production. People did not see their personal interests implicated in the program but considered the structures to be the affair of the central powers. Moreover, the program did not demonstrate that collective production was better than individual production. 2) The authoritarian methods of program administrators destroyed the original popular enthusiasm for the idea. 3) The program had no clear vision of the future and many people who were involved considered themselves to be agricultural laborers only. There was little explanation of program work plans and execution. 4) Workers received compensation for their efforts. Sow (1975) wrote that the purpose of Brigade Type A was often misinterpreted by the local authorities and, thus, the

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collective fields became known as the government fields. Sow (1975) blamed the failure of Type B Brigades on unresolved questions related to such issues as ownership of equipment and organizational management.

In 1972, the Animal Traction Production Brigade (BAP) was introduced, followed in 1975 by the the Mechanized Production Brigade (BMP). As their names suggest, BAP activities utilized animal traction and BMP activities used tractors. These programs emphasized that surplus production was to be used to auto-finance the BMP or BAP after individual and government production goals were met (Sow, 1975). A team of 18 people -- one foreman, two drivers, one mechanic, ten university students, and four laborers -- were assigned to each production site (Barry, 1975). This program, which included literacy education, had limited success but eventually failed like the others.

Finally, in 1979, after the failure of the BMP and BAP program, the Sekou Touré government initiated a program called FAPA, *Fermes Agro-Pastorales d'Arrondissement* (Arrondissement Agro-Pastoral Farms), and transformed the remaining BAPs and BMPs into FACs, *Fermes Agricoles Communales* (Communal Agricultural Farms). The FAPAs, intended to be revamped CERs, were envisioned as decentralized, 200 to 500 hectare organizational units for modern agriculture in Guinea. Sekou Touré's vision was that Guinea needed "intensive, scientific agriculture that produced very high yields", namely, "six to nine tons of rice per hectare" (Touré, 1980). He wrote:

> Whatever would be the natural fertility of our lands, it will never allow us to obtain the crop yields that we expect if we have no recourse to (commercial) fertilizers. One point must be made clear in this regard. Until we have the (capacity) to produce our own chemical fertilizers, we will use fertilizer that we make ourselves. We will use green manure, farmyard manure, . . . human waste, and household garbage as primary materials in the preparation of fertilizers. . . . The best cultural practices must be utilized to achieve per hectare yields comparable to the best yields in the world (Touré, 1980)."

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In his speech to introduce the FAPA program, Sekou Touré invoked the name of "American (U.S.) farmers", calling them scholars and engineers who have mastered high-level technical knowledge. Touré envisioned the FAPAs as localized centers of applied agronomic research and agricultural extension. There were to be 300 FAPAs throughout Guinea. Touré spoke of the FAPAs as bases for the development of a "new type of civilization":

> The FAPA should jostle our methods of thinking, jostle that mentality which says scholars and intellectuals should not reside in a village and not work with their hands.

Ancillary to the creation of 300 FAPAs throughout Guinea was a plan to establish 30 agro-pastoral training centers at which 70-75% of high school graduates would pursue careers in agricultural science and later work and teach in the FAPAs. A total of 28 institutes of agro-pastoral science for the premier cycle were established throughout Guinea[110], two fewer than planned. The course of study was for three years. Five other institutes of agro-pastoral science for the second cycle were also founded, one of which was located in the Fuuta Jalon at Tolo, near Mamou. Today, there are four functioning agricultural training institutes in Guinea, including Tolo.

The failures of the agricultural extension education system in Guinea under Sekou Touré, by which the government furnished inputs, extended agricultural credit, and bought produce at a low official price, were analyzed by Blaul (1985), who cited several possible reasons for the overall failure of these well-intentioned efforts, including 1) irregular provision of agricultural inputs; 2) low grain prices for farmers; 3) poor management; 4) corruption; and 5) lack of incentive on the part of public sector employees.

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[110]Precise information on the number of operational training centers in the Fuuta Jalon during the FAPA era is not available.

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Today, in the new government of Lansana Conté, a major policy goal is to transfer the commercialization of agricultural inputs and equipment to the private sector, including foreign firms (Ministère du Développement Rural, 1986). For agricultural extension education, the central political issue in Guinea today is whether to adopt the Training and Visit system nationwide, as promoted by the World Bank, or some version of the French extension system, or a synthesis of the two systems. The French system resembles the classic transfer of technology model which emphasizes the transmission of technical messages from agronomic researcher to field agent to farmer in cooperation with public institutions though not necessarily public universities.

The current research-extension framework places both agricultural research and agricultural extension within the Ministry of Rural Development. Once the Guinean agricultural extension system becomes functional, as fully proposed, the extension field agent at the local level will be known as the Rural Counselor. At present, field agents with this title exist only where a special development project is underway. The Rural Counselor is, or will be, responsible for organizing people into groups, helping people to define their priority needs and put their means to work, and conducting the transfer of basic agricultural techniques. Local extension agents will serve about 1500 to 2500 people on 300-400 farms in a Rural Community or a District, depending upon the population density and the number of available field agents.

Within the Rural Community or District, a supervisory extension agent will coordinate the work and on-going training of six or seven Rural Counselors. Technical support and information will come from the technical services within the Ministry of Rural Development (Ministère du Développement Rural, 1987). At the *préfecture* level, each technical sector (agriculture, animal husbandry, forestry, etc.) is to be represented by a Chief of Service. These technical

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services are overseen by a Prefectoral Inspector of Rural Development. The various Chiefs of Service are also members of the Prefectoral Development Committee presided by the *préfet* (Ministère du Développement Rural, 1987).

The general philosophy of agricultural extension in Guinea today is centered upon the French-born concept of *vulgarisation*, by which ideas unknown to farmers are placed at their disposition by a *vulgarisateur*, or extension agent. (Ministère du Développement Rural, 1987). By definition, a *vulgarisateur* is responsible for transmitting technical messages to farmers and verifying the application of the messages. She or he is responsible for documenting the reactions of farmers to introduced technologies so that if the technology transfer fails, the failure may be corrected. A *vulgarisateur* is also expected to help people express their problems and make them conscious of their capacity to solve the problems themselves (Ministère du Développement Rural, 1987). According to the FAO, the purpose of *vulgarisation* is to improve the peasant (farmer) production system to ensure optimal satisfaction of peoples' needs while safeguarding production potential (Ministère du Développement Rural, 1987). The goal of *vulgarisation* is to bring farmers techniques and means otherwise ignored but which could be used to improve the food production system (Ministère du Développement Rural, 1987).

The FAO notes that improvements in a food production system supposes that 1) the system be known with sufficient precision, which necessitates detailed investigations in the field, and that 2) the factors of improvement be utilized in concert in order to avoid wasted time and money (Ministère du Développement Rural, 1987). For Guinea, the World Bank has suggested that only after having determined the constraints to food production will it be possible to propose extension themes adapted to the milieu (Ministère du Développement Rural, 1987). Increased knowledge of the food production

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system in Fuuta Jalon, Guinea, and determination of constraints to food production in this region in order to propose agricultural extension themes adapted to Fuuta Jalon is, in fact, a central focus of this dissertation research.

Guinean agricultural research objectives include defining research themes and peoples' needs from the ground up, in accordance with field surveys, and developing a close link between agronomic research and *vulgarisation* (Ministère du Développement Rural, 1987). The Guinean government plans to build a system of research support centers in each *préfecture*. Each center will consist of twelve or so hectares to be used in the training of extension agents, for demonstrating improved techniques, for tree and plant nurseries, and for seed multiplication. The centers will be placed under the authority of the Prefectoral Inspector of Rural Development and be integrated into the framework of a national program (Ministère du Développement Rural, 1987).

In Dara Pelli district, the agricultural extension service barely maintains a presence due to inadequate financial support. There is an agricultural extension agent in the *sous-préfecture* of Pilimini, within which Dara Pelli district is included, although his principal responsibility was to monitor fruits, vegetables, and grains for diseases at the weekly market. We interviewed this extension agent as well as the field agent for the Waters and Forests Service. These agents articulated issues that we have long recognized as critical for improving extension services in nations such as Guinea. In brief, the agents desired logistical support to better perform their work-related duties, additional technical training, complementary increases in salary, and more opportunity to improve their career. It was not clear that these agents' personal job-related mandates included agricultural extension education *per se* as a means to serve farmers, at least beyond research and demonstrations. It is quite clear that these agents are very ready and willing to work for the good of farmers.

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RESULTS AND DISCUSSION

Overview

In this section on RESULTS AND DISCUSSION, the perceptions of Tahira and Bussura farmers are reported together with data obtained from participant observation. The perceptions of many Tahira and Bussura farmers have been translated, paraphrased, and presented singly or as a synthesis of several farmers' observations. Considerable care has been taken to ensure that the integrity of the farmers' observations is maintained. Moreover, the opinions of Tahira and Bussura farmers presented in this section have been chosen as either representative of a general outlook or representative of a less common perception that is nonetheless insightful and indicative of cultural realities associated with soil management and conservation in these two villages.

Though it may not be readily apparent to readers which observations represent the opinion of one farmer or of several farmers, unless otherwise indicated, the philosophy of education adopted for this dissertation research holds that one farmer's perceptions are as important as those of one hundred farmers. The reporting of farmers' perceptions in this way is purposeful in that the farmers' opinions presented in this dissertation could comprise the heart of a community sourcebook on soil management and conservation in Tahira and Bussura. The observations as presented here could serve as starting points for discussion about various soil management and conservation topics, led by agricultural extension educators. This "discussion approach" to initiate information exchange would create an environment for learning in which learners could recognize critical facets of their own world view and build new knowledge upon their own perceptions of their agricultural environment.

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The twenty soil management domains that emerged from the interview responses of Tahira and Bussura farmers have been organized into four major sections, each of which can be thought of as subject matter for one volume of a four volume community sourcebook on soil management and conservation. Titles for each volume, including chapters on each soil management domain, are suggested below in Table 2 with Pular versions of each title in parentheses.

In Table 3, presented below, each of the twenty soil management domains are cross-referenced with each of the sixteen interview questions described in RESEARCH METHODOLOGY. The information provided in Table 3 explains which soil management domains were referenced by the interview responses of Tahira and Bussura farmers, "per question" and "per scenario". For each of the sixteen interview questions (twelve first-round questions and four second-round scenarios), a minimum total of seven references to a specific soil management domain was required across all interview responses to that question in order to conclude that a soil management domain was addressed by the responses.

In the narrative discussion that follows Table 3, for each soil management domain that emerged from the responses of Tahira and Bussura farmers to the interview questions (12) and scenarios (4), the number of interview questions represented in the narrative for each soil management domain is given. The number of references from men and from women represented is also given. This information complements that which is provided in Table 3. Translated and paraphrased quotes from respondents are also included in the narrative.

The order of discussion of Tahira and Bussura soil management domains does not imply that one domain is more important than another. The domain of human relations and resources, for example, appears to be a major response category while machinery and equipment was one of the least addressed soil management domains. Yet, both domains are considered equally important.

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Volume 1:

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Table 2. Suggested volume and chapter titles for a community sourcebook on soil management and conservation in Tahira and Bussura.

	Soil Management and Conservation: Agronomy, Society, Economy, and Religion (Dankitagol Leydi : Demal, Jamaa, Feere, e Diina)
Volume 1:	Agronomy (Demal)
13 chapters:	leaves and fertilizers (haako e angere) trees and grasses (ledde e hudo) soil properties and utilization (jikku leydi e nafa leydi) rain and water (ndiyam e ndiyam) landscape and topography (fello e aynde) tillage and cultivation (jasugol e rentagol) fire and burning (yiite e sunnugol) wild and domestic fauna (kulleeji e mummunteeji) crop rotation and fallow (coppi e fakkere) crop production and harvest (toore e wa'ugol) seeds and seeding (aawugol e sankugol) weeds and weeding (geenal e dulagol) machinery and equipment (juude e keri)
Volume 2:	Society (Jamaa)
4 chapters:	human relations and resources (tagaaße e aduna) tradition and habit (finaa tawaa e woowugol) knowledge and study (ganndal e jangugol) health and survival (cellal e nguurndam)
Volume 3:	Economy (Feere)
2 chapters:	work and labor (golle e golloo6e) money and markets (kaalis e luumo)
Volume 4:	Religion (Diina)
1 chapter:	Religion and spiritualism (diina e jinnaaji)

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Table 3. Cross-reference chart illustrating which soil management domains were addressed by the responses to each interview question.

	First-round interview questions												Scenarios			
Soil Management Domains	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
human relations & resources	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x
trees & grasses	x	x	x	x	x	x	x		x	x	x		x	x	x	
religion and spiritualism	x		x	x		x	x	x	x	x			x	x	x	
wild & domestic fauna	x		x				x	x	x	x	x		x	x		x
work & labor			x	x		x	x	x	x	x	x			x		x
leaves & fertilizers	x	x	x	x			x	x	x					x	x	
rain & water			x	x	x		x	x	x		x		x	x		
fire & burning	x	x	x	x					x	x	x			x		
tillage & cultivation	x	x	x	x		x		x	x							
crop rotation & fallow	x	x	x	x					x		x			x		
soil properties & utilization	x			x	x		x		x					x		
seeds & seeding	x						x	x						x	x	x
knowledge & study				x			x	x		x	x	x				
tradition & habit	x						x	x				x			x	
money & markets							x	x	x		x					x
weeds & weeding		x	x				x							x	x	
crop production & harvest	x		x					x			x					
landscape & topography					x				x		x		x			
machinery & equipment							x	x	x							x
health & survival							x	x			x					x
TOTAL no. of domains addressed per question:	12	7	12	11	4	5	15	14	14	7	12	3	6	12	7	7

First-round interviews

1. How does "good land" differ from "poor land"?
2. What does "taking care of the land" mean to you?
3. What does "ruining the land" mean to you?
4. What does "improving the land" mean to you?
5. What does "soil erosion" mean to you?
6. What does "land owner" mean to you?
7. What makes taking care of farmland difficult for you?
8. What would make farming easier for you?
9. What makes farmland valuable?
10. What does Islam counsel with respect to taking care of farmland?
11. Do your farming techniques and your parents farming techniques differ?
12. How do people learn to farm?

Second-round interview (scenarios)

1. Stearm and source drying.
2. Diminishing harvests.
3. Agricultural experimentation.
4. Agricultural credit.

Discussion

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Discussion of the soil management domains is organized around four of the seven "cultural factors" of soil management and conservation. These are the agronomic, economic, social, and religious cultural factors. Historical and political factors are included in the discussion of the agronomic, economic, social, and religious factors and their various soil management domains. The relative importance of the aesthetic cultural factor was found to be negligible.

In reviewing the results of interviews and participant observation presented on the following pages, one should be aware that the residents of Tahira and Bussura, considered together, are a community of farmers who represent a community of ideas about agriculture. Their perceptions and ideas presented here as soil management domains reflect the cultural bases of agriculture in Tahira and Bussura. These perceptions and ideas are the cultural bases upon which curricula for agricultural extension education could be developed for application to training programs, youth and adult education programs and texts, and agricultural development programs in Tahira and Bussura.

The essential point to understand in reviewing the twenty soil management domains that have emerged from interviews and participant observation is that the cultural basis for agricultural extension education in Tahira and Bussura is now documented. New knowledge can be built upon this cultural groundwork through information exchange that proceeds from how Tahira and Bussura farmers perceive and articulate key facets of their agricultural environment. Moreover, an agricultural extension education program in Tahira and Bussura, using these soil management domains as the basis for its curricula, would be owned by the community members by virtue of their input, rather than belonging to some outside agency or organization. Program activities would consistently refer to the input of community members such that educational experiences and products would be, in effect, home-grown.

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Agronomic domains of soil management and conservation

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This soil management domain, as discussed below, was addressed by respondents in 9 of 16 interview questions. The information presented below represents a synthesis of data from participant observation in addition to 121 references to leaves and fertilizers by men and 111 references by women as articulated during the semi-structured interviews.

Manure, leaf mulch, and organic matter were cited by nearly every man and most women interviewed as major determinants of good land versus poor land for cropping purposes. This is not surprising because, in the absence of commercial fertilizers, farmers depend upon various sources of organic matter for soil fertility on both ngesa and suntuure lands. Some soils are known to have more ñolu than others though both good and poor land is cultivated.

Grasses and trees are recognized sources of ñolu for the soil. The leaves of trees, especially of trees that grow thickly together, fall to the ground and become ñolu. Leaves are considered farmers' fertilizer (angere[111]). Corn and taro leaves left as residue on the suntuure after harvest can improve the soil as much or more than leaves brought in from the forest. One farmer pointed out that behind the houses of the villages grow tall grasses and large trees which, when struck high in their crowns, drop their dead leaves. When burned,

[111]The word angere is derived from the French term for commercial mineral fertilizer (*engrais*).

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these leaves become ño l u for the land beneath the trees. In addition, to augment ño l u in the s u n t u u r e soils, cornstalks are burned[112].

The application of leaf mulch is perceived to be absolutely essential to maintaining corn yields in the s u n t u u r e. The quality of c u n t u u j i soils is also a function of how long people have resided near to their s u n t u u r e due to frequent deposits of household debris (ñ o g u ñ a g a). For the s u n t u u r e, an indicator of whether or not there is sufficient ñ o l u is the relative number of "fingers" or branches (c a l d'i) produced on the taro tuber (j a a b e e r e).

Leaf mulch is called the soul (j i k k u) of the soil. The s u n t u u r e soil is accustomed to mulch, like a person habituated to eating rice but suddenly unable to do so, explained one respondent. Consequently, the person will never again feel satisfied, we were told. Likewise, a s u n t u u r e would lose its essential character if it were no longer mulched.

Leaves are thought of as "bushland fertilizer" (a n g e r e b u r u u r e) and additions of mulch and manure are seen as the only way to revive "dead land" (l e y d i m a a y u n d i). One farmer claimed that even a b o o w a l could produce a crop if enough manure was applied.

The application of leaf mulch (f o y u ŋ) is a matter of putting a lot of leaves on the s u n t u u r e soil and knowing how to use the leaves correctly. This is not a question of putting as many leaves on the s u n t u u r e as possible but of using the right species. All varieties of leaves are used as s u n t u u r e mulch but the best varieties are n g o o l a (Holarrhena africana)[113] and b o y l e (Uvaria chamae) because these decompose most rapidly. Other preferred mulch leaves are

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[112] This operation is usually performed in March or April, one to two months prior to planting corn. My neighbor children were given this task in the s u n t u u r e next to my house, an indication that people are oriented at an early age to the practice of burning. This practice is as much a means to clear the s u n t u u r e of crop residue (a hazard to barefoot women who work this land) that would interfere with planting as it is a method to improve soil fertility.

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sinja (Cassia sieberiana) and buube[114]. Adequate supplies of boyle and buube leaves are available in the watershed but fewer ngoola leaves.

Leaves used as mulch in the suntuure differ from those used as ñolu in the ngesa in that the former are largely left to decompose by themselves while the latter are burned. Young leaves (haakɔ waggo) are preferred as mulch because they decompose more rapidly than older leaves. Older leaves are less preferred as mulch because they decompose slowly and don't help the crop as quickly, and may even keep the crop from doing well[115]. Newer leaves, which decompose quickly, are more immediately beneficial to the crop and are thus preferred. Newer leaves will decompose in one month, we were told.

All leaves are valued, however, because they suppress weed growth. In the absence of sufficient mulch, as many as three weedings per season may be necessary[116] to prevent the weeds from "eating"[117] the crop. Despite the necessity and value of mulching, this practice is considered one of the most onerous of agricultural tasks, particularly by women.

Manure additions, like decomposed leaves and other debris, account for a dark soil color and improve the fertility of red soil. Red soil can be blackened with livestock manure because cows and goats eat grasses and leaves. The

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[114]The scientific name for buube could not be verified. One woman explained that buube seems to inhibit corn ear development as compared to other leaf mulches, although other farmers did not indicate this to be the case. One area for agronomic research might be to determine the most appropriate leaf mulch for corn production from among local and exotic species. Parameters such as tree and crop germination and growth rates, effects on insect populations, contributions to organic carbon, tree survival upon coppicing, and the like, would be worthy of investigation.

[115]This might result from longer periods of nitrogen immobilization due to a longer process of decomposition for older leaves as compared to younger leaves.

[116]Normally, one cultivation prior to seeding and a second cultivation prior to mulching, when the corn is six to eight inches tall, are completed. The first cultivation can be considered seedbed preparation. Conceivably, the second cultivation would not be necessary if the leaf mulch was applied early and thickly enough.

[117]The verb ñaamude, to eat, is the root word of the expression "eating (the crop)", used in this context to mean "outcompete".

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same effect on soil color and fertility is realized from manure applications as from mulching, but the manure effect is more rapid, as one woman explained.

> Manure gives life to the land because animals eat leaves and grasses that decompose in their stomachs. Manure is therefore even better than leaf or grass mulch because its effects are more rapid.

However, if the soil is very black from a great amount of ñolu, then grain yields will suffer at the expense of increased leaf growth. This is especially true for foñe[118]. For leaf mulch to fully transform red soil to black, three to five years of addition and decomposition of organic materials are required. Organic materials also help to thicken (deepen) the soil. Moreover, where there is more ñolu, soil is more friable (ɗaati).

A farmer can transform a peanut field into a rice field and then into a suntuure for corn production by digging in manure and leaves over a period of three to five years. One respondent told us of a rocky expanse of land near Dara Pelli that was once a boowal but is now periodically cut and cleared[119]. Years ago, someone's huuwooɓe incorporated a great deal of manure and leaf mulch into the soil at this site, rendering it arable. In Tesin, one farmer's once-rocky land was planted to kurakacce (Psychotria calva), whose roots grow in a horizontal form. Now this land is a productive suntuure.

Most farmers in Tahira and Bussura agree that leaf mulch and manure can be substituted for each other when the objective is to maintain the level of ñolu in the soil. However, these two materials in combination provide the best

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[118]Higher levels of nitrogen at certain times of the growing season will favor vegetative growth in most plants. At grain filling, a relative lack of nitrogen will inhibit grain production. Different crops behave differently, of course. *Foñe*, which is in the grass family, is perceived by farmers in Tahira and Bussura as more susceptible to excess leaf growth versus grain development due to a high levels of soil fertility than is rice, which demands soils of higher fertility .

[119]Land cleared for farming is also called soppuuru (pl. coppi), from the verb soppude, to cut.

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advantage to crop production. Manure and mulch are the common sources of ñolu for the suntuure, but fallen tree leaves and foraging cows are major ñolu sources for ngesa lands. Animals can be grazed on gese lands during the non-crop period to improve the land with manure additions. On suntuure land, manure also keeps soil from drying too quickly. Among the various manures available, goat and sheep manure are considered by many farmers to be best for crop production, in part because the smaller pellets decompose quickly[120]. Uprooted weeds and post-harvest residues are also sources of ñolu.

In the ngesa, rice adds fertility to the soil but foñe does not[121]. Where the land is "fat" (fayi) due to decomposing leaves from trees, the land is better suited for rice. The mulching of rocky ngesa land can even "fertilize the stones" and improve the soil, we were told, but this is rarely practiced, if ever.

The stream area of the landscape, which includes the dunkiire and the dantaari, is perceived to be better for grain production because there is more ñolu washed down from the hills. Likewise, the erosion of ñolu from hillsides is blamed for poor production on the slopes. On dantaari land where cicada-like insects (geegeɗe) bury themselves in the soil[122], the land is not considered to be suitable for farming.

Lower harvests in the naako as compared to a previous year would most likely be related to a lack of manure. In the sardin, yields are not often subject to decline thanks to the presence of ñolu. Soils can be hard in these areas but this condition is improved with leaf mulch and ash from burnt debris.

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[120]Perhaps differences in nutrient content between the various manures would make one or the other more appropriate for crop production. This is a question for agronomic research.

[121]There is debate in the agronomic literature on Fuuta Jalon as to whether foñe is a soil nutrient usurper or is simply able to thrive on soils that are quite low in fertility. Generally, the consensus seems to tend towards the latter opinion.

[122]We were shown this insect, which appears to be a large cicada about four to five inches in length, but were not able to verify that it resides in the soil. This insect was noted by several farmers, one of whom told me that children sometimes eat them.

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The importance of tilling surface ñolu into the subsoil is recognized. When the surface and the middle soil horizons (hakkeendi[123]) have sufficient organic matter, the soil will be fertile and most suitable for farming.

One informant noted that farmers used more fresh manure in the past as compared to the present but, with fewer cows today, more goat manure is used instead, placed right into the corn seed pocket at sowing. The effects of cow manure are not immediate unless it is pounded, pulverized, and turned into powder. Powdered manure and burnt leaves are spread after planting to speed fertilization. Farmers burn cow manure so that the ñolu is available right away but pounding is a more common practice. However, burned manure is as valued as powdered manure[124]. Manure is not applied to gese lands. The reasons for this are explained below by several farmers.

> On cleared land, leaves serve the same function as manure. There's not enough manure to put on ngesa land because there aren't enough cows and they're usually left to roam around. We could park the cows for two months or so in a given field as a type of corral (dingiray). When cows are left parked they urinate and drop their waste. One month's worth of two cows grazing in a field would provide enough manure for good crop growth for one cropping season. Another reason we don't bring manure to cleared land is because these lands are cultivated for three years at most[125].

In the past, people had more cows and manure but, today, the price of cows is prohibitively expensive for most people. There are also fewer cows today because the taxes in-kind on cattle during the Sekou Touré era depleted herds and, more recently, because of thieves. If farmers have only two or three cows,

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[123]The hakk- portion of this term is derived from hakkunde, meaning "between".

[124]Certainly, there would be differences in the respective chemical composition of fresh, dried, and burnt manure.

[125]This remark illustrates the key role of labor in soil management. Because certain gese lands are not cropped for more than three years out of ten, to use the labor to bring in leaf mulch would probably not be worth the time and energy, as it is for women on suntuure lands.

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they usually let them wander around on their own to browse and graze. If they have more than two or three cows, they may park them in a corral (dingiray), as was done more often in the past, so that the manure accumulates and is accessible to people for use. If cows are kept in a corral (dingiray) next to the hoggo, it is easy to obtain the manure. However, cattle are generally left to roam all over the hillsides searching for browse and pasture. Thus, there's not enough manure readily available for corn production. Other informants suggested that there is enough manure in total but that it is not distributed well.

Many farmers believe that if they had access to fertilizer (angere) for use where the soil is not fertile, this would make the suntuure as well as the cleared lands (coppi) more valuable. There is little angere available because people have no money to buy it, we were told. If angere was available, someone would have to show many farmers how to use it. At present, this is usually done by the seller. When asked about the chance of being bamboozled by fertilizer merchants, one farmer replied that people wouldn't buy angere if they weren't sure of what they were buying. Whoever sells people angere that is not good, he explained, is only hurting himself because the money won't serve him well.

One controversial issue is whether or not women would cease to mulch the suntuure should angere prove to effective in maintaining or increasing current yield levels. Angere might be used in conjunction with mulch, suggested some farmers, while others believe that angere could replace mulch entirely. Some women told us that if angere or herbicide were available and effective, they would cease to mulch because of the work and pain involved in this practice. Given a choice, many farmers said that they would choose angere over herbicide because they can always eliminate weeds with hard work. Others point out that if they had both angere and mulch available for use, they could

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take care of both weeds and ñolu in the suntuure at the same time. Several women addressed the labor issue associated with mulching as follows:

> Of the "10 plus 2" tasks that we have[126], bringing mulch material from the forest to the suntuure is the most difficult. If people who have studied (jangoobe) came up with something that would allow us to not need mulch material for our corn, we'd ask Alla to bless them without limit for the rest of their lives. Many of us would surely stop mulching if there was an alternative way to add ñolu and suppress weeds, the two functions of mulch. But, if we stopped this practice, many people would laugh at us and say we were asking for trouble.

Some farmers consider angere a good candidate for experimentation because they have not seen how fertilizer works and because there is little available in the area for farmers to try on their own. It was noted that some angere may be good for one crop and bad for another. That is, angere is crop specific. However, because farmers in the watershed are not too familiar with angere, they do not separate the crop-specific angere as much as they should. One respondent pointed out that if a person doesn't know very much about something such as angere, it's difficult to comment on it. The people who have traveled to Senegal to work have the most information about the benefits and limits of angere and how to use it.

trees and grasses

This soil management domain, as discussed below, was addressed by respondents in 13 of 16 interview questions. The information presented below represents a synthesis of data from participant observation in addition to 118

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[126]The phrase "10 plus 2" is an expression used to mean "numerous". Also used to express the same idea is the phrase "8 plus 10".

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references to trees and grasses by men and 69 references by women as articulated during the semi-structured interviews.

The presence of trees and grasses was consistently cited as an important criterion for discriminating between good and poor farmland. Trees and grasses are perceived by most farmers as vitally linked to soil organic matter and fertility. Respondents told us that to take care of the land means to leave the larger trees in place such that they "close together high in their canopies." Farmers believe they should never cut trees to the point where none remain, large or small. This perception is associated with the practice of relying upon leaves as a source of soil fertility.

As long as water or rain is available for their growth, trees are seen as a major source of life for the soil because they provide organic matter (ñolu) for fertility and shade to humidify the soil and keep it from drying. If the trees dry up, so will the land, believe Tahira and Bussura farmers. "Trees are the wealth of the land (ngalu leydi)," said one farmer. Another farmer explained, "When a tree seed sprouts and grows, this starts a cycle during which the soil will increase its strength, all because of the tree leaves which fall every year." One perception is that without trees there would be no falling leaves and no worms because worms consume the tree leaves that fall, according to some farmers.

In general, good land is perceived as land where trees and grasses grow well. The only more or less treeless land considered to be quite valuable is hollaande[127]. Trees and grasses give value to land but not all trees are the same. Tall trees indicate the best land. Where trees are numerous and have

[127] Hollaande (pl. kollaaɗe) is a clayey, lower slope, grassed meadow that is often considered to be pasture land *par excellence*. In the Dara Pelli watershed there is no hollaande, though one such land type can be found in the vicinity.

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thick trunks is good land. Where trees are stunted and scraggly or have bent trunks the land is not as good. Crops will mimic the trees. If the trees are tall, the crops will also be tall. Where smaller trees grow the crop planted there will be relatively small.

Despite the fact that women are directly involved with cutting leafy branches from trees in the forest environs of the watershed for use as mulch material, the suntuure soils that they cultivate are generally treeless, except for a few fruit trees near the houses. Where trees do grow within the suntuure, little or no corn is cropped beneath the canopy because of shading. Moreover, it is men, not women, who cut and burn trees to clear lands for both suntuure and ngesa production. It is not too surprising, therefore, that women would cite leaves, which are used for mulch material, but not trees, as determinants of soil quality. Men, however, work in the ngesa with the entire tree in the process of cutting, burning, and clearing.

To find suitable sites for foñe the first year after fallow, farmers look for small trees like buube[128]. For rice, where teli (Erythrophleum guineense) or yalegge (Vapaca togoensis)[129] predominate is good land. Other trees that indicate good land are barkehi (Piliostigma thonnongi)[130], ɗooki (Combretum elliotii), and kaajo (Syzygium guineense). Land where large teli (Erythrophleum guineense) is found is the best land, especially for corn. Poorer land is where pellitoro (Hymenocardia acida), sinja (Cassia sieberiana), and celen (Prosopis africana)[131] grow. Land with ngoola (Holarrhena africana)[132], pellitoro (Hymenocardia acida) and

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[128]Genus species undetermined.
[129]Also classified as Anacardium occidentale.
[130]Also classified as Piliostigma reticulata
[131]Note: It is somewhat surprising that Prosopis africana, a leguminous tree, was noted as an indicator of poorer land, unless this is a case of a good tree growing on poor sites.
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karukarunden[133] is good for foñe. Groves of buube and teli (Erythrophleum guineense) are good for rice but on these sites foñe will only produce leaves because of too high fertility. Where boyle (Uvaria chamae) is found, rice will at times produce only leaves, but other times will grow well. Such land, in most cases, is better suited for foñe. The land where kaafawaandu (Markhamia tomentosa) grows is poor for rice but good for foñe. Where there are kahi (Khaya senegalensis) and lenge (Afzelia africana), the land beneath these trees will not be as productive. There will be fewer worms in these places and rice won't grow well.

Teli (Erythrophleum guineense) is considered to be beneficial to rice production. Teli will not sprout back the first year after clearing and burning but will resprout during the second year after burning. Teli seeds mixed with the seeds of sunala (Harungana madagascariensis or H. paniculata), then broadcast seeded on denuded land, provides a desirable vegetative cover. In time, the sunala must be thinned so that the teli can grow.

Upland rice needs adequate soil moisture, moreso than foñe, agree farmers in Tahira and Bussura. The land beneath very thick-crowned trees is therefore not as good for rice because the leaf canopy reduces the amount of rain reaching the ground. Here, rice will grow thin and upright but won't produce a lot of grain due to insufficient moisture. This rice may sprout and ripen but risks dying or not growing as well as expected. Foñe likes the dantaari but rice grows poorly there because the dantaari has fewer trees and thus fewer leaves for ñolu. Plus, there is "too much sun" on dantaari land, a condition that favors vegetative growth over grain development[134], we were told.

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[133] Genus species undetermined.

[134] That (upland) rice produces poorly on the dantaari is perhaps due more specifically to soil type and available soil moisture due to "too much sun", as expressed by the respondent.

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If farmers want to clear land for a suntuure, they look for land with many trees and few stones, then plant peanuts first of all. Even for soils whose structure is somewhat cemented (leydi sattundi), if the land has trees growing on it, the crop will do well, believe farmers. Selective cutting, rather than clear cutting, is perceived to be the better management practice when removing a parcel of land from fallow for cropping.

Where many tree leaves are found on the soil surface, the land is considered to be good for a ngesa. When these leaves are burned the soil is improved, believe farmers. But if the land is burned too vigorously, it may not produce for at least one year. Farmers in Tahira and Bussura burn, among other reasons, because forest shade may keep crops from growing well. The government (laamu) advises people not to cut and burn at all and has been saying this since the time of Sekou Touré, to little avail. Some farmers cut a lot of trees for burning and some cut a moderate amount (ko hawri). Farmers in Tahira and Bussura believe that if trees are cut and the land is burned only on the surface then the crop will do well. On fallow land with many trees, the land will neither dry quickly nor easily burn because of the shade. There, animals rest beneath the trees and leave manure, thereby contributing to soil fertility and, ultimately, to the harvest.

It is generally agreed that, in the past, there were more trees to cut and therefore yields were better. One farmer clarified this opinion, suggesting that the actual number of trees may have been the same as today, but the trees in previous times were bigger. It is commonly thought that the forested bushland will never be devoid of trees because trees resprout by themselves. Alla is believed to provide people with enough useful trees. Some farmers suggested that, thanks to the fruit of the forest trees, a person could live in the forest and bushland for as many as 40 days without going home. In this respect, the total

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Farmers believe that the total elimination of trees by cutting is unlikely because every dry season, just prior to the rains, many new trees sprout naturally to replace felled and burned trees. However, farmers in Tahira and Bussura are, with some exceptions, of the opinion that cutting trees next to watercourses leads to stream drying. Deep pools of water in rivers are considered to be areas where there are or once were large trees.

> Trees and water go together. For example, in the morning where there are trees you see the dew on the grasses. Where there are no trees there is little or no dew.

One farmer observed that vast forests are located in the east and noted that rain comes from the same direction. He, like others, have heard people on the radio talk about the effect of deforestation and many farmers now believe that this is one possible reason for reduced rains. That the rains have diminished is one reason why farmers are now prohibited to cut next to the streams.

A counterpoint to the "trees bring rain" argument is that sometimes rivers just dry up without explanation, even when the trees next to them are left intact. Although some people believe that the cutting of trees has reduced the rains, farmers in the watershed note that they have cut a lot of trees in years past, for a long period, and the rains have only recently begun to decrease[135]. Farmers say they should have seen the effects of cutting on rain long ago if the "trees bring rain" theory was correct.

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[135]The respondent is perhaps thinking of an immediate cause and effect relationship between trees and rainfall rather than the long-term effect.

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We were told that when people cut and clear trees near stream areas they should leave a wide margin of trees next to the streams in order to shade the water for, when sunlight reaches the water, the water dries up. This exposure (ɯirtugoːl) could be a reason for the migration of sources, some believe:

> When there's no shade over the riverbed the sun rays dry the water and the proportion of mud to water increases. When trees next to the river are cut, this contributes to the accumulation of small debris (tippe) in the water, making the water more shallow, and allowing the sunlight to penetrate all the way to the water surface and dry it up.

Burning the bushland is seen to contribute to drying out large trees. Moreover, in cutting trees for farming next to the river, the leaves and the trees themselves fall into the water. The leaves decompose, become mud, and plug up the source. To verify this, a person can lift up the dead leaves in the water and see the mud beneath. For streams that are clogged with debris (ñogu ñaga), one can clear out the wood that falls into the river or don't cut next to the river for firewood but go further away to find and retrieve wood.

People who cut the trees next to rivers are those who need to cultivate to eat even though, one man noted, water is more important than grain for survival. Some farmers are perplexed because the Taybatawol stream runs through a forest gallery but has little water and there are streams with no trees at all but plenty of water. So, stream drying with respect to trees is an unclear issue:

> We do have confidence in what the Forey[136] says and much of what they say we believe to be true. But, some places in the rivers that dry up have trees right there. Nevertheless, at the Taybatawol, we can see how people have cut the trees out. Before, this watercourse was so covered with trees that, next to the stream, it was extremely dark.

136"Forey" means an agent of the Waters and Forests Service (taken from the French word for forest, that is, *forêt*).

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In any case, with few exceptions, trees that grow next to the streams are no longer cut and burned. Consequently, because rice was once cultivated next to the streams following the clearing of trees from these areas, people eat less rice than they did before. Just the same, a number of farmers admitted that when people need to farm in order to eat, or to earn money from the lumber, they cut trees. Even so, large trees are generally left to grow, and some farmers take the time to clear grasses away from their bases to reduce competition. To this regard, a common perception is that if trees are left to grow tall, or if more trees are planted, then the land where trees remain abundant will be more valuable:

> If we leave the forest intact or plant more trees it will strengthen the soil, but peoples' negligence doesn't favor tree planting. If the Forey would intervene, prescribe tree planting, and set planting goals for every year, people would work in order to respect the law. But, planting trees is not something that can be done in two weeks or a month. Even then, it's not always sure that tree planting will work because there are problems with animals, termites, and rocks. But, if the trees survive, and there's good will, people can water the trees in the dry season[137].

The person who (theoretically) would plant a tree on the boowal will share ownership of the tree and its fruit with everyone else. Similarly, ultimate ownership of planted trees anywhere would reside with Alla and the government, according to most peoples' perceptions.

Respondents told us that the planting of fruit trees makes the land more valuable. Fruit trees are also perceived as useful to society (jamaa) as food for avoiding hunger. In the past, there weren't as many fruit trees planted and that's one reason why people would then experience more hunger than they do

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[137]In fact, in Tahira and Bussura, once a year, deep into the dry season, a day or two is selected for watering the orange trees that are located around household compounds. This is a traditional practice and is generally the responsibility of children in the village, who bring pails and containers of water from the sources and streams to water the trees. The idea is to provide the trees with enough water to survive the final month or so of the dry season. In years when so-called "mango rains" come early and are bountiful, this practice of watering may be supplanted, as in 1989.

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today. Some respondents contradicted this opinion, saying their grandparents and parents planted more trees than people today. The middle ground opinion is that, in the past, people planted fruit trees but today even more are planted.

With fruit trees, people therefore have more to eat and the fruit can also be marketed. What people don't eat they sell and, with the revenue, they buy necessities for their families. Oranges bring a good price at the market but marketed oranges alone don't provide enough money for a family to buy food for a year. It is usually women who sell the fruit at the market.

The fruit trees are planted by men but women or children usually water them as needed. Oranges, mangoes, avocadoes, guavas, and bananas are usually planted as small orchards (tutateeri) near watercourses or near family dwellings where they can be more easily watered than if planted on distant, dry ngesa land. Plus, there is also the danger of fire damage to trees growing on ngesa land. Other reasons for not planting fruit trees on ngesa land are that the soils are stony and not particularly suited for good tree growth, and that no one resides on these lands and, thus, no one is able to keep watch over the trees for damage from monkeys and birds.

One respondent suggested that planting trees could even provoke streams to dry up, although this opinion is in the minority. A young farmer from Bussura had this experience with banana trees to relate:

> In our sardin, we planted some bananas at a time when there was no water at the site. Now, however, the bananas have grown up and the water has come back, thanks to the shade afforded by the bananas leaves. But, except for fruit trees next to the river, we don't have the habit of planting trees and, anyway, there's less burning now of trees. However, banana trees do seem to be able to pull up water from beneath the soil to make areas that were once dry, wet again. Any big trees can do this, in fact, for they keep the ground shaded.

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More people than at present would plant non-fruit trees but would first like to see if the trees are beneficial to cows. Tree leaves like lenge (Afzelia africana), bani (Pterocarpus erinaceus), cimme (Chlorophora regia or C. excelsa), and nonko (Ficus capensis or F. polita) are reputedly better for cows than are grasses. If people could plant grasses, as well, it would be helpful to livestock owners because today there are not enough grasses for cattle. Foñe is also readily consumed by cattle, especially younger plants. Local farmers once tried making silage but that attempt did not succeed.

Grasses, trees, and other plants are perceived to prevent gullies from forming on the landscape. Where severe erosion occurs, one can see the roots of plants left behind.

> Runoff can carry away leaves but it won't carry away grasses. Where no grass grows at all is precisely where the water runs off the most.

During the early part of the rainy season, near the end of setto[138] and beginning of ndunngu[139], is the time to go to the fields and observe where grasses are growing. Where grasses have grown and reddened[140] (wojji) the land is poor and won't do well. If the grass is green (6awlii[141]), that's good land. Should the land "lack courage"[142], the grass will yellow and dry. This indicates poor land, whether on dantaari land or on rocky land. Where there are clumps of grass every 75 cm or so[143] the land will be good.

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[138]The word setto refers to the rainy period that occurs in May and June, primarily.
[139]The word ndunngu refers to the period of heavier rains that occur in July , August, and September, and also into October some years.
[140]The term used in this context is wojji, from the verb wojjaade, to redden. For plants, in fact, wojji refers to a dried or yellowed condition.
[141]The term used in this context is 6awlii, from the verb 6awlude, to darken. For plants, in fact, 6awlii refers to a green, as opposed to yellowed, condition.
[142]The term used in this context, wakkilo, is derived from the verb wakkilaade, to be courageous and/or to persevere.
[143]The respondent indicated this distance with his hands and we estimated the distance.

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Different grass species are indicators of the variation in soil fertility, we were informed. As noted above, the crop will mimic the grass. If the grass is short, the crop will be short. If the grass is tall, the crop will be tall. Even on stony land this is true. Tambagangalon[144] and puki (Pennisetum polistachion)[145] are indicators of poor land for the suntuure. Where farmers find kiikalapurel (Ageratum conyoides)[146], they normally do not cultivate[147]. Mulch and fire will eliminate kiikalapurel. Other grasses which indicate that land should be put into or left in fallow are pompalegetere[148] on the dantaari, and foñe colli[149] on dantaari or dunkiire lands.

On ngesa land, janjalli (Eulosina indica) and kebe (Bidens sp.)[150] are indicators of good land. Land where fugulu (Hyparhenia rufa) grows is considered to be good land. Even land where puki (Pennisetum polistachion) grows tall with strong heads is considered good, especially dantaari land. In addition to fugulu (Hyparhenia rufa), other grasses that indicate good land are timel[151], kerke (Panicum sp.), and joban[152]. These grasses, known as "bush grasses", indicate that land is ready to be taken from fallow. Kudʼijiga[153] land is good for rice. Tunni[154] land is good for rice but also for sorghum and foñe. On the dantaari, one may find pote, a white material that appears to be a fungus. If present, grasses or a crop will sprout but not develop well.

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[144]Scientific name not available.
[145]Also Pennisetum subangustatum.
[146]Kiikalapurel means "old man's small hairs", which are generally white. This refers to the flower of this plant which is white.
[147]Kiikalapurel is an indicator for farmers to return land to fallow where this plant grows and leave it in fallow until there is no more of this plant growing on that land.
[148]Scientific name undetermined.
[149]Digitaria longiflora or Digitaria adscendens or Sporbolus pyramidalis.
[150]Also, Cenchrus biflorus
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[153]Scientific name undetermined. Literally, kudʼijiga means "buzzard's grasses".
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As for using money for experimentation with trees, one farmer wryly noted that money and experimentation really do not mix well, but if people find something that seems useful, as long as it doesn't tire them out, they'll try it.

soil properties and utilization

This soil management domain, as discussed below, was addressed by respondents in 6 of 16 interview questions. The information presented below follows represents a synthesis of data from participant observation in addition to 85 references to soil properties and utilization by men and 58 references by women as articulated during the semi-structured interviews.

There are three levels to soil, hooreendi[155] (topsoil), hakkeendi[156] (middle soil zones), and leydeendi[157] (lower soil zones). Hooreendi is often dark and hakkeendi is red or yellow. Good farmers mix these layers with their hoe to move ñolu and "vitamins"[158] into the red zone, we were told. Hakkeendi is good for crops and leydeendi is good for trees.

Dark (grey or black) soils are considered good and red soils not as good. Farmers say that poor land is either totally red-hued or has red soil mixed with black soil. A totally dark soil (black) color indicates good land and often has many worms. Suntuure soils, for example, are virtually always dark due to manure and leaf mulch, unless the suntuure is recently established. In this case, the soil will be more red than black, except perhaps at its surface.

The presence of small rocks in a thin layer of red topsoil indicates poor soil. But even rocky land that is black is productive. Red soil is usually thin and

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[155]The "hoor" portion of this word is derived from hoore, which means "head" or "top".
[156]The "hakk" portion of this word is derived from hakkunde, meaning "between" or "middle".
[157]The "ley" portion of this term is the word for "beneath".
[158]The informant used this term, borrowed from the French word for "vitamin" (*vitamine*).

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deep, black soil has fewer rocks than other soils. Thick (deep) soils are the most productive. Grasses and trees grow well on these soils and so do crops. If Thin soils yield grasses that will yellow early in the dry season.

Some farmers say that rocks beneath the surface of soil, or a lack of soil on the surface, or red soil with rocks and little grass, means that the soil has died. There are some areas where rocks have emerged, like on the boowal, although the boowal is not considered to be "dead". Red soil often has many rocks and doesn't produce well. Land called leydi woosu is often reddish, has many small rocks and few or no worms, but is not completely prone to drying. Crops such as peanuts or foñe will grow fairly well on this land.

Stones and boulders (feto pl. pete) located beneath but near to the soil surface tend to inhibit grass from growing. With many boulders in the field, we were told, what is planted will sprout but risks to not flower in some years. Corn that yellows near its base just after it sprouts indicates the presence of boulders near to the soil surface. However, if farmers manure and mulch these lands, the corn will grow well there.

If land has ñolu and is black then it's good for rice. If the soil is black, such as suntuure land, runoff water won't remove it easily. On the other hand, red soil is often degraded from runoff and is not usually thought of as very good land, even for grasses, although some red soil can be productive. For example, red soil is often found close to humid zones in the subsoil and as such can be good land for rice and trees. Normally, red suntuure soil won't produce well, however, unless manure is added for several years. If soil is yellow, like a match stick, it's essentially "dead", and will produce very little. Some suntuure land that is sandy is good for manioc (bantara).

Men moreso than women cited other soil properties than color, such as texture and structure, as elements for differentiating soils. The suntuure soils

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farmed by women, of course, tend to be relatively consistent in structure and texture from year to year. On the other hand, the soils of individual ngesa land, managed by men (and worked by women), are cultivated for only two to three years out of ten or more. These soils are likely subject to gross alterations in physical properties over several cropping seasons.

Black soil doesn't dry out as easily as red soil and is more friable, a noticeable trait when working with a hoe (keri). Some agricultural land is difficult to cultivate with a hoe but will nevertheless produce for as many as seven years. Other land is not difficult to cultivate with a hoe but will produce for only two or three years. Generally, good land is easily worked with a hoe and poor land is difficult to work. Black soil is usually easy to work.

During field preparation, farmers walk on dry land to see whether or not it stays in place when scuffed. If so, it's good land. Poor land moves when stepped on or becomes a cloud of dust. One elderly Bussura woman explained that where the hoe makes the sound "kese kese" when put to the soil, the soil will likely be thin and rocky. On the other hand, on land where the hoe makes the sound "jufu jufu", the soil likely is thick and productive.

After clearing ngesa land for the first year of cropping after fallow, farmers plant rice first and then plant foñe. This seeding order permits farmers to survey for birds on rice fields. Then, peanuts are planted. The roots of foñe tend to grow near the topsoil. Foñe likes black soil near the surface but it won't do well on really black soil, where the plant becomes thin and weak. Foñe reportedly produces only leaves when sown into very black soil but rice does quite well on dark soils, we were told.

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Foñe also withstands drought better than rice. Thus, near the river, on the dunkiire or parawol, lands that flood are good areas for cropping rice[159]. Where land doesn't puddle is better for foñe and peanuts. It was also remarked that a poorly drained field generally will not yield well because too much water can rot plants.

On the dantaari where sand (njaare) is found in moderate amounts is generally good cropland. But, in the dry season, the rocks and sand in the soil can seal together and become cemented. Dantaari land having a certain type of termite mound (leydi jengalle[160]) is not thick or good even when the grass fugulu (Hyparhenia rufa) is present, which is usually an indicator of good land.

Dunkiire land tends to be better for farming than dantaari land. The dark, humid dunkiire soil is productive, especially for bananas. Among red soils, the red dunkiire soils next to rivers are best. At these sites are two kinds of mud (loope): bodeeje, red and poor, and baleeje, black and good. Reportedly, only the rice variety banjul fello grows well on red mud soils.

The naako and the sardin[161] are located at the same landscape position, next to watercourses. Tomatoes, onions, peppers, and the like are grown in the naako but the sardin is for fruit trees. The naako soils are the blackest of all black soils and are, in general, quite productive. Where naako mud is red the

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[159]In the past, the technique called ■uki was in use. By this technique, areas close to the rivers were cleared. Then, the land was given a special fertilization technique in which manure and other debris were piled up and burned with the resulting ash and cinders spread around the area. According to reports, very good rice crops were realized with this technique. But, the colonial government discouraged the technique, believing that it was destructive to the soils and waterways. The prohibition of ■uki has continued today although similar techniques are used on a smaller scale for vegetable gardens (naakooji) and fruit tree areas (sardin) near waterways. These techniques are government sanctioned and promoted.

[160]A jengalle is a stool to sit on. Certain termite mounds resemble these stools.

[161]Although the term sardin is derived from the French word for garden (*jardin*), in Fuuta Jalon, sardin refers to bottomslope orchards where fruit trees are grown, while the naako is used primarily for vegetable production.

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land can support bananas for one or two years. Lighter colored soils (leydi daneeri) are also found next to the river.

Flat land is generally good land. Debris (piiti or tippe) is carried from steep slopes and hilltops by runoff, collects in bottomlands, and decomposes to become ñolu and black soil. Farther upslope, closer to the hansaŋere, the soil worsens in terms of its suitability for crop production.

If land becomes completely dry, like after three to four months of no rain, the initial rains of the season soak right in, we were told. Then, after the soils are saturated the rainwater runs off. When the runoff meets an obstacle downslope like a stump or line of rocks, it again has an opportunity to infiltrate. Too much rain may not totally infiltrate but will carry soil and seeds downslope. This occurs on the coppi, where the soil is thin and infiltrating water meets up with bedrock quickly and runs off.

Rain falling on the suntuure infiltrates and transports the ñolu down into the soil. The fence around the suntuure helps prevent erosion, it was pointed out, because runoff can't build up enough force by the time it reaches the fence, where it infiltrates. Deep tillage with a long-bladed hoe (sombere) is also seen to help infiltration in the suntuure. In any case, the suntuure is not thought to be very erodible because it is mulched each year which, along with the roots of corn and taro, keep the land in place.

Land where large tree roots are located is difficult land to farm. Rock-filled or stony soils are also difficult to cultivate. Local soils in Dara Pelli watershed are rocky and sloping and thus not favorable to machines and plows. Where the soil is hollaande, like in the Poopodara region, said one farmer whose relatives live there, plows can more easily be used,.

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rain and water

This soil management domain, as discussed below, was addressed by respondents in 9 of 16 interview questions. The information presented below represents a synthesis of data from participant observation in addition to 60 references to rain and water by men and 59 references by women as articulated during the semi-structured interviews.

Rain and water are seen as the power of creation (t ɑgoore doo l e). Without water life is difficult because water is necessary for all work. Even plows, which seem to work better when the soil is not too wet, will not help if there's too little rain. In general, farmers feel that there is nothing a person can do about the amount of rainfall in a year except to ask Alla for a good season. One farmer suggested that diminished rainfall in recent years is perhaps a consequence of "fewer water reserves in the sky today". For the most part, the phenomenon is considered to be the work of Alla and people are not able to know the reasons for why Alla acts. One farmer noted that because people don't really know what brings rain, it's difficult to determine what will bring rain back to previous levels.

In the past, farmers in Dara Pelli watershed were able to sow and cultivate for three entire months. Now, with the reduced rainfall, the planting period is 1.5 months. In 1988, however, there were a total of only 23 planting days:

> Rainfall, like many things, is less today than in the past. Before it would rain for seven to nine months, three to four of which would be nearly continuous rain such that we couldn't go outside. Women would have a difficult time cooking. Now, maybe it's like this for a month or so. It's written in the Book of History (d e f t ere t ɑɑr i i k)[162] that we'd have drought for seven years, then the rains would come back. Maybe this is happening now.

[162]This refers to the Koran.

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> In the river that runs through the dantaari we would once catch fish even during the dry season. ANext to the dunkiire where there was once water for playing in and for washing is now filled with wood and grasses. This is due to less rain and more drought and clear days now. Before, in the middle of ceedu, we could still find water in the streams where there is none now. The streams today are plugged up with debris. We would only go right here behind the hoggo to wash our clothes. But, these days, even the Taybatawol river dries up.

The Taybatawol stream was a constant point of reference in discussions with Tahira and Bussura farmers about how the rainfall and watercourse have changed in recent years. It was noted that the water in the Taybatawol is no longer contiguous during the dry season whereas, in the past, it would remain contiguous even when its water level would decrease. One man claimed that a series of droughty seasons which began about ten years ago significantly affected the water supply in the Taybatawol. Another said that the rains have decreased since about midway through the Sekou Touré reign[163]. A third person said that decreased rainfall began to occur about seventeen years ago (or 1971) and that seven years ago (or 1981) the rains began a pattern of earlier cessation at the end of the growing season.

In any event, rain makes the difference in whether or not a crop is good or bad. If it doesn't rain, which is Alla's affair, a farmer will not obtain much of a crop. Water is the "crop's mother" (neene toore) and the "mother of life" (neene nguuri). Thus, a crop growing in too dry soil can be expected to experience trouble with its development. If there's a drought period, or if setto goes by very quickly, there will be reduced harvests. This can occur anytime in the growing season. If, for example, the rains don't come on time, or leave too

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[163]This would be around 1970, which would coincide with the infamous Sahelian drought period of 1968-74 that so severely ravaged and altered life in nations to the north and northeast of Guinea, those being Senegal, Mali, Burkina Faso, and Niger.

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early, or are insufficient, or if there's a lapse of rain of 15 to 20 days, the harvest will suffer. An excess of rain may also cause crop production to suffer .

Some farmers suggested that a remedy for diminished rainfall is to begin work in the field early in order to be ready when the rains come and not allow weeds to outcompete the crop. But, even if farmers do their work early in the season, if there is no rain, they can't do much about the harvest. Just the same, Tahira and Bussura farmers believe that rain, hard work, good seed and Alla's help leads to a good crop, with one *caveat*, that the rains must be blessed (wonda e barke)[164]. The rains of 1988 were not perceived by respondents as being particularly blessed.

Because total rainfall has diminished in recent times, floods are now rare in the watershed, the last one occurring about five years prior to the field work (around 1983). When floods occur, they can remove what farmers cultivate.

Virtually all farmers in Tahira and Bussura agree that only the very heavy rains, rather than normal rains, are considered to cause runoff and to make rivulets in the landscape. These rivulets, ruts, and gullies in the suntuure or ngesa can be ameliorated or prevented by laying down lines of rock and stone (kot i) perpendicular to the slope, as many farmers pointed out. On ngesa land the kot i should not be placed too far apart, observed one Tahira farmer[165], because the closer the kot i to one other the less strength the runoff can build up to carry away soil, he said. This farmer also described some mechanics of the soil erosion process:

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[164]An indicator as to whether or not the rains for a particular year are blessed is the yield performance of crops.

[165]This particular farmer was growing rice on a steeper slope than any other farmer in the watershed, a slope of at least 60°. Yet, he had indeed laid down felled branches on the soil surface, perpendicular to the slope.

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> Raindrops (toɓɓe ndiyam) are the rainfall's strength. This can be seen when they hit the ground. If the raindrops hit leaves (baape) that cover the land the water won't even touch the soil. But, on the bare paths, if raindrops hit the soil directly, the soil will splash up[166]. We can see that the soil has splashed onto the plants on the sides of the path or on our feet if we stand there when it's raining. If the rain lacks such force the soil debris (piiti) will not be taken away, but will remain in place and be useful as ñolu.

The great majority (31 out of 40) Tahira and Bussura farmers whose responses comprise this soil management domain believe that adequate rainfall will inhibit streams from drying. Several of these farmers pointed out that at certain points along the streams within the watershed there is water all year, even during the dry season. Rain is expected to vary from year to year, however. For example, 1987 was considered a better year for rainfall than was 1988. Of course, farmers in the watershed do not use rain gauges to evaluate rainfall but primarily look at their crop yields to evaluate the growing season.

The drying of streams could also be the result of having too many leaves in the river. This condition renders the water shallow and makes it easier to dry during the months of no rain (ceedu). However, the deep pools of water (diidere pl. diide) do not easily dry up. Likewise, if a river is not deep, it will dry up quickly. Small rains tend to allow leaf and wood debris to accumulate in the rivers while hard rains, early in the rainy season, are viewed as vehicles for sweeping away stream debris. Some farmers indicated that if all the water in the watercourses and sources dried up, they could dig wells. But most agree that, because there is still adequate rainfall, wells are not yet a critical need.

The migration of water sources is also considered to result from diminished annual rainfall. For the problem of muddy streams and water sources, some say that rain augments the mud in the streams and sources while others believe

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[166]This remark refers to soil detachment and splash, initials step in the erosion process.

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that less rainfall means less stream water and, conversely, more mud in the streams and sources. In any case, periodic hand dredging is thought to be one way to alleviate this problem.

An excess of mud in the streams and sources is generally considered to be a seasonal phenomenon. Many farmers attributed muddy streams and sources to surface runoff from the hills during hard rains that carry soil downslope. This occurs, we were told, where farmers have neglected to maintain or put in place either giriinji or kotii.

One woman provided this anecdote related to muddy waters:

> One year, one day near the end of the rainy season, it seemed to rain mud, or water mixed with mud. It was a big rain and greatly appreciated by everyone. What really happened was that there was a lot of haze and dust (cullaare) in the air. The soil was quite dusty as well at the time. When it rained the water running off the leaves turned into mud, as did the dust on the ground, and that gave us the impression that it was raining mud. We still think of the day that it rained mud in Bussura.

Finally, one farmer explained that every year a noticeable decrease in water in the streams and sources coincides with the resprouting of trees[167].

landscape and topography

This soil management domain, as discussed below, was addressed by respondents in 4 of 16 interview questions. The information presented below represents a synthesis of data from participant observation in addition to 61 references to landscape and topography by men and 52 references by women as articulated during the semi-structured interviews.

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[167]This phenomenon is also observed in the dry Sahel region of West Africa.

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For the most part, surface runoff and erosion are seen as a threat to soil quality only on sloping land and rarely on flat land, except for the effects of floods or when considerable quantities of water run off the slopes with great velocity. On flat land, water tends to puddle and then infiltrate. Many farmers insist that there are sloped landscape areas that won't erode despite the gradient. In any case, because people need to eat, it's not easy for them to cease cultivating the hillsides. A remedy to this dilemma is the placement of kot i of wood or rock at intervals along the slope.

The forested bushland (l adde) is not perceived to be subject to surface runoff and erosion. On the other hand, the upper slope boowa l is widely considered to be a source of surface runoff because water spills off of the hilltops onto residential areas on the lands below the boowa l.

The hansaŋere does not experience a lot of surface runoff because of the small stones and rocks on these soils which facilitate infiltration, we were told. The suntuure, as well, is rarely subject to erosion. For dantaar i land, farmers claim to make drainage ditches on these landscape areas in order to direct the surface runoff water to the river. We observed this practice in some, but not all, dantaari fields. The naako is thought not to be subject to surface runoff and erosion because farmers water the vegetables by hand and thus have control of the water placement and force of contact with the soil.

Two farmers from Bussura explained to us their perceptions of the watershed system:

> The river and the sources are connected. The small rivers feed the larger rivers. The small rivers dry up during ceedu and, in turn, the water in the larger rivers diminishes. Likewise, if a source dries up so will the streams that flow from it.

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Streams and sources dry out because there is not abundant water in the underground river below the soil and rock, said some farmers. Consequently, the water atop this underground river has also decreased. Others suggested that water-borne soil running off the hillsides flows into sources and closes them up, making it appear as if the sources have migrated. When a source does dry up, the water often comes out of the hillside further downslope, but at times even this won't occur. Rarely will water flow again from a spot that has dried.

There were once two sources in Tahira but one was filled up by the effects of surface runoff. The people of Tahira placed large pieces of wood around the other source. Now, the runoff water flows around the lower landscape source, not into it. Likewise, about four years ago (1984) a source named Ɓunndu Teli, near Keete, dried up. However, Tahira and Bussura farmers who were asked about this phenomenon saw no apparent reason why this source had migrated because the area around Ɓunndu Teli had not been cut and farmed.

We were told that one reason rivers seem to dry up is because, when wood and leaves in the river stop the water from flowing, the water flows instead beneath the the leaves and wood, or it goes completely underground. In a similar fashion, the Taybatawol river comes out of the hillside upslope next to the boowal, goes underground, then again comes back out of the hillside downslope. The Taybatawol is the first river in the watershed to dry up each year. Older respondents indicated that very rarely would the Taybatawol be without water when they were young. It has been about ten years or so (that is, since 1980) that the water in the Taybatawol began to recede earlier in the season, as compared to the past.

We were told that the Bussurawol stream is muddier than the Taybatawol stream because there are more dunkiije soils next to the Bussurawol. The Taybatawol takes its source in the stony-soiled hansanere. There are also

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boulders (pete) in the middle of the Taybatawol, unlike the Bussurawol. Thus, because there is greater evaporation from rivers where there are rocks, these areas are quicker to dry out. Moreover, where the the riverbed is muddy rather than rocky, the water sits above the riverbed and does not infiltrate. On the contrary, water sources situated near or on top of rock do not dry up[168] .

There are two kinds of mud, each kind caused by the type of soil found next to the water, red mud and black mud. The red mud has been increasing and replacing the black mud little by little over the past ten years. The red mud is not considered very good because the water associated with red mud is not potable and it also reddens peoples' calabashes that are used to hold water. On the fello the soil is red and, consequently, the mud found there is red. Near the dantaari the soil is darker and the mud is therefore dark as well.

tillage and cultivation

This soil management domain, as discussed below, was addressed by respondents in 7 of 16 interview questions. The information presented below represents a synthesis of data from participant observation in addition to 70 references to tillage and cultivation by women and 39 references by men as articulated during the semi-structured interviews.

Working the land, a land evaluation criterion expressed by many more women than men, addresses the notion that land must be worked and put to use in order to be considered "good land". In this sense, idle land not in use is not good land, unless it is in fallow, which holds only for ngesa land. For

[168]Farmers in Tahira and Bussura tend to perceive a positive relationship between the presence of rocks and stones on the soil surface and infiltration.

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ngesa land, primarily worked by men, fallow is a necessary element of soil fertility in the absence of commercial mineral fertilizers. Most suntuure land, after years of tillage, mulching, and manuring, is primed for cropping and reliable yields, given normal agronomic practices and adequate rains.

The best way to know if land is good is by working it, claim most Tahira and Bussura farmers. It is widely thought that a farmer cannot simply look at land and determine that it is good or bad land without working it, except to note the presence or absence of trees and grasses. Moreover, only working the land can make a difference between good and poor soil. Farmers can work the soil and obtain either something or nothing but almost all land will produce something if it is worked. The suntuure is generally considered to be good land as a consequence of it being worked (and mulched) every year.

Farmers in Tahira and Bussura believe that if they work correctly, using their own strength (doole) and perseverance (wakkilaare[169]), they will obtain a good harvest. Any person who is courageous and who perseveres in their work (wakkiliiɗo) will harvest well, it is believed. Red soil can even be turned into black soil through courage and perseverance.

There is a strong, widespread perception, particularly among women, that by working the land using tried and tested techniques, one takes care of the land. This opinion reflects considerable confidence on the part of farmers in their traditional practices. The logic underlying this perception was expressed by one woman who noted, "If we work the land, we are taking care of it, and if the land is worked, it's being taken care of."

The idea that "not working the land ruins the land" is a very common belief among the farmers of Tahira and Bussura. To start work in the field and then to

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[169]Wakkilaare, which refers to courage, perseverance, and determination, is derived from the verb wakkilaade, literally "to shoulder (a burden)".

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not follow through in the best way known and possible is a sure method for ruining the land. To not cultivate, not plant trees, not build fences, not apply mulch or manure, and not weed, is a waste of time and effort and leads to the ruination of land. This, in turn, is equated with ruining the crop or, worse, ruining the people who depend on the crop for their food needs.

One farmer in Dara Pelli remarked with brutal honesty, "If we think the hoe will farm all by itself, we'll go hungry. We should either work the land or look for another occupation." There is a strong sense among the people of Tahira and Bussura that work is the common denominator for success and failure. It is a serious error against the entire community to not work if you are able. To not work in the fields is perceived as a source of discouragement for people who do work hard and, more importantly, is seen as depriving others of food. The only excuse for not working is poor health because physical capability plays a major role in food production. One farmer from Bussura noted, for example, that "deep tillage . . . requires strength and the deeper (we) till and cultivate the easier it is for roots to penetrate the soil."

However, working the land is no guarantee that certain plots will not be ruined. One must work correctly. To work correctly means to work as the elders showed their succeeding generations how to work and to be thorough and timely with field operations. Moreover, clean hearts and souls that harbor no malice or hate are also considered to be requisites to a successful harvest.

Several women noted that, of all cultivated land, the sun t uur e would at first glance seem to be the most vulnerable to ruination because it is cropped every year. That is, this is what would happen to n ge s a land if it were cropped for longer than three consecutive years. However, to the contrary, Tahira and Bussura women believe their soil and crop management methods ensure that the sun t uur e will not be ruined. They believe that not to work a sun t uur e for

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Whoever tills the soil is the owner of that land for as long as he or she farms it. When a person works a parcel of land and everyone sees and understands this, then he or she owns that land. The land owner is therefore the person who puts the land to use, makes the land valuable, and helps out his or her people.

Many farmers noted that, unless they are farming the dantaari (which has virtually no stumps or boulders), no field work is easy. But, for most farmers, if they don't work fello land they will have neither food nor clothing for themselves and for their families. So, farmers in Tahira and Bussura convince themselves that working the land is not that difficult, by necessity, even as bending over to cultivate is, in fact, painful and tiring.

fire and burning

This soil management domain, as discussed below, was addressed by respondents in 8 of 16 interview questions. The information presented below represents a synthesis of data from participant observation in addition to 71 references by men to fire and burning and 22 references by women as articulated during the semi-structured interviews.

Fire and burning are perceived as essential for farming gese lands. Even for growing foñe, which will thrive on the poorest of soils, fire is seen as a necessary requisite to acceptable yields. Nevertheless, most farmers recognize that too much fire can be a detriment to soil productivity:

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We must burn to some extent for the field to do well, but burning too much will kill the soil beneath the surface. If this happens rice will lodge. We wait until the first rains and the leaves of trees to sprout to burn for clearing fields. This year (1988) the early rains tricked us into thinking that s e t t o would pass quickly[170]. But an unexpected drought arrived and the extra heat encouraged too hot a burn[171]. Many spots were overburned, resulting in poor stands of rice with widely-spaced plants. We burn trees to improve the land but if we burn too much then the trees and their leaves will dry up, leading to a decrease in ñ o l u. If all the leaves are burned the soil will eventually disappear. We build firebreaks before we burn so that the entire forest will not be burned because when fire destroys trees it destroys our source of ñ o l u. If too much land is burned too often, the trees will die as will the soil creatures (k u l l o y l e y d i). Too much fire kills the useful trees such as nete (Parkia biglobosa) and k a a r e (Butyrospermum parkii). Yet some people destroy the land by burning too much even when they know that fire can hurt. We should burn with moderation. Although burning does contribute somewhat to the growth of grasses and weeds we try to avoid bush fires which degrade the soil and keep cows and goats from having enough to eat.

Overburning is perceived as one of the worst things that people can do to the land, especially if it happens frequently. Too much fire results in "dead land" (l e y d i m a a y u n d i) upon which little or nothing will grow. Most farmers in Tahira and Bussura agree that it is difficult to totally ruin land so that it dies completely, although they admit that overburning can result in a poor harvest for given year, especially for rice. On the other hand, they point out, to not burn n g e s a land at all will also result in a poor harvest. For each of these reasons, farmers try to burn only the leaves that accumulate on the soil surface and not the wood that is strewn on the surface, which burns hot and is liable to smolder.

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[170]We were told that the religious leaders in Taybata advised farmers about when would be the best time to burn. Numerous early rains in May led people to believe that the rainy season would be upon them early in 1988. This advice was followed but, as it turned out, farmers burned about two weeks too early. The burn was not followed by a rain, nor were the first seedings of upland rice. Even corn, planted on April 30th and May 1st, experienced difficulty from the three-week drought. In short, the religious leaders and the farmers guessed wrong. However, it is unlikely that the credibility of these religious leaders suffered much in the eyes of Tahira and Bussura farmers despite this blunder.

[171]The rains to extinguish the fire did not come as expected and the fire smoldered.

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In order to not burn the wood on the soil surface, Tahira and Bussura farmers generally wait for the seasonal rains to arrive before they burn. In 1988, however, nearly all ngesa farmers in the two villages concurred that they received untimely advice from the local religious leaders and jumped the gun on the rainy season, burning too early. This resulted in too hot a burn, scorching the soil in many places. The overburn did not affect foñe too badly but the upland rice suffered. Many farmers, in fact, replanted their rice in 1988 after it sprouted and lodged soon after.

Farmers in Tahira and Bussura seem cognizant of the detrimental effects of fire on trees, despite our observations of a number of large, dead trees on fallow land, casualties of either fire or insects. To a person, Tahira and Bussura farmers insist that they try to not let the larger trees burn, especially those with economic value such as nete (Parkia biglobosa) or fruit trees. As discussed previously, Tahira and Bussura farmers noted that the destruction of large trees leads to stream drying due to decreased shade over the water, and pointed out that streams usually take their source near large trees. Despite their caution with respect to fire and burning, farmers in Tahira and Bussura rightly believe that ash is a source of soil fertility, as well as a deterrent to insect pests when sprinkled on the leaves of low-growing suntuure crops such as black-eyed peas (cowpeas) or plants that are grown and used for sauces.

Tahira and Bussura farmers acknowledge that they use fire as a soil management practice with the idea of having something to eat in mind. They also are aware that too much fire can "kill" the land. "If we burn too much the soil will turn red from the fire. Our tradition tells us not to burn down into the subsoil. This kills the soil, dries the trees, and thereby destroys the land." The control of unintentional bush fires that burn leaves and grasses, sources of ñolu for crops, is also a way to "make the land live." The greatest fear is that

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wildfires will destroy grass-roofed huts and damage the suntuure. Farmers also perceive unburned bushland as beneficial to domestic animals.

Respondents said that farmers should not burn senselessly. And, as one farmer said, "Burning the land is not good unless it's done in order to avoid the necessity of stealing food to survive." Tahira and Bussura farmers give credit to the government's Waters and Forests Service for discouraging indiscriminate burning of forested lands. Many farmers recognize truth in the warnings of field agents that burning can be detrimental to productivity. Others are cautious with their burning practices on the basis of potential fines for fires that go out of control. The fine for this is at least 5000 Guinean Francs[172]. As one farmer deadpanned, "If you lose control of your fire the best thing to do is get lost."

As a final note, on the suntuure, cornstalks are burned to eliminate the crop residue (ñogu ñaga) for ease of tillage and cultivation. Manure is burned for more rapid decomposition and to have additional ñolu.

wild and domestic fauna

This soil management domain, as discussed below, was addressed by respondents in 10 of 16 interview questions. The information presented below represents a synthesis from participant observation in addition to 53 references wild and domestic fauna by men and 26 references by women as articulated during the semi-structured interviews.

Worms (ñirtoto) and the presence of worm casts (bu'e) were cited by a number of men and fewer women as good indicators that land is fertile and

[172]Approximately $10.00.

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suitable for cropping. Poor land is generally devoid of earthworms. On good land there are worm casts (bu'e ñirtoto) scattered on the surface. This is what the worms leave as waste, several respondents explained. The worms eat what becomes their bu'e and then they die. They turn over the soil. Soil is rendered productive because of worms but, just the same, both good land and bad land is farmed. Where farmers find worms the soil will be black even if it is rocky. This is good land. Worms and ñolu account for this dark color.

Land where there are few or no worms is better fit for foñe than for rice. Land where there are many worms is good for rice. One farmer noted that worms are not often found on the boowal where the soil is too hot and there is little for worms to eat. Other farmers added these observations about worms:

> Worms are found where there's organic material (ñolu). Trees attract worms due to the leaves that fall. Worms are commonly found during the rainy season or near water, like next to streams. I suppose we could raise worms if trees were present[173]. Otherwise it would be like taking a fish from the river and putting it on the hansaŋere.

Some insects and wild animals were cited as sources and causes of ruined land. Grasshoppers, for example, often menace the naako. Ashes sprinkled on the plant leaves is used as a deterrent to these insect attacks. Termites (gangooji or teriyaaji) are also perceived as capable of ruining the land. We were told that grasses growing next to a termite mound is an indication that the termite mound is inactive. Near active mounds, termites eat the roots of the sown crops or trees. Gangooji in particular attack corn and trees[174].

To not yoke cows and goats makes farming difficult in the eyes of some farmers because these animals can then enter through openings in fences

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[173]This response was given in reply to a question to one Tahira farmer about the possibility of raising worms and spreading them on agricultural land.

[174]Gangooji and teriyaaji are not the same termite. Their nests differ, for example.

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around fields and wreck the crops. If farmers work their ngesa land without fencing it at all, the animals will likely eat the crops. Should animals eat the crops early in setto there will be less damage and farmers should still obtain an acceptable crop. During dabbunde, however, right before the harvest after most of the season's work has been completed, it becomes problematic should an animal wreck the crops. In any case, said respondents, if farmers fence the fields to keep cows out and be on guard for monkeys that eat the crops, then they will do alright in terms of the harvest[175].

Other insights on the domestic animal issue were provided by two young farmers from Tahira:

> When cattle devastate your crop, it's difficult because we can't make the owners of the animals pay. These animals often belong to the local leaders and the Koranic school teachers (karamokooße), but we don't dare say anything. That's why it's difficult. This usually happens at night. We go to the fields in the morning to see if the cows have slept there, to see who the owner is. If the owners are from Tahira, they will pay, but if they're from Taybata it's difficult to make them pay. If it's your own animal that wrecks the field, of course, you can't reimburse yourself. If someone else's cow wrecks your field, however, you won't be able to collect as much from a fine as the value of the crop. It's useless talk to even try to collect damages in many cases. If your crop is wrecked by someone else's animals, you don't say much, for tomorrow it could be your animals that wreck their crop.

The people of Tahira and Bussura agree, in principle, that animals should be well guarded. In the past, many animals were parked and watched but today they roam more freely and are thus liable to wreck the fields. There are

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[175]We are rather surprised that monkeys were not mentioned more often than they were as a menace to crops, considering the time and effort that farmers, especially their children, would invest in keeping monkeys away from the crops. In Dara Pelli district, monkeys were quite numerous. Fortunately for farmers, monkeys do not come out of the trees at night to look for food. Thus, guarding the fields against monkeys is a daytime occupation, one that is often relegated to children (for those farmers with young children), just as for shooing birds from crops.

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problems with collecting compensation for damages done to fields, as explained by several farmers from Tahira and Bussura:

> Cattle owners don't readily pay us for the damage their animals cause in our fields, especially if we hadn't built a fence. Even if we fence some of us don't dare try to get money from the cattle owners from Taybata because so many people owe these people rent for borrowed land. In any case, if someone's cattle wrecks your field, it's considered to be jokkere endam if you keep quiet about it.
>
> Normally, in the rainy season, if you have animals you should watch them. But, given two people who have animals, if one person's animals wreck another person's crop, instead of forcing the cattle owner to pay, you should keep quiet, for tomorrow it might be your animals that wreck his field. Of course, the people with few or no animals are the ones who are really hurt with this type of convention.
>
> It's the farmers who did not fence the fields into which animals enter who are not practicing jokkere endam. The cattle owners are not at fault in this case.
>
> The law (sariya) says that one should pay 1000 GF, for either night or day damage, to the owner of a wrecked field. But we often arrange it between us to pay 500 GF[176].

It is widely agreed that, in the past, more herding and less farming was the norm. People had more cows in times past and thus more manure. Also, herders today travel a much more than previously to sell their cattle. As for raising livestock, domestic animals were herded in the past. Today there is much more open range management. In the past, as well, there were more head of cattle per livestock owner. It was not uncommon for a herder to have 100 head or so. Before, of course, the Fulbe did not farm, but were herders. Plus, they were more numerous than farmers. Today the opposite is true. If farmers need to take care of the animals then they won't have time to farm. Some people who have a lot of cows cultivate just a little if at all.

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[176]The 500 GF is approximately $1.00 and the 1000 GF is about $2.00.

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Streams and sources often become dirty or dry up because fences weren't built to keep out the animals. People should reserve a watering area for animals by piling up rocks or wood next to the river or source to keep the animals away from it, some suggested. When leaves fall and cattle move into the water, the animals mix up the leaves with mud and water and this moves even more leaves into the water and thickens the mud. Or, when cattle knead the dusty soil next to the water and it mixes into the water, it too turns into mud, and this is a problem. One Tahira cattle owner lamented that the rivers have dried to the point where the livestock don't have enough water to drink, and some have even died as a result. To this development, he implored, "May Alla protect us from having too much mud in the source!"

Animals are useful in many ways and are considered better than angere with regard to future security. Many farmers would buy animals with a loan before they would use the money to expand their fields because animals bring potential benefits while cultivation brings fatigue. Of course, animals obtained with loan money could die, a serious problem. Some people don't dare buy animals with a loan because of the risk of theft and illness.

Nevertheless, for every 10,000 GF[177] to spend on a sheep, the sheep can be sold for 12,000 GF[178]. Normally, a sheep or goat costs 8000 to 12,000 GF and a cow goes for 30,000 up to 70,000 GF. Thus, the sum of 50,000 GF is probably not enough to buy a plow and a bull, we were advised. But, with a female goat, in two or three years a farmer can have a herd of 20 head or so.

Even though goats have a reputation of dying more easily than sheep, they are considered more useful than sheep because people can use the goat milk for the family. The same is true for cows versus sheep. But sheep are more

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In general, an investment in animals is perceived to be more profitable than farming because with livestock a person can multiply both animals and money. However, not everyone has the God-given ability to buy cows and do well with the investment. To do this successfully a person must have a certain measure of luck (arsike). Otherwise, we were told, the animal may not reproduce well, if at all. "Some people buy a chicken and the next day it's dead". Many believe that Alla arranged it so that not everyone is able to make money work. Thus, only with Alla's compassion do an individual's animals not all die at once. Plus, one never knows when an illness (henndu)[179] will arrive to kill the animals. Thus, many farmers would prefer to use loan money for things such as their sardin, which is considerably less risky than animals.

crop rotation and fallow

This soil management domain, as discussed below, was addressed by respondents in 7 of 16 interview questions. The information presented below represents a synthesis of data from participant observation in addition to 58 references to crop rotation and fallow by men and 21 references by women as articulated during the semi-structured interviews.

[179]The respondent used the word henndu to speak of illness. This word means "wind" and is sometimes used to refer to sudden or unexplained illness that fall upon either people or animals. The idea here is that the illness is, in some way, linked to spirits transported in the wind or in the same, mysterious way that the wind moves.

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Fallow periods as a soil management issue was referred to by many more men than women who were interviewed. The fact that more women did not refer to fallow as a means for land improvement or as a criterion for land evaluation is not surprising because the women do not put the suntuure lands that they work into fallow, as do men for the gese they work.

We were told by many respondents that with repeated exploitation of a parcel of land the soil degrades. But, it was always noted, if land is left in fallow it will become better land. After two to three years of cropping ngesa land, farmers should wait seven to ten years before cultivating the parcel again. Meanwhile, the land will "come back." In the past, people waited as long as 30 years before cropping a certain parcel of land again but today there are too many people to have such a long fallow. Despite a common practice of seven to ten years of fallow, farmers feel that to leave the land in fallow for less than 10 to 12 years is still inadequate.

Several respondents made the following observations about fallow:

> We ought to leave land in fallow for an odd number of years, as opposed to an even number of years, but this rule is little respected today. If we cut and cultivate land, we should farm it and then leave it for 7, 9, or 11 years. Leaving land in fallow for 13, 15, or 17 years will be good for productivity, but 12 years is not good, because it's not an odd number of years[180].

This "odd" observation about fallow length is a fairly common perception among farmers in Tahira and Bussura. An even number of fallow years, particularly eight years, is undesirable and will lead to poor harvests, it is believed. This revelation was the most puzzling of all the information obtained

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[180]A number of respondents, all men, indicated that an even number of years of fallow will be detrimental to crop yields.

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in our interviews because no one was able to provide a definite answer as to why or how this belief was founded:

> Eight years of fallow is not a good number, mostly because the mawɓe said it wasn't. Eight years of fallow produces yields that are one-quarter to one-third the harvest of a seven-year or nine-year fallow. This knowledge is not written but is something that people discuss. It's like black magic (sirku), the work of devils, and we respect this rule out of fear that our ngesa will become a place of no harvest (horumba). However, this belief could be due to a lack of reflection and thinking by people. At Pilimini, for example, people would formerly insist upon using only odd numbers of cola nuts at baptisms. Now, people use 40 cola nuts at special occasions, whether a baptism, wedding, or whatever the ceremony.
>
> After a fallow of even-numbered years, especially an eight-year fallow, it's almost as if the field is not even there, or like there's something missing in the fields, as if something was skipped or is incomplete. It's like the years get in each other's way. We're not exactly certain why this is so. Maybe it's because of Alla. In any case, this is our tradition, and what the mawɓe told us, we follow.

Today, 11 to 13 years of fallow is the upper end of fallow lengths on hillside land after two or three cropping seasons. Farmers in Tahira and Bussura say that the reason for fallow is to allow trees time to grow back and provide ñolu to cropland via the tree leaves. However, the length of the fallow is limited by the number of people farming in the watershed and the subsequent lack of available arable land.

To not observe a fallow of at least 11 years encourages the growth of tall, competitive grasses to the detriment of crop yields. Conversely, to cultivate an area for too many consecutive years, seven or eight years straight, for example, is perceived as a practice that ruins the land and, therefore, the crop. However, on some dantaari land continuous annual cropping can exceed even these limits, as long as a reasonably long fallow period is maintained. Thus, for a

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general fallow length of seven to ten years, an individual who begins to cultivate fairly seriously at age 12 may farm a particular parcel of land for a total of four to six complete rotations (9 or 10 years per full rotation) during his or her lifetime under a rice-peanuts-f oñe-fallow rotation system.

Farmers in Tahira and Bussura say that there is such a thing as working the land too much. Four consecutive years of cropping hillside land (f e l l o) is perceived as too long. On the hills, the most recommended practice is to farm for two years followed by a seven or nine-year fallow. The cultivation period here should certainly not exceed three years in a row lest grasses overtake the food crop. Farmers say that they should leave the land idle until the trees grow big, then cut, burn, and put in k o t i to inhibit land from running off and eroding.

One man insisted that, in the past, farmers would cut and burn every year because there weren't as many people farming. At the time, he said, land was more valuable because there were fewer people and they could leave the land in longer fallow. One farmer noted specifically that fallow, not population *per se*, makes the land more valuable[181].

crop production and harvest

This soil management domain, as discussed below, was addressed by respondents in 4 of 16 interview questions. The information presented below represents a synthesis of data from participant observation in addition to 39 references to crop production and harvest by women and 37 references by men as articulated in the semi-structured interviews.

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[181]That arable land is scarce does not necessarily make it more valuable because the fallow is shorter and therefore the land is less fertile. That is, the value of land also depends on its use and capacity for production, which is no surprise.

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Crop production, or yield performance, was often cited as a criterion for evaluating agricultural land. The use of this criterion represents, in effect, a "post-facto" analysis of land quality. That is, if the yield was good, then the land must have been good, and vice versa. The same logic holds for poor harvest and poor land. Also, land on which the crop is develops well early in the season is considered good land.

On suntuure land, farmed by women, yields remain more or less consistent due to annual cropping on the same land using virtually the same agronomic techniques, such as mulching, and given an adequate amount of rain. Thus, women may not necessarily feel obliged to evaluate their suntuure land prior to cropping. Rather, they are more concerned about being able to complete every agronomic procedure in the corn and taro "production formula". Some women informed us in 1988 that they told their husbands not to count on them to work in the gese that year because their suntuure work was keeping them too busy. If yields on a given suntuure farmed for many generations suddenly decrease, with rainfall not a mitigating factor, a woman might then make a special evaluation of the soil within her suntuure. Otherwise, she can expect the soil to be suitable for corn and taro production year after year, a noteworthy agronomic feat for a continuous corn system.

Men, however, prior to planting in the gese, are obligated to pay close attention to such things as leaf accumulation on the soil surface, tree growth, the quality of a land-clearing burn, and the like, in order to sow the appropriate rice, foñe, or peanut variety in the correct place. Thus, for men, land evaluation criteria other than crop production may be more useful.

Different people know different things about the soil. Farmers use recall to know how fields produced in past years in order to evaluate whether the soils are good or poor. The quality and quantity of leaves of the crop itself indicates

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good land versus poor land. On black soil, for example, foñe plants will have many leaves but less grain. Farmers also conclude that the soil in a given field is good if the crop grown there produces a lot of grain relative to the area cultivated as compared to other fields. If the crop has a dark color (no ɓawli), not pale, then the land is considered to be of good quality. Where peanuts have been planted the land will normally be good, we were informed.

On suntuure or naako land, where crops or fruit trees don't wither during their growth period, these plots are perceived to be good land. On the suntuure, if the corn yellows after having been manured and mulched, the land is likely to be seen as poor. Farmers also judge suntuure soil quality during the dry season when the taro is unearthed and evaluated. If neither corn nor taro produce well then something is amiss in the soil because, even on good land, corn has been known to do poorly while taro does well.

Where corn leaves yellow early is often where too many sweet potatoes (putee) are growing alongside the corn. Once planted, putee is difficult to eliminate no matter how deep the tillage. As soon as it rains, putee sprouts. Such land tends to be drier than other land. This phenomenon can have negative effects upon corn growth and development.

Work input is thought to have a major influence on the harvest. If land is worked as farmers know it should be worked but they harvest little or nothing but fatigue and exhaustion, this indicates that the land is not very good. "We know the land is ruined if we work only for pain." The idea of "ruin" expressed here is the notion that if a person seeds and cultivates and works the fields just as they should but still do not obtain an acceptable harvest, they have perhaps ruined the land. The realization that crops may fail despite seemingly good rain, good seed, and good work habits leads people to believe that foul play (sorcery) can sometimes be a factor in poor harvests.

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In the past, farmers and their families would obtain better yields for their work, we were told by many farmers. Various estimations of the differences in yields between times past and today were provided by several respondents. Estimates appear to range from a two-fold to twelve-fold decrease in yields:

> Before, one koruŋ[182] would yield one to two debeeje[183] but today one koruŋ yields less than one debeere.
>
> Before, three koruŋji would yield three debeeje. Now, we need six koruŋji to get six debeeje.
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> They would sow one koruŋ and harvest 40 koruŋji. We now harvest from 10 to 30 koruŋji from one koruŋ sown.
>
> Then, 12 koruŋji yielded 12 debeeje but, now, just one (debeere).

In the past, the cuntuuji also yielded more grain than today even though, many believe, farmers didn't work as much before as today. A common perception is that, in the past, farmers were able to obtain more yield from less land because the land was more fertile. A widespread opinion is that farmers today work more and harvest less. To this equation is added the fact that everyone farms today, unlike previous times when the Fulɓe had serfs to farm for them, yet yields are still too low to feed everyone adequately.

seeds and sowing

This soil management domain, as discussed below, was addressed by respondents in 6 of 16 interview questions. The information presented below represents a synthesis of data from participant observation in addition to 42

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[182]A koruŋ is slightly more than one kilogram, and 40 koruŋji = one debeere.
[183]A debeere (pl. debeeje), technically a woven basket, is equal to 40 standard measures (40 koruŋji), or about 50 to 60 kilograms which, in a sack, is called one basagaare.

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Seeds and germination are used as land evaluation criteria by farmers in Tahira and Bussura, although these criteria are secondary to others. These criteria are usually used in a "post-facto" analysis. That is, if the seed doesn't germinate, then the land is not good. Most farmers who point to seeds and germination as land evaluation criteria do not blame the seed itself for poor viability. Some people even test seed prior to sowing although this test seems to be included in the actual sowing operation itself. If a fair amount of seed does germinate, but stand establishment is spotty, farmers tend to place the fault with the land rather than with the seed.

Perhaps this confidence in the seed is due to the fact that most Tahira and Bussura farmers produce most, but not all, of their own seed, except for peanuts, which are highly valued for use in sauces and are thus more often consumed than sold. We observed in 1998 that, because peanuts are the last crop planted during the cropping season, farmers tend to wait until mid-growing season to evaluate how much land and labor remains available for planting peanuts. Then, they determine how much extra peanut seed they need to buy.

Seed germination appears to be more of an indicator of land quality than of seed quality. If germination is not complete, most farmers say that the land is poor. Some respondents did suggest that, in some cases of reduced harvests, the problem may indeed be poor seed quality. The major evaluative measure for testing seed is to note whether the seeds germinate when sown.

Several farmers explained to us their views on sowing seed:

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> We do not sow too many seeds in one place. If we sow thickly, the plants won't form a good head and only their leaves will develop. The hansaŋere is not seeded in the same way as the dantaari, although foñe is cultivated on both types of land. On the hansaŋere we don't sow a lot of seed relative to the amount of seed sown on the dantaari. For the dantaari, we seed more thickly in order to outcompete the weeds which grow there more profusely.

Due to recent reductions in rainfall, some respondents suggested that farmers should plant more short-season grain varieties to take advantage of rains that are no longer as reliable as in the past. As for peanuts, harvests are perceived by Tahira and Bussura farmers as being on the decline in recent years. For peanuts to do well, we were told, they should be sown early so that they are harvested at the same time as or close to the corn harvest. To sow peanuts late does not seem to work well anymore, we were told. But, labor constraints appeared, in most cases, to inhibit the early planting of peanuts in 1988 in Tahira and Bussura. Short-season varieties of peanuts may help this problem though these varieties can be poor producers. In Dara Pelli watershed there are short season varieties available for every crop, including peanuts.

Most Tahira and Bussura farmers indicate that in choosing between fertilizer, herbicide, or seed for experimentation, they would choose to work with seed, first of all. However, many respondents indicated they would experiment with as many things as possible, including trees, because each of these inputs has its own utility and all would be intended to solve the same problem, hunger. Short season seed varieties are seen as a practical area for experimentation because there has been less rain in recent times.

In general, Tahira and Bussura farmers would try any type of seed if it were something they didn't know about already. Some said they would like to experiment with foñe seed before rice and that peanuts would not be a top priority. Foñe is perceived by many as useful for feeding the family because it is

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a better overall producer than rice or sorghum. One young man suggested that If farmers had two or three kinds of foñe seed to try out, they could plant different varieties in different places in different quantities in order to reap a stagger harvest. Or, for any of the crops planted in the watershed, farmers could try seed in different places or even change the order of rotation. On the dunkiire, instead of foñe, it would be good to experiment with rice followed by peanuts. These are some ideas of Bussura farmers.

Some farmers indicated that they would like to experiment with corn because it matures fast . As one young Tahira farmer expressed, a person in poverty looks for the quickest solution to remedy the situation and to feed the family. Corn fills that bill because it is the first crop harvested during the cropping season. For this reason, corn is widely perceived among Tahira and Bussura farmers as the most important crop. Corn is also the cereal used for special occasions and for fulfilling the obligation of the farilla.

Many respondents indicated that with a loan to experiment with seed they would first buy grain to eat, then plant larger areas with the extra remaining seed. If farmers could obtain seed to sow increased areas, foñe or peanut seeds are preferable because there is no extra land for rice, which is quite particular in terms of site suitability. For purposes of experimentation, there are several areas of interest for observation because, when a crop doesn't produce well, the problem could either be the seed itself, or the soil, or that the soil is not appropriate to the seed, or that the planting method is not good.

Most farmers said that, with a loan of 50,000 GF, they would buy seed, perhaps one basagaare (40 korunji) worth of seed (foñe). From this a farmer can generally expect to obtain nine basagaaje, remitting one and gaining eight. With a harvest of ten basagaaje, a person can buy an animal after eating half the grain and selling half. One respondent suggested that if

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seed bought on a loan was distributed among farmers, each person could remit some harvested seed to pay back the loan saving some to start over[184].

Buying seed every year for planting is a common practice in Tahira and Bussura, anyway. One respondent suggested that a good-sized loan would enable a farmer to double their normal seeding and use left over money for a work group (k i l e), or pay workers to cultivate a larger area than usual. It would take quite a field to use the entire 50,000 GF for seed alone, we were told.

weeds and weeding

This soil management domain, as discussed below, was addressed by respondents in 5 of 16 interview questions. The information presented below represents a synthesis of data from participant observation in addition to 32 references to weeds and weeding by men and 23 references by women as articulated during the semi-structured interviews.

Taking care of the land means not leaving weeds or crop-competing grasses in the field, plain and simple:

> We see differences in yields on the same soil by virtue of weeding or not weeding. This is worth repeating, that grasses stunt crop growth. The roots of weeds and the roots of crops are antagonistic, not compatible (ɗaɗi geenal e ɗaɗi ñaamateew weldaa).

The importance of weeding early and on time is universally reiterated by Tahira and Bussura farmers. For whatever reason except poor health, be it inadequate labor supply for the land area cultivated or extracurricular activities such as commerce, or negligence, to not weed is to ruin the land. Many farmers

[184]These are the fundamental principles of seed cereal banks.

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in Tahira and Bussura would likely agree with one farmer who said it would be better just to leave good land intact than to farm without weeding.

To not mulch the sun t uure is considered the ultimate *faux pas* with respect to soil and crop management on this land because of the weed suppression capacity of the leaf mulch. Weeds are thought to be a major pest to farmers in Tahira and Bussura yet its seeds are known as Alla's seeds:

> Alla puts the weeds in place and we put the crops in place. But Alla's seeds will always sprout and grow better than crops if not removed.

Weeding is indispensable to a good harvest. If farmers don't mulch well, they say, the weeds will be there in the sun t uur e to compete with the corn and taro. For ges e lands, if these are not placed in fallow when needed, too many grasses will grow and ultimately overtake the crop. To cultivate more than three consecutive years on han saŋ er e puts even the f oñ e yield at risk.

Many farmers in Tahira and Bussura have seen herbicide used in Senegal and believe it to be practical, as long as it rains. Because some farmers in the watershed do not have access to dan t aar i land on which to use a plow, the first experimental choice for many of these farmers would likely be herbicide. Herbicide[185] would reduce farmers' field labor requirements and could improve yields because weeds can easily wreck a crop if they are too plentiful:

> We'd choose herbicide over aŋgere, and aŋgere over short-season seed varieties, some of which don't produce well. The best seed is neither early nor late but sometime in-between. Herbicide would be useful in that it would reduce our pain of labor. Plus, for the time being, there is no herbicide here but we do have short-season seeds, at least for rice and peanuts. Moreover, if we had something to kill weeds, many of us might even quit mulching the sun t uur e, as weed suppression is the purpose of mulch (to be replaced by the herbicide).

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[185]Termed conn d i geen a l, lit., "weed (geen a l) flour (conn d i)" or "weed powder".

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The most commonly held view in the herbicide versus mulch controversy is that mulching is probably a wise practice even if herbicide was available. Nevertheless, many farmers said they would like to try herbicide without mulch just to see how it works. If the crop doesn't fare well without mulch, they would revert to mulch for weed control. Like farmers anywhere, the bottom line for Tahira and Bussura farmers is that weeds outcompete crops if not controlled.

machinery and equipment

This soil management domain, as discussed below, was addressed by respondents in 4 of 16 interview questions. The information presented below represents a synthesis of data from participant observation and 43 references to machinery and equipment by men and 9 references by women as articulated in the semi-structured interviews.

Farmers in Tahira and Bussura commonly acknowledge that a lack of farm machinery contributes to the difficulty of farming:

> Without machines it's physical strength with which we work. To work only with our hands is difficult. People who know, they understand that with plows and angere we could accomplish more in less time.

However, several respondents from Tahira pointed out that most soils in the watershed are mountainous, rocky and stump-ridden, places where plows are of limited use. Thus, farmers' choices with respect to farm machinery are limited. If all the cropland was dantaari and dunkiire, then plows would have greater use potential for more farmers in Tahira and Bussura.

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Some farmers, in fact, have already used rented plows on these lands. It was suggested that, even with only one plow shared among everyone, each farmer could use the plow when needed. Farmers said that one horse or two oxen or bulls would pull a plow. A plow could be used on land where there are small stones and stumps, it was claimed by some respondents. Plow operators can circumvent these obstacles if the oxen are trained correctly, they said. On the fello, it is widely recognized that such equipment would nevertheless be very difficult to use where rocks are piled up and where there are many stumps. Plows cannot be easily used on the suntuure, either, because there is always something planted there, like taro or manioc, even during the dry season.

In any case, enough farmers concur that equipment such as a plow would make it easier to farm:

> For one thing, we wouldn't have to bend over and use our hands to work. If we could get a harvest without having to bend over, that would be good. We can only work with what we have within our means. If we had the means to not have to work with our hands, that would be a good solution. There would have to be a way to obtain and maintain the machines, of course.

> If we had the option to work the dantaari rather than the mountains, then we'd try to obtain a plow and oxen. However, most of us couldn't obtain plows or oxen, anyway, because there's no money to buy them. One bull costs 50-70,000 GF. There are few horses around here, of course. Where the land is flat and smooth, machines like plows with horses or cattle would help. There were tractors here for two years during Sekou Touré. I was 15 years old at the time and don't know what happened to them.

> On the dantaari, a tractor would help for rice and foñe. Plows would help but they don't work as quickly as a tractor. The plow is also less profitable, some say. Before, the birgaad(s) of Sekou Touré brought a plow here and people were able to use it for two to three days at a time, though it was really intended for the collective.

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For experimentation, the plow is a priority. If a farmer would buy seed, it can be multiplied with use of a plow and angere. If Tahira and Bussura farmers could obtain a plow and bull and practice jokkere endam with others, they could make the loan work, we were told. Farmers could also rent a plow together or pay someone with a plow to work their fields.

Social domains of soil management and conservation

human relations and resources

This soil management domain, as discussed below, was addressed by respondents in 15 of 16 interview questions. The information presented below represents a synthesis of data from participant observation and 160 references to human relations and resources by men and 143 by women as articulated in the semi-structured interviews.

Because their lives are linked to the land, there is a general recognition among Dara Pelli farmers not to ruin it. An elderly woman from Tahira explained that whoever ruins the land ruins a friend because the land has everything for people. There is a common perception among the farmers of Tahira and Bussura that "taking care of the land" is a personal interest because their lives depend on farming. One farmer also pointed to the dependence of cities on farming, noting that prosperity across the land is a function of farming.

Some people learn certain agricultural techniques and knowledge from their distant voyages. Upon their return, other farmers ask about which new techniques may be worth considering.

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> We mainly have knowledge of farming because we are intelligent. If we're with people and follow what they do, because of our intelligence, we'll also know what to do. All obtained knowledge requires intelligence for to begin with.

Differences in perseverance (wakk i l aare) and differences in intelligence account for differences in the way people take care of the land and in the role of intelligence and knowledge for farming:

> In the past, it wasn't intelligence (hakk i l) that was important but perseverance (wakk i l aare). However, pain is a prerequisite to perseverance and today's spirit of having enough contributes little to accepting such perseverance.

> If we don't take care of what we plant we'll stay ignorant and waste our chances. Everyone has their own knowledge, which is like gold, and everyone uses their knowledge differently. Some people, more than others, look for what is useful in putting their knowledge to work.

However, ruining the land (ayb i ngo l l eyd i) is perceived not so much as damaging the land *per se* but as ruining the crop that grows on the soil, or ruining the people who grow the crop:

> Ruining the land is mere talk compared to ruining people. For example, if the people who organize a work group (k i l e) exploit their helpers, this ruins people. Or, if those who participate in a k i l e do so only to eat the food that is provided but not to work, they are no help. It's work that helps people. However, the idea of individual property and possessions dominates thinking around here. People may talk a lot about community solidarity (j okkere endam) but everyone more or less works for themselves. We need community consensus to work together for the common good.

Discouraging or pessimistic attitudes on the part of an individual towards others are seen as contributions to land ruination. Behavior such as telling others too strongly what they should and shouldn't do, or badmouthing a parcel

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Improving the land, or "making it live again" (wurn i t ugo l), are acts which help the community, such as being cooperative with others:

> The goal of our work is to help people. We transfer agricultural practices from parents to children with this in mind. This gives life to the land. Our parents, who were not merely farmers but cattle keepers, as well, followed these techniques.

Peace and harmony and the spirit of solidarity make farming easier. On the other hand, individualism is thought by many to be "the starting point for problems", and doesn't pay. If people help each other out, farming is easier. This includes assisting people who are sick and can't cut and clear fields.

What pays off for a community is to work to establish something that will endure. To accomplish this, a community needs three types of people, we were told: Farmers, herders, and those who have studied, either in Koranic school or government schools. If learned people (j angoo6e) would lend their support to Guinean farmers, we were told, they could tell farmers things which farmers don't already know that will lead to an improvement in farming:

> A community or society needs a good leader, someone who lets people keep what they earn. We need a leader who will take us forward, even if food prices are high today. If we could get our leaders to show us how to improve, farming would be easier. We'd agree with a government program to help us to obtain equipment. We could work together to buy or borrow the machines.

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Tahira and Bussura farmers would like to experiment with whatever could assist the community and help people to have enough to eat. One farmer suggested that people should ask the faamuuɓe[186] what to experiment with:

> All we know is that we should get out to do field work on time and to do our work correctly. We would do what the faamuuɓe advise but would get a second opinion as well, even though we do have confidence in what they say. We'd ask close family members about such advice for they won't try to trick us.

Another farmer observed that it wouldn't be easy for people to deviate from their traditional methods.

> Some people waver and change their opinion (woɓɓe wadʼa ko doñe). They say initially that something is a good idea, but then hesitate and say that only fools (jo fooɓe) are the first to try new things. For some people, new things are too risky to try or not worth it if they haven't seen them work or haven't used them already.

Tahira and Bussura farmers agree that assistance from external sources might help them to take care of the land. In acknowledging that each person has their own particular means (kala leggal e dʼowdi muŋ)[187], farmers said their harvests are intended primarily to feed their families. Though they would welcome advice from others on how to improve their harvests, many farmers in Dara Pelli watershed share the opinion that follows:

> Each government prior to Lansana Conté has worn us out, starting with the Portooʃe[188], who forced people to harvest rubber such that these people didn't even have time to work their fields. Today, collaboration with the authorities would be helpful, but the

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[186]The word faamuuɓe, people who understand, refers to those who have either knowledge of the Koran or knowledge of how to counteract sorcery and spirits. Some faamuuɓe possess both types of knowledge and information while some have one type or the other.

[187]Literally, "each tree has its own shade".

[188]The word Portooɓe refers to the colonialists (i.e. white people) and is probably derived from the Portugese word for "Portugese", who were among the first Europeans to colonize Guinea.

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government usually dictates to us what to do. We don't talk or ask questions. Plus, the elders (mawɓe) have the power, not the young people[189]. If the government said to put in soil conservation structures (koti), as they did before, we'd do it, because the government owns the world (laamu jeyi aduna)[190]. If people were united, we could ask the government to help us out. But people don't always agree on what to do. Just the same, some type of government program might help us to obtain other means[191] or it might facilitate the buying of our crops. Cotton, for example, could be bought by the government at a good price to us.

As for government-based information services, the Waters and Forests Service personnel tell farmers to not cut large trees[192] and to not burn the bushland during the wrong period or without official supervision. The Brigade (birgaad) system taught a few Tahira and Bussura farmers how to plow (which can be learned in two days, we were told). One farmer from Tahira observed that, in Senegal, government-paid extension agents teach people how to use non-traditional agricultural techniques. In Tahira and Bussura, people learn from their parents:

As children, we make mistakes in the field and the mawɓe laugh at us, but eventually we learn. We earn a lot from the mawɓe but there's a limit to what they can tell you in terms of information. There are many of us who wish that our children won't be farmers, but if we don't have the means, they'll farm like we do. It's difficult to lead children away from farming. If they could learn another trade, like woodworking, or mechanics, or sewing, this would be good, too. In any case, what we know we show our children, that's for certain.

Farming is difficult for some people because they can't leave farming for another occupation due to familial responsibilities. However, if everyone in the

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[189]This observation was offered by a 38 year-old man.

[190]The word aduna means "world". Laamu means "ruler" or "authorit(ies)" or "government", and jeyi is from the verb jeyude, "to own or possess".

[191]The word feere was used in this case. This term is most often used as a thinly veiled euphemism for money.

[192]Permits are required and issued to cut certain trees.

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community harvests a good crop, then farming as an occupation seems easier for individual farmers as well as for the community as a whole.

Consensus opinion is also perceived as a means by which to make farming easier. Farmers do consult with each other, sharing what they know to the benefit of everyone. Prior to the first year of cropping after fallow, for example, farmers collaborate and consult with each other on how to partition the watershed for clearing the forest, building fences, and burning cleared debris. However, one farmer claimed, "If we ask another person for farming advice they might not help us for fear that we will ruin them[193]." Others explained:

> Here, it's normally everyone for themselves but if someone finishes their work for the season they might help another person who hasn't finished. People might discuss between each other the issue of when to go to the fields at the start of the rainy season but we don't hold meetings to decide how to farm common land because there is none.

One young Tahira farmer, whose access to farmland was limited except for his sunt uure and one field behind his hoggo in addition to land available to rent, lamented about missed opportunities and the perceived lack of common sense among farmers in the watershed:

> We see monkeys in the forest having no problem finding food, yet some of us here don't have enough to eat. Although Fuuta Jalon is blessed, its people are cursed. Our selfishness ruins the land. People can plant fruit trees but we don't take advantage of this opportunity because we're not realistic. For example, a regime of bananas goes for 3000 GF[194]. For someone with 20 trees, the benefits are obvious. But we don't understand the benefits of planting trees because our parents (mawɓe) were naive. And, if you live with someone easily duped (jo fooj o) you become like this, too. Our great grandparents (mawɓe) did not even have mangoes, nor taro, which alone ease poverty and fatigue (t ampere).

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[193]This person is referring to the paranoia on the part of some people that certain individuals look for opportunities to use sorcery on others for no other reason than hate.
[194]About $5.00 depending on the exchange rate.

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Virtually all respondents indicated that they learned to farm as children from being close to adults and, as adults, from being close to good farmers. Parents take children to the fields, give them small hoes, and explain what is to be done, where and how. Little by little, explained one respondent, children begin to remember things about the fields on which their parents work. Soon the children are able to cultivate without supervision. With practice, people teach themselves so that they are continuously learning. In brief, experience and observations teach people how to farm for the most part.

One man from Tahira outlined a hypothetical situation in which a farming novice wants to learn to farm. He or she organizes a work group (k i l e) at which participants show the novice some fundamental operations, like sowing and hoeing, and leave the rest up to the individual's intelligence. To learn how to sow seed correctly, each person in the k i l e might try sowing and compare the distribution of sown seeds on the soil surface and then decide whose technique is better:

> Even harvesting has to be learned. Mistakes are often made when someone doesn't really know how to perform a certain operation. People should ask and discuss the operation with someone else who already does know. This method can prevent or clear up errors.

Tahira and Bussura farmers said that Islam teaches people how to cooperate and maintain community solidarity (jokkere endam):

> Community solidarity (jokkere endam) is the mother of all other duties. We should maintain community solidarity without having to buy it. In the past, there was more jokkere endam and more goodness (laaɓal) among people and less hate of others. In the past, people helped each other more than they do today. Most of us don't know why this has changed, it's just the world today. There's more cunning and deceit in the world today. Some of us don't have enough food to eat yet some of us have enough grain to sell. We

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> should help out those who have very little if we have anything at all. My need should be your need and *vice versa*. Islam doesn't tolerate selfishness. To take care only of one's own needs shows a lack of community solidarity. If we sell all of what we grow, just for our own personal needs, it's a waste. Everyone for themselves is not useful. We should be honest and don't cheat our neighbors, don't accuse or wrong others, don't trick people with either chicanery (jamfe) or sorcery (sohugol), don't think badly towards others, and don't hate or hurt one another.

Few Tahira and Bussura farmers disagree that the abundance of people in the watershed today is a factor in preventing people from obtaining sufficient harvests. Not only is there less land available today to farm but farmers have more people to feed. Due in part to the land problem, a common perception among adult farmers in the watershed is that, increasingly, young people look for money in the cities rather than work the fields for all or part of the growing season. Yet, we were told that the majority of those who look for work in the cities come back temporarily to work the fields, if not for the rest of their lives.

Because today there are more people than ever who cut and farm, all of whom have their family needs, it is important that people accept to not cut and clear areas next to streams and rivers. If streams should dry up, in addition to asking Alla for help (for it's Alla who brings rain), people would need to help each other more than ever. Unlike many places in West Africa, there is not a great tradition of well-diggers in Fuuta Jalon because people have had enough streams and sources to supply their water needs. Plus, the serfs of the ruling Fulbe, in the past, would suffer the pains of bringing water to their ruling overseers. Those in power rarely gave a thought to wells. Today, well-diggers reside in the cities and to enlist their service is quite expensive.

At Taybata, in fact, two wells were dug in the past. But, they were not dug deeply enough and are now abandoned. Nevertheless, residents of Tahira and

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Bussura recognize that wells are more useful than sources because they don't dry up as quickly. One woman noted that the leaders haven't helped people out in this respect. A possible reason why there has not been much action in the recent past with regard to well-digging is that, for the most part, only women and children retrieve water and their political voice is subdued.

Among their options for protecting watercourses and water sources, the building of fences around them to keep children from playing there or doing things that dirty the water is a possibility because filth in the sources is thought to cause sources to migrate. This filth may also result from people washing their clothes in or near the source, or from dumping dishwater into the source or stream. It was also the perception of a number of men and women that when women wash (in the streams or near sources) the clothes that they wear during their menstrual periods, this can cause sources to migrate because the spirits (j i n n a a j i) who reside there do not like this.

Some people are afraid of how the spirits (j i n n a a j i) would react if local residents would try to dredge a source of water. First of all, we were told, metal tools should not be used for this task but, rather, wooden implements or bare hands. The j i n n a a j i don't like metal, everyone agreed. When sources are dredged, it is the usually the task of older women past child-bearing age (y u m m i r a a ɓ e)[195], or of the elderly men (m o k o b a a ɓ e), who are also asked to build fences around the source to keep out animals. Most ideally, those people who like to have everything clean and in order (b e t e e ɓ e[196]) should delineate areas at the water sources where people wash clothes, obtain drinking water, or

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[195]Women of child-bearing age are called j i i d i r a a ɓ e.

[196]The b e t e e ɓ e are also the people who conduct circumcision and who wash corpses before burial. Their integrity is unquestioned by the community . People expect the b e t e e ɓ e to guard in strict confidence anything controversial they might notice about a corpse that would cause rumors to circulate or damage the name of the deceased in the eyes of the community.

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water animals. It is thought that young women of child-bearing age or women who have young children should not participate in the dredging of the sources because the jinnaaji[197] will desire these women sexually. It is thought that jinnaaji can ruin an infant's mind, particularly the infant of a woman pregnant by jinnaaji, which is considered a possibility.

One young farmer from Jam Weli said that even though many people try to attribute such things as decreased rainfall or dried up sources to jinnaaji or to Alla's work, he believes that Alla is for the good of everyone. He insisted that people make the difference in success or failure. There are some people, he said, who create problems with their egocentrism and selfishness, looking only after themselves. He suggested that fouled water in sources often results when people use poor techniques to draw water from sources. He used the example of people who don't take off their dirty shoes when they draw water.

Some farmers indicated that if they farm as they should but the harvest is not good, the problem could be due to something that the neighbors (kawtal) did:

> People should be careful, for others are capable of anything. Some people say that the fields sometimes don't do well because of a curse (sohu). Those who curse fields are sinning and looking to carry something with them into the Afterlife (i.e. looking for trouble). Sohugol is used because people hate. Thus, it is important to maintain good relations with your neighbors. We should just follow our joom[198] (Alla). We are honest people and can't know what's in other peoples' hearts.

The ability of some people to place a curse upon another person's ngesa land or suntuure, to the detriment of the crop, is a fairly common suspicion among Tahira and Bussura farmers. It's difficult to know if the ability to curse is

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[197]Also referred to as yimbe buruure, or "people of the bushland".
[198]The word joom refers to "owner" or "master" in this context.

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real or imagined, but this is how some people account for crop failure in the absence of other explanations. Those who believe in sorcery (sohugo l) note that its perpetrators are able to curse a suntuure simply by laying their hand on the soil so that the yield will be little or nothing. Preventive remedies (l ekk i) for curses may consist of a fetish-based ritual used in combination with verses recited from the Koran.

People also believe that a good harvest depends, in large part, on luck (arsike). Arsike is considered by some to be more powerful than wakkilaare. Someone with little or no arsike can work a lot and obtain a worse harvest than someone who is very lucky but doesn't work as hard. A person with arsike can give other people the fruits of their arsike, but cannot give others the arsike itself. Only Alla can do this[199].

As for borrowing money, a number of respondents believe that borrowing money is not good, that it retards the individual and may even send a person backwards. In some ways, said one woman, borrowing is like a curse because when a person borrows, in effect, they "work for" the lender. This, she said, is an endless cycle if the loan cannot be repaid. Thus, it can seem like someone who borrows money is a loser (a hudaado, a "cursed person").

It is quite true that people in Tahira and Bussura don't have very much material wealth to begin with and that they are often forced to borrow money. What is bad is if a person is obliged to ask over and over again for a loan. However, if people use their brains with a loan, they won't have to borrow very often, if even more than once, we were told.

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[199] Farmers often prefer a kile to other forms of farm labor, such as individual paid labor, because a kile offers good odds that at least one set of hands from the many people who participate in the various field operations on the day of the kile will be the lucky hands of an arsikenaado, and this will have a positive effect on the crop.

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It's alright to borrow, we were told, but people should not make a habit or career out of it. Nevertheless, if a person fails to repay a debt, he or she may not be arrested, of course, but they will look for somewhere to hide, and will ultimately be discovered. Everyone will then know what has happened and the person will feel ashamed. It's personally insulting to not be able to pay back a loan after an agreement has been made and after people have helped.

The terms of many local loans depend on what the parties agree upon. With "contact and convention", people begin to trust each other, "to dare each other" (suusindirde). But, if someone wants to help others, they should help others to not only climb up (ŋawude) but also to get back down (jippaade). People should not help others only halfway and then abandon in midstream those they have helped.

As for the proposed loan scenario, we were informed that, first of all, it is unlikely any lender in the area would loan 50,000 GF to someone from Tahira or Bussura. Second, this is too much money for just one person to borrow. The money would have to be distributed among several people, perhaps an association of people. If loan money could be used to collaborate with others it may be easier to use it for farming, if everyone was honest, we were told.

In any case, there are very few lenders in the watershed except those who operate among merchants and cattle owners. There are merchants who loan money for three to four or more months, mostly for cattle-trading. The benefits are divided between the lending and borrowing parties in several ways. They either split the profits, or all benefits go to the lender to use again, or all benefits go to the borrower for the borrower to use again, or some other convention.

Some people who have money to loan are perceived as hateful when they won't loan without collateral or a guarantee such as cows. Thus, in general, most lenders won't loan to just anyone. People in Tahira and Bussura would

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borrow more frequently except that only a nedᶑᶑo[200], a person in whom lenders can have confidence, has access to borrowing. Moreover, the fact that some people from Tahira and Bussura, in the past, have not been able to pay back loans discourages lenders, we were informed.

Some informants consider it better to loan to a good friend (njaatigii weldudᶑo) than to a hard worker (wakkiliidᶑo) because a good friend can help facilitate the way for another person to enter into a desirable Afterlife (laakara) upon their death. Even if a loan made to the friend results in losses, the losses may be worth it later if the good friend "pulls you up" into heaven.

It's difficult for a woman by herself to obtain a loan but if she does receive a loan she can use it in a way she wants. It's also not easy to obtain money for an investment from a family member, we were told, for there is always the fear and risk that the loan will end up as a loss. If the money is for an immediate need, that's another story. In these cases, family members usually help each other out fairly willingly.

Several respondents insisted that after many years of farming they have never seen farming make anyone rich and are not confident that it can. If a farmer has many mouths to feed but does not produce a lot of grain then most of the harvest will be used to feed the family with little left over. It's difficult to accumulate a surplus of grain because people need to be fed, we were told. But, the same children whom one feeds later help out with the farm work.

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[200]The word nedᶑᶑo, or ne'iidᶑo ,which technically means "a person", is sometimes used to mean an individual who is raised correctly such that he or she behaves and interacts with others in an exemplary manner.

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tradition and habit

This soil management domain, as discussed below, was addressed by respondents in 5 of 16 interview questions. The information presented below represents a synthesis of data from participant observation and 46 references to tradition and habit by men and 40 bywomen as articulated in the semi-structured interviews.

Experience and observation are important means for land evaluation. Both men and women referred consistently to the ability of farmers to study the land and determine its suitability for farming. Respondents told us that through observation and intelligence they are able to know what is good soil and what is not. Farmers' knowledge, it was explained, is the result of long experience and observation. Even so, sometimes farmers think a parcel of land will do well only to see it not produce much after all. In any case, the ability to know which land is good and which is not is a function of developing observation habits. Someone accustomed to farming learns to do this.

Because farmers in Tahira and Bussura start working in the fields at an early age they are able to learn a lot about traditional farming. Children learn that if they cut and sow early they'll obtain a better harvest. They may make mistakes when they are just starting to cultivate but they learn. With time and practice they become better and better at farming.

Farmers increase their agricultural knowledge by observing what they themselves do and what others do during the growing season. If they observe new techniques of potential value, they might try them. If it works, they stay with it, continue to observe, and make comparisons. Or, as one respondent remarked, "When we practice something that is not useful, we cease to use it."

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Above all, farmers in Tahira and Bussura learn to farm by using their hands. That is a consensus opinion. They learn by working every day in the fields. With practice, always in combination with observation and repetition, they understand and learn how to farm well. Through observation and practice, Dara Pelli farmers learn which practices are worthwhile and which are not. Their three-sided learning formula consists of inquiry, observation, then practice. By following this formula, farmers increase their knowledge of farming especially, one said, "if we are careful to do our work on time."

If farmers work their fields and are able to differentiate a good crop from a poor crop, then they will have learned something, we were told:

> We should first be good observers, then follow up on what we have seen. We watch, study, and are shown what to do. We go home, reflect on what we've seen, and think, then act. That's learning.

A more conventional, conservative philosophical approach used by many Tahira and Bussura farmers for learning agricultural techniques is this:

> No one does what they don't know how to do. We have the habit of farming and everyone follows their own habits. If we are used to doing something, we become good at it. If we work this year, bring in the harvest, and continue the same thing next year, we'll have learned something. If we cultivate, after the crop grows we'll have learned if what we did was good or not.

Virtually all arable land around Tahira and Bussura is cultivated (or in fallow) today. For this reason, due to their year-to-year observations, farmers in Tahira and Bussura learn to know how a given of land should perform under cultivation. If farmers observe a parcel of land that has produced well, they will consider cultivating near to that area at the next opportunity.

Many Tahira and Bussura farmers travel to distant locales, observe what other farmers do, then return to Dara Pelli watershed and try out the new

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knowledge. Many farmers in the watershed learned how to use *angere* in Senegal by observing others, for example. Some farmers saw people planting tree species like cola elsewhere, then brought the knowledge back to Tahira and Bussura, along with seeds, and began to plant. There are always new things to see, said one informant.

Farmers watch their crops and count the days from one activity or event to the next to keep track of which operation to complete and to evaluate the season as it progresses. Yet, when farmers obtain a good crop in one place one year but nothing at all in the very same place the following year, this does little for their understanding of the farming system. Some Tahira and Bussura farmers say they have noticed definite decreases in yields over the course of three to four years but that this makes little sense to them.

Nevertheless, there is no doubt that farmers in Tahira and Bussura, like people everywhere, are entirely disposed and motivated to learning more than they already know about farming.

knowledge and study

This soil management domain, as discussed below, was addressed by respondents in 6 of 16 interview questions. The information presented below represents a synthesis of data from participant observation and 41 references to knowledge and study by men and 23 by women as articulated in the semi-structured interviews.

Knowledge is seen by many people in Tahira and Bussura as a source of power and vision. Those who study are thought to add knowledge and power to the community. Most often, among Tahira and Bussura farmers, when the

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idea of knowledge and study is discussed, it is done with the Koran in mind moreso than the public school system:

> People who have not studied are limited in their options. Those who have studied have more possibilities. Who doesn't study, works. People don't rely enough on studying. They don't have vision. They don't see that that studying moves faith forward. If we want to be able to see things for ourselves, we have to be serious about studying (the Koran). It might make it easier for us if people who studied would help us with what they know, for they know what we don't.

There are three ways to study, with one's parents, with the Koranic school teacher, or next to intellectuals. If farmers and scholars would help each other it would make farming easier, it was suggested.

The majority of respondents whose responses comprise this particular soil management domain (knowledge and study) said that Islam advises people to study, either the Koran or in public school. The Koran should be studied so that people know how to act and how to teach others about Islam. If people study the Koran, along with praying and following the religion, then whether they work well or poorly, they'll harvest something, it is believed. Study is considered by many Tahira and Bussura residents to be a key to deliverance (k i s i yee), ease of life, and length of life. Studying is seen as a way to help move people ahead.

Some respondents said that, in the past, people in Tahira and Bussura weren't as smart or efficient as people today. Several people said that, in the past, people worked more than necessary. This particular analogy was told to us by two different people, a man from Bussura and a woman from Tahira:

> The mawße were like people carrying a load on their heads who, upon arriving at a hill that may be a short cut to the village, would put the load down and climb the hill first to see if the climbing was difficult, then come down and retrieve the load and climb the shortcut again, this time with the load on their heads.

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The opinion and analyses of several farmers, men and women, on the use of knowledge in peoples' work today are pooled and presented below:

> We still use the knowledge (ganndal) of our parents, but it's old and heavy knowledge. Today, things move faster and if we see something that is good we'll go for it. Overall, there's more knowledge today. Our parents primarily used physical strength in their work while we use intelligence. They worked well with their physical strength but didn't know how to use the means, which is the opposite situation of today.
>
> Our mawɓe's mawɓe didn't know that much. Today's people are smarter. Today we discuss with our mawɓe the principles of working but many of them have not been enlightened (ɓe finaa). They were and are more conservative.
>
> The mawɓe knew a lot of what we still don't know but they didn't know Islam that well, either from negligence or lack of practice. We study the Koran, they didn't.

Studying adds to peoples' general understanding (faamu) about many things. Studying and reading can help anyone, even farmers. Studying helps everyone. People who have studied may even know more about taking care of the land than farmers do.

> If we were in contact with people who have studied (the Koran or at the public school), we can learn what they know. Studying and interacting with learned people can always increase an individual's knowledge. Those who have studied can add to our knowledge because we cannot think deeply (men waawataa lugginde mijo). We only follow, as if we were blind. Intellectuals are useful for showing us how to move forward. We must work with those who have studied because, if a person studies even a little, whether at public school or Koranic school, it will help them to know how to work.

Some respondents felt that studying doesn't help a person with farming at all. Others indicated that a school could be useful to taking care of the land, helping not only students but the people who are near to the students.

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There is also mixed opinion among Tahira and Bussura as to whether or not the ability to read and write would help farmers to farm more productively. On one hand, writing helps people to communicate with others through the mail, but it doesn't help a farmer to farm. On the other hand, "reading and writing help people remove themselves from being blind to what has happened in the past and what is happening right now", said one person.

A number of younger farmers said they would like to study in order to learn how to farm better. Many would like to learn how to write, even those who don't see how the ability to write will help farming. One farmer suggested that it might be possible to learn farming from a book if a person reads the product of the interview discussions. Another believed that people who know how to read can learn farming from a book if they read about what is useful in farming. Many others say that farming can't be learned from a book at school, but that people must grab the hoe, follow the mawɓe, and be shown how to farm.

Intelligence is wealth, said an elderly man from Jam Weli. If someone is smart they can imagine something and then realize it. If a person's means (feere, pl. pehe) fail to make things better, then go ask an intellectual (joom gannda l) what to do, he insisted. Other respondents added that anytime someone studies it's helpful and always good for people, whether the writing is the Koran or for correspondence or something else. To read and write Pular can be useful, said an elderly farmer from Tahira, because people already speak this language and it's spoken in other nations. But, learning to write Pular would not be useful if French was neglected, as in the past[201].

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[201] During the Sekou Touré era, students in Guinean public schools learned for a number of years from curricula that were taught totally in national languages. This policy was quite controversial and unpopular for a number of reasons. The biggest complaint against the system, perhaps, was that it made it difficult for Guineans to compete with others who operated primarily in French. The pitfalls and positive aspects of this experiment would be a most interesting area of research. It is noteworthy, however, that one of our colleagues, Souleymane Diallo, recorded his interview notes entirely in Pular, a skill he acquired as a young student in Guinea.

health and survival

This soil management domain, as discussed below, was addressed by respondents in 4 of 16 interview questions. The information presented below represents a synthesis of data from participant observation and 30 references to health and survival by men and 29 by women as articulated in the semi-structured interviews.

There is no farming without pain. Simply to bend over to work is painful. But suffering and farming is what Tahira and Bussura farmers were born into.

The most difficult thing about farming is if an individual is in poor health. If a person's body is old, worn out, and not healthy, it makes it difficult for that person to work all of the time. Of course, if a person doesn't work, it's difficult for them to have enough to eat or to make their dutiful sacrifices (sadakaaj i). Although farming wrecks peoples' bodies, if farmers benefit from their work they can support the fatigue, we were told.

Some respondents felt that their life is easier than in times past and that they are able to buy more essentials, like clothes. Others said that the elders (mawɓe) may not have had as many clothes as people today but they had more to eat because they ate everything they produced and marketed very little. Some respondents thought that people today have more means and options than in previous times and that the mawɓe had more poverty and fatigue (tampere). Today, there's more food to eat during the rainy season.

Having the ngesa and the suntuure enable people to have more variety in their food, which makes things easier for women at home, unlike the past. Life is better now, many believe, because hunger was not an uncommon phenomenon in the past. Then, life was more confusing, said the most elderly

man in Bussura, who added that singing and dancing were peoples' major needs and concerns (haa j uu j i) in the past. Today, there are more mosques and religion is now peoples' principal concern.

Some, however, believe that people were better fed in the past as compared to today. Most people agree that, in former times, there was more and cheaper meat available for making sauces. Today, people tire quickly in the fields because they don't have enough to eat, especially meat and milk. Others believe that, before, people would live longer, and that today there is more illness (ñabbee l i) and less prevention and care (reenaare).

Some people have little or nothing or eat at the time of sowing so they borrow money to buy food to eat and reimburse later in money or nature. This practice is quite common and happens every year to a number of people. An average amount of such loans is 2000 GF[202] or so to buy enough food to have the energy to cultivate. Several people indicated that they would probably use a sizable loan to buy food because food is what they most need to help them to work better. People who are hungry can't work well noted a number of farmers. Corn is a cereal of preference for work energy because it endures yet digests well (kaaba yonkataa ka reedu) as compared to rice or foñe.

Because stumps in the landscape inhibit farmers from using plows, many people would buy food and goats with a 50,000 GF loan and organize a work group (k i l e) to cultivate a large field. In this case, a 50,000 GF loan would not be used entirely for a k i l e but also to buy food at a low price for food security in the rainy season. As previously noted, it is widely perceived that to take out a loan to buy food for the household during the post-harvest period (dabbunde),

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[202]About $3.00.

when prices are cheap, and buy enough to sell again during setto when the price increases, is a good way to make and save money:

> Because our first priority is having something to eat, we'd buy food when the price was low, sell it when the price is high, or make loan of it. But some people don't borrow during dabbunde because they have what they need. Or, they might borrow foñe when they don't have anything to eat, then pay it back later when they can. People borrow like this all of the time. And, if we buy a lot of food when the price is low, later there will always be people looking to buy.

The opinions of several other farmers with respect to use of a 50,000 GF loan for agricultural purposes are summarized as follows:

> Here, there's not a lot of money, but if we have a special need like a baptism or something, or if we run out of food, then we have to ask for a loan of food or money. We would indeed dare to borrow if we thought the loan would be useful. Many of us would orient a loan to the suntuure, which is very useful for having enough food to eat.

Economic domains of soil management and conservation

work and labor

This soil management domain, as discussed below, was addressed by respondents in 10 of 16 interview questions. The information presented below represents a synthesis of data from participant observation and 105 references to work and labor by women and 92 by men as articulated in the semi-structured interviews.

Farmers in Tahira and Bussura say, "Dewal ko laaw, desal ko laaw, demal ko laaw (i.e., religiosity and faith, marriage, and farming should be

realized early)". To not begin and follow through on field work in a timely manner is seen as behavior that leads to the ruination of land. To begin field work early is perceived as a way to assist crop development and growth. Weeding and fence-making are considered particularly important with respect to timeliness. Farmers recognize that other tasks such as house or fence building may inhibit a timely start to the cropping season but this reason should not be regularly used as an excuse for not working on time.

We were told that there are two kinds of means in life, work and laziness, and if farmers do their work well then the land will produce, as long as there is rain. There is no really such thing as bad land, some respondents insisted, because it is effort that counts. Only a lack of effort can hurt the land:

> At corn harvest we can tell who has been delinquent with their work and who has had character and personality (b e t e) with their work because, at that time, we can better see how the weeds have grown.

Respondents said they must work by the sweat of their brows, as Islam recommends, even if it is painful. Farming is considered by some to be one-half of a person's religious obligations. Everyone profits from a person's work and this is why work is important, according to Islam. People are guided by Islamic principles to follow through on their work, to work in accordance with their capacities, and not to depend upon others. This is how people survive and thrive. Otherwise, they will be parasites on society.

Courage and perseverance (w a k k i l a a r e) go hand-in-hand with work and, as many farmers indicated, "Alla helps whoever has courage and perseverance (A l l a w a l l i w o o w a k k i l l i i ɗ o)." W a k k i l a a r e is the character trait that compels an individual to work to the best of his or her ability. As one farmer pointed out, "The land doesn't ask us to work it. We have to go to it."

Work such as tillage, cutting, cultivating, weeding, and harvesting is difficult, all of it done in a bent over position under the sun. Farmers say they are obliged to bend over to work, especially people who farm neither the dantaari nor the dunkiire, where animal traction could be used. One Tahira woman noted that having to carry water, pound grain, cook, and perform other tasks, after having worked all day in the field, is quite difficult, but that women have little or no choice. Moreover, if a woman has a lot of work to do and no children around to help, it's especially difficult. It's also difficult when a person can't work their land alone and are obliged to pay others, or if someone wants you to help them and you can't or won't because of physical difficulties. In addition, the necessity of working every day during the rainy season without rest is difficult. Because of such difficulties, without the perseverance and courage (wakkilaare) required to keep working, a farmer is more likely to wreck the areas where he or she cultivates.

A commonly held view among Tahira and Bussura residents is that farmers too often "work a lot to obtain little". People believe that a comparable effort and amount of work today as opposed to the past reaps less today than it would before. The ratio of former to present grain harvests is about three to one basagaare[203] for the same amount of work, estimated one man.

After they finish their seasonal work, Tahira and Bussura farmers worry about their impending harvest. It's difficult for a farmer to have cleared land, worked hard, yet fail to obtain a good yield. When little or no benefit to hard work is the rule, it is painful. The fact that farmers now keep what they earn from their hard work is greatly appreciated. Informants said repeatedly that Sekou

[203]One basagaare is roughly equivalent to 50 to 60 kilograms.

Touré impoverished them with taxes. Yet, several respondents noted that, even today, farmers often sell the fruits of their labor at a loss:

> Because farming is our livelihood, the work is not bothersome as long as we get something for our efforts. But, if we sow and the seed doesn't sprout or if the grain doesn't ripen, that's difficult. Or, it's difficult if what we have cropped is destroyed or if we harvest nothing because the land was not fertile enough. This makes a person think about leaving farming, but we can't do this easily. In these cases, we must have courage and perseverance. It's important to have patience and accept the situation as it is. It's patience that pays.
>
> Even if we don't get enough money to buy a bicycle or a car, we usually obtain something to eat. This allows us to maintain our dignity. Farming could make farmers rich if they have a good harvest, enough to produce surplus money with which to buy animals. But, normally, farming won't make a person rich. After taxes[204] and buying necessities, especially food, there's not much left. We normally aren't able to farm enough to have sufficient food to eat all year, sell some of the harvest, and still have money left over. If we had cows, for example, we could trade them. But farming alone won't make us rich. If so, many of us would be the richest people around, as we've farmed a lot. A person just can't get rich off farming. No one has yet anyway. You don't see many huβeere[205] around here.

The periods of late-season weeding and the rice harvest are perceived as the easiest times during the growing season because the corn has been harvested and is ready for eating. These are the moments when the field work slackens so, even though there is work to do, this period is somewhat of a break. "Of course," noted one farmer, "when we finish working at the end of the growing season, then the farm work is very easy."

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[204]In Guinea, there is a household head tax of 2000 GF (about six dollars) on family members between the ages of 14 and 65. Only those people within this age range who are in good health and able to work are taxed. Of the taxes, 43% is returned to the *district*, and the remaining 57% is divided between the *préfecture* and the *sous-préfecture*.

[205]A huβeere is a cement block or cement coated house with a galvanized metal roof. A certain level of income or capital is needed to afford such a structure. In the watershed, there were two of these structures, one belonging to the family of the religious leader of Dara Pelli and the other to the family of the religious leader of Taybata.

Farmers in Tahira and Bussura recognize that, in times past, some people had huuwoo6e to do their farming for them but now everyone works for themselves. Nevertheless, most people cannot sow and maintain as large a field as they would like because the available labor force is low and not everyone is able to organize a work group, or k i l e. More money, animals, or foodstuffs would allow for increased hiring of labor for farmers to cultivate more land, or to organize a k i l e for this purpose.

> Today a k i l e is difficult to support. It definitely makes farming easier but we need food to feed the people who come to the k i l e. People are willing to "loan" themselves to you to help, especially in-laws, but you have to feed them for their work. As for hired labor costs, this depends upon the market and the cost is always rising. Last year it cost 300 GF[206] per person per morning, from sunrise to noon. This year it's 400 GF. We sometimes even have to pay as much as 500 GF for someone to sow and cultivate one k o r uŋ[207].

At present, in Tahira and Bussura, few farmers are able to afford extra field workers. Many respondents said that they would use a loan to pay people to work in their fields. To pay someone wages for field work is called s a s i. This is commonly used when a person falls behind in their work and has too much work to complete by themselves. People who need money to buy food or other necessities make themselves available for this kind of work, particularly in the periods when food supplies are low. In a s a s i, workers are paid a wage and given a meal, usually the first hot meal of the day (s o y y a a r e). One problem with this form of agricultural labor is that a farmer can't always be certain that workers will return the next day to complete a necessary task. The s a s i is

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[206] This is equivalent to about 50 cents.

[207] One k o r uŋ is roughly equivalent to slightly more than one kilogram of grain.

comprised of one or a few people for one day at a time while the other form of farm labor, a k i l e, consists of one day with many people working.

A k i l e is more common than a s a s i. For a k i l e, farmers spend money for food but they risk to not receive their money's worth because, we were told, some people come to the k i l e not to work but to eat. Furthermore, to manage a s a s i effectively is not a skill that all farmers have. For a k i l e, management consists of women cooking food and men working in the field.

Some farmers say that a k i l e is often preferable to a s a s i because farming tasks must be completed in a short period of time, often in one day, or be followed up on a daily basis. The cooperative nature of a k i l e facilitates the completion of agricultural tasks in a short time period, like a day. This is especially true when different crops begin to ripen at the same time, like corn and some peanut varieties. A k i l e also can be better than a s a s i because with many hands doing the work, as in a k i l e, there's a good possibility that some of the hands in the k i l e would be blessed (w o n d a e b a r k e), thus giving an extra advantage to the crop. Moreover, a k i l e can be better than a s a s i because the work is completed more quickly. But, with a k i l e, farmers may spend more money on food and cola nuts than they would for a s a s i.

We were informed that a k i l e costs a farmer about 1000-1500 GF[208] per person. In the past, farmers would do such things as slaughter a cow to provide sauce for 200-300 people to cultivate a lot of land in one day. But such practices have ceased because people don't have the animals to spare.

A s a s i can be less costly than a k i l e, in some cases. The present labor rate for sowing and tilling in a full k o r u ŋ of seed ranges from 200 to 1000 GF[209], depending upon what is negotiated. The harvest wage is negotiable. The

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[208]About $1.50 to $2.50.
[209]About $0.30 to $1.50.

wage for hauling foyuŋ from the forest to the suntuure is reportedly 100 GF[210] per head full of leaves.

With a 50,000 GF[211] loan to pay for labor, some farmers would place more land under cultivation, perhaps with a kile futu (a kile of in-laws). The loan could be used to quickly complete three major field operations or twice buy a goat for sauce for a kile futu. One farmer estimated that 25,000 GF[212] is enough for one year's worth of field work. Another farmer indicated that a work group of five or so people (ballal) would not cost as much as a ten to twenty person kile, which would cost about 3000 to 4000 GF[213].

money and markets

This soil management domain, as discussed below, was addressed by respondents in 5 of 16 interview questions. The information presented below represents a synthesis of data from participant observation and 55 references to money and markets by men plus 47 references by women, as articulated in the semi-structured interviews.

We were told that more money would resolve a lot of problems. However, the only way to earn money in the countryside is to sell crops, and that won't earn much. The other possibility is to leave farming and enter into commerce. Commerce is widely associated with prosperity and most farmers believe that only commerce can help a person earn money, not farming. One informant noted that farmers are money users, not money makers, and with a loan would

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[210]About $0.15.
[211]About $100.00.
[212]About $50.00.
[213]About $5.00 to $6.50.

use all or part of the money to buy food or seed. Thus, in order to make a loan work, farmers would have to enter into some level of commerce with the loan.

If it were possible to work for money while farming that would make farming easier, said a number of respondents. On the other hand, one woman noted, "Money won't make farming easier unless it's used to buy plows." However, if people don't farm at all then they'll need to have money to buy essentials, especially food. If a person has a place to work, the means with which to work, and they have studied, then they can farm and manage well and obtain enough money for their expenses, we were told.

A common opinion is that if people had money to pay for a work group (k i l e), this would make farming easier. "If we had money we could pay people to work the d a n t a a r i , or rent a plow." However, the central problem remains a general lack of money to pay others to do the work. The bottom line is that life will not be easy for whomever doesn't farm very much unless they obtain enough money to buy food to complement what they do grow.

A modern lament was echoed by one Bussura farmer who said, "Today, everything is for sale." In the past, life was perhaps better because people had more milk and butter to consume even though there were fewer places to sell these items. The negative effect of fewer markets in the past was that people were not pushed to produce a surplus, we were told. In the past, people bartered for such items as salt because they had no money. Just the same, people were once able to make more money selling the same amount of food or even less than is sold today. Now, because of bigger markets, the prices of goods and foodstuffs are higher, suggested one respondent.

Borrowing and lending exists in Dara Pelli district but it's difficult for people to obtain loans because money is a scarce resource. For this reason, many young people go to the cities to look for work and money. Only if there are no

other possibilities would most people resort to a loan. Not a few people feel that "borrowing is close to stealing (Fayda ñamaande ßadike nguyka)".

Some people don't borrow because the prospect of not being able to repay the loan is frightening. One elderly woman said she never borrowed more than 100 GF (about 15 cents) in her entire life. The repayment of a loan in-kind, with seed, is thought to be easier than repaying with cash. But, with 50,000 GF (about $100.00) invested in animals, a person can earn 70,000 GF to 100,000 GF at the end of two years and easily pay back the loan, one man figured.

If such a 50,000 GF loan had to be repaid with money, then inputs like angere, herbicide, or the plow, or whatever might help farmers to improve their harvests would be a good place to put the money, some suggested. In these cases, farmers could sell some of the harvest to pay back the loan. If a person takes money on loan, they should do something that will produce money, we were advised. If not, and they can't repay the loan, it is sinful (ko harmee). One woman from Tahira said that her policy on loans is not to take one unless she owns something of value, like gold or silver, that could be used to repay the debt if needed. Her belief was that more people should follow this rule.

One young farmer from Bussura explained to us his strategy for using such a major loan for farming purposes, as our scenario proposed:

> I would divide up the money and use it in different ways. I would take part of the loan and use it for farming. Part of it I would save in case the lender wanted it back. I would use some of the money to buy animals, a sheep or a goat. This would provide me with something to use as collateral, or to use as a (meat) sauce when the lender comes to visit. In time, I could sell the animals to obtain more money or to buy food, if needed. Another part I'd use for commerce. Thus, I would have three or four options for using the money to help me avoid the shame of not being able to make the money work on just one scheme.

Another man and a woman from Bussura explained their perceptions of borrowing money, as follows:

> It's not a curse to need to borrow. If a person doesn't have what they need, they borrow. We don't often borrow, however, because of a lack of means to repay. We only work with our hands and this is a limiting factor when it comes to production. If we don't produce enough we can't be sure to have enough money or food to feed our family. Thus, if we need money or food to pay back a loan, we could be in trouble. Some people don't borrow because there's no crisis to solve. They're not totally hungry and do not need to borrow.

With this kind of money (50,000 GF), a farmer looks for things to sell because they cannot receive that kind of return just from farming. If they buy things to sell, they can still farm, but not as much. Most respondents, the majority of them women, said that with 50,000 GF, a person could buy merchandise to sell, like soup, salt, gas-oil (diesel fuel)[214], or other useful items that people need and like. Many respondents said they would buy grain at a low price and sell it high.

Finally, it is thought that people who loan money ask for interest if they don't fear Alla while those who do fear Alla won't ask for interest.

Religious domains of soil management and conservation

religion and spiritualism

This soil management domain, as discussed below, was addressed by respondents in 11 of 16 interview questions. The information presented below represents a synthesis of data from participant observation and 87 references to

[214]Diesel fuel is used for small houselamps in Tahira and Bussura.

religion and spiritualism by men plus 74 references by women, as articulated in the semi-structured interviews.

A prevailing perception in Tahira and Bussura is that Alla is the ultimate owner of the land, because the land is Alla's creation. The government, however, is a close second with respect to land ownership. At the same time, whoever is working a particular parcel of land at a given point in time is considered to be the owner, at least until he or she ceases to work that land. The land is considered to be entrusted to people by Alla. One respondent added that this is especially true with respect to people in power.

> Alla created Adam and Eve, the Earth, and Human Beings, so Alla and no one else owns the land, unless we count the person who works it, uses the production, shares it with others, and makes dutiful sacrifices. But Alla is the supreme land owner, and this takes precedence over everyone else, except for the faamuuɓe[215]. Alla owns the land and people only take the benefits from it. Though Alla is the true owner of the land, some people pretend to be landowners and talk as if they own the land. Alla says that people should support others, but altruism doesn't always exist in peoples' hearts.

Though opinion differs as to who owns the jinnaaji (spirits) land, most people believe that Alla and the jinnaaji share ownership of such land. Some farmers in Tahira and Bussura claim that no one owns the jinnaaji land, except the jinnaaji themselves, and no one dares to cultivate there. If someone would cultivate there, they surmise, this land would then belong to that person. Some respondents insisted that Kalduyaaɓe own the jinnaaji land and that they even cut and cultivate there. But most people who believe that the Kalduyaaɓe own the jinnaaji land say that no one dares to cut it.

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[215]Faamuuɓe means "people who understand (certain forms of knowledge; e.g. the Koran, or sorcery)".

Plus, if j i n n a a j i land is needed for cultivation there are ways to make an agreement with the j i n n a a j i or to chase them away.

> Even though you may love your children a lot and need to cultivate to feed them, you probably won't place your own life at risk by farming j i n n a a j i land, thereby daring the j i n n a a j i to kill you. Even with a mutual agreement they can kill you on a whim. If two to three years pass and nothing happens, you can believe that you've been spared. Two dead at Tandasara (a nearby hamlet) attest to their power.
>
> Some j i n n a a j i can be displaced. Others we don't dare to provoke. There are j i n n a a j i that live in rocks and big trees. They own the land where they are found. They can either make your head hurt a lot or kill you if you cross them. If you cut the trees where they are, they might well kill you. This is what happened to the father of N.K. Our recourse is to make sacrifices to counteract the j i n n a a j i.

One farmer said that only Alla can ruin the land but that spirits (j i n n a a j i) own certain lands that are untouchable by people for crop production. These j i n n a a j i lands are thus ruined, in effect. One Tahira woman said it was hard for her to raise goats because the "bushland people" (y i m ɓ e b u r u u r e) keep killing them off.

As noted earlier, sorcery (s o h u g o l) is used by certain people to ruin the cropland of their neighbors, if not for revenge, then simply because of hate. An example of sorcery that ruins the land is the case where the perpetrator makes otherwise productive cropland produce only grasses instead of the crop that is seeded there. Remedies (l e k k i) for sorcery range from Koranic verses to potions to live animal sacrifices:

> To love the land is to believe in Alla and produce food from the land. But, if someone wrecks the land, it's difficult to know if Alla is in agreement or not with this, as we are only human and can't know what Alla thinks. If Alla is watching over you it is good and we say, "So be it, that our work would be successful in accordance with what Alla desires (B i s m i l l a h i , y o A l l a n e w n u f i i g o l l e.)

To maintain solidarity with others, as prescribed by Islam, people should make sacrifices like the muddo[216] and farilla from the harvest. Many people offer their farilla out of fear of falling ill. To "remove" the farilla (from the harvest) is perceived as insurance that crops planted the following year will grow well and that farmers will be healthy enough to farm.

Saying the five daily prayers is another example of what Islam prescribes for taking care of the land. Farmers should pray that people help others, that Alla would send people to the Afterlife (laakara), and that no one would go without what they need. People should also pray that Alla will take care of their children. It is commonly thought that if one believes and follows Alla, and asks Alla for what is needed, these requests will be granted. Farmers should also pray (especially the faatiya[217]) for good crops, that Alla would protect them, and for deliverance (kisiyee).

Praying for a good harvest should be done in the fields. When people work in the fields, they should work until the prayer hour, then the praying should be done in the fields. People should not work until they are too tired to pray.

> If we cultivate we should ask God, while in the field, to bless the land to get a good harvest. This has long been recommended but not all farmers do this. Some wait to return to the compound. This should be done at the proper times of prayer.

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[216]The muddo is two handfuls of grain from every harvest to be given to someone in need. This nominal sacrifice is important in that, at the end of the world when fires engulf the universe, every grain given as muddo will be transformed into a protective wall of grain when tossed into the fires that menace everyone.

[217]The faatiya is the opening chapter of the Koran. According to Ali (1983), the faatiya expresses Man's relation to Alla through praise of Alla. Through this praise, people become one with Alla's will, they see goodness, peace, and harmony, they understand Alla's attributes, they worship Alla, and they ask for guidance (Ali, 1983). The faatiya represents the essence of the Koran and can be considered to be the perfect prayer (Ali, 1983). The faatiya is the absolute minimum that a follower of Islam should be able to pray.

Tahira and Bussura farmers also believe that Alla takes care of whatever is too difficult for people. People must believe this idea or life would be too difficult in their hearts, we were told. What Alla wants is not heavy. Alla follows what is written on one's forehead[218]. If Alla doesn't make good what people cultivate, then farming is difficult. For example, if the rains don't come such that the crops don't flower and ripen, that's difficult. But, very little is considered difficult if a person has perseverance and Alla gives them a long life and good health.

With too little or too much rain, farmers ask Alla to intercede. Alla is the master of rain, and if he does or doesn't help the crops, that's the way it is. People in Tahira and Bussura believe that humans can't do much of anything to make it rain more, that Alla brings rain when he wants to:

> Alla makes the dry season and the rainy season and other things in pairs: day and night, man and woman, *et cetera*. Alla brings the rain and diminishes it. There are some things we simply can't explain or know because we can't talk with Alla. Rain and water are gifts from Alla but, even so, many of us don't see stream drying as a problem here. In any case, rain and the rivers drying is the affair of Alla and, thus, to remedy such a situation we would need Alla's help.

> We don't understand how to explain the reduction in rainfall. Everyone has their own theory. Some say that higher prices of food and such have wrecked the nation, that people have raised prices and Alla doesn't see this as a good thing and is therefore punishing people with less rain. Others were in Senegal and saw this same phenomenon starting to happen there. They say that Alla chastised people when they started to use mummunteeji (animals, or creatures unable to talk) to work the fields. If we ponder a phenomenon long enough, we can think that it could be for any reason, or all of these together. Other people think that there is less compassion in the world these days, or not enough solidarity, or good works, and that Alla is punishing people for these developments, showing his power.

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[218]This is a literal translation of an expression used to express the idea of destiny. Another phrase, foddore Alla, is used to connote "Alla's plan, promise, covenant, or destiny" for each person.

If a source of water dries up, in addition to dredging it out, the religious leaders can ask Alla for help after offering a sacrifice. Some form of imploring Alla is usually done every year. In the past, the elders would kill a chicken or goat every year for this purpose. However, as there are no extra animals to spare these days, this type of sacrifice is observed less frequently and, according to respondents, there are more sources drying up these days.

Several respondents made note of a second source in Tahira upslope from the principal source. This second source, called Korosi, dried up after the trees above it were cut and, added one man, after a goat gave birth there, which caused the source to migrate. Some people say it migrated to rejoin the source at the bottom of the slope. The parent rock near to the soil surface at the former upslope source makes it difficult to dig more deeply and perhaps find more water. Nevertheless, when we left the watershed in March, 1989, the water had begun to eke from this source for the first time in eight years.

People say the j i n n a a j i own the sources[219] but if people don't go looking for the j i n n a a j i or give them trouble no one will be harmed or bothered. J i n n a a j i are reputedly more tolerant of women than men. They are also thought to have the power to alter the quantity of water in a source. J i n n a a j i can't be seen unless Alla shows them to people and only Alla is capable of making the j i n n a a j i move against their will.

Only Alla knows whether or not a person will obtain something for their work, as well. Some fields might produce a specific crop with great success while other fields fare poorly. This is due in part to the luck (a r s i k e) of the farmer, which only Alla grants. Though doing one's work well is a prerequisite to successful crop production, luck (a r s i k e) is perceived to have a critical role in

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[219]They are commonly referred to as the j o o ɓ u n d u, or "owner of the source".

this process as well. Even if a person has courage and works correctly, if Alla makes them unlucky, that's difficult. If a person is not lucky, if Alla makes their "blood sour" (ɲi iɲam kaaɗɗam), that's a difficult situation to deal with.

Another conundrum for at least one farmer is explained as follows:

> It's difficult that we can't make certain people of Taybata pay for their animals that wreck our crops. This is because of the saint who lives there. It would be like asking God to pay for the damage caused by his animals. The saint is monitored only by Alla and the jinnaaji. Alla will decide later who was right and who was wrong. The saint has ways to skirt the things that others would do and be called a sinner for. Alla believes that it is better to be patient than to wrongly accuse someone of something. All people will be recompensed later by Alla. If we try to make the saint pay, the devils will come after us.

In summary, Islam advises people to follow Alla as prescribed and to have a good heart. People strongly believe that Alla gives them what they need. Thus, when something is needed, people should ask Alla for help.

Field work closure

meeting with the men of Tahira

As indicated in the final section of RESEARCH METHODOLOGY, we held a series of four meetings with the men and women of Tahira and Bussura at field work closure in order to share the results of our observations and to elicit input as to how the dissertation research might be useful. Each meeting lasted from 90 minutes to over two hours, depending upon how prompt those who attended were in arriving at the meeting site and upon the dynamic of the meeting. A synopsis of each meeting is presented below, starting from the meeting held with the men of Tahira.

The major political personage in Tahira, D. S., was not present at this initial meeting. Nevertheless, after the research results were shared with the men who did attend the meeting [220], an open discussion of the results and potential utility of the research was initiated in an atmosphere of relative disorder as compared to the other meetings that ensued.

One young Tahira man, M.S., observed that the book that we were to write (i.e., the dissertation) would likely be read by many people. Therefore, he hoped that it would be interesting, consistent, correct, and of high quality. He called attention to a well-known Guinean writer, Camara Laye, and pointed to the authentic quality of this author's work as the ideal example of how a written work ought to be perceived by its readers.

After this remark, the most elderly man at the meeting, K.S. (who also made an unsuccessful attempt to maintain order throughout the meeting), said that the people of Tahira were born into farming and herding and this is what they know. For this reason, he said, it is farming and herding, rather than commerce, that will make or break the people of Tahira.

A comment on practicality was then made by a younger man, A.J., who said that the only way a book can be useful to people is if the book is read. It was then suggested by another man, M.B., that the responsibility of people who have studied and know how to read is to take a greater interest in agriculture. He said that if the book serves to stimulate interest in agriculture by intellectuals then it can be considered useful. At the the same time, he said, farmers should interest themselves in education to a greater extent than they do at present.

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[220] The men attending this meeting attested, virtually across-the board, to the veracity of the information that we presented. One elderly man suggested that hearing the interview results was very much like looking into a mirror that reflected his own thoughts.

One man, L.D., then noted that what the people of Tahira really need are such things as wells and farm equipment. Several other men quickly pointed out that it was not our (i.e., the researchers') mission to bring wells and plows to Tahira. We then reminded the men that we did not consider their opinions lightly and that everyone has their own ideas about what needs to be done. We also told them that, in some ways, it was chance that brought us to Tahira and Bussura and that we would like to make the most of this chance.

Several men suggested that we, the researchers, should know better than any of the Tahira farmers how the research can be useful because we have gone to school. We replied that we had lived in Tahira for one year and saw how the people there live and what many of their problems are. Nevertheless, we told them, we would still like to know their thoughts about how to make the research and the dissertation useful. It was suggested that we reconvene the following day when D. S. would be able to attend the meeting.

The following day, many of the Tahira men who had attended the initial meeting were significantly tardy in arriving at this second meeting. At the gathering, D.S. displayed some impatience with the delay in starting the meeting and noted that he had other work to complete. It was finally agreed that the meeting should begin before everyone arrived. We proceeded to present a resumé of the previous day's discussion as well as a brief version of the research results. D.S., who has a strong and vociferous personality, quickly began to dominate the discussion that followed. He pointed out, just the same, that he was only speaking for himself. We later discussed this turn in the meeting and, based upon observations from having lived in Tahira for a year, we were reasonably certain that the other Tahira men at the meeting likely felt well represented by the opinions of D.S. simply because he dares to articulate what they might not because of their traditional protocol of *politesse*.

D.S. spoke at length about the respective roles of intelligence, physical strength, the means to accomplish desired goals, and suffering. He said that farmers in Tahira surely have the intelligence and physical strength to accomplish their desired agricultural goals but that the means (feere pl. pehe) to accomplish such goals remains the domain of intellectuals, those who have attended school, particularly with regard to machinery[221]. As for suffering, D.S. noted that he and his family certainly suffer but that others in the community suffer even more.

He then spoke of a certain dichotomy of life whereby hunger (heege) and fatigue or poverty (tampere) share one side of the ledger, that of the farmers of Tahira, versus the states of "having" (het taare) and of "plenty" (haarande) on the other side, the side of those people who have studied. He pointed out that people who are hungry and impoverished will nearly always look to those people who have enough to live comfortably and who are fulfilled materially. However, he observed, those people with enough to live comfortably only look to the poor when they choose to do so. He said that most people know if they have enough material goods to live or not, relative to others. If these people do have means enough to live, he said, they ought to make some effort to share what they have with those who have little or nothing.

Finally, D.S. said that a person who has studied is equipped to "show the way" to problem resolution to those who have not studied and that, once they show the way, the rest is up to Alla. He reminded us that farmers' forms of study consist of seeing (yiiyugol), trying (etugol), and traveling around (yiilagol). He also said that among three types of people -- a person who

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[221]Specifically, he said, "Mo jangaa ko doole gollirta, mo janngi ko feere gollirta" (Who doesn't study works by force, who does study works with the means to work.).

studies, a person in poverty, and a person traveling around -- all of these types share a common element: That is, they all have the opportunity to observe a great deal about how the world works. Finally, D.S. said that community solidarity (jokkere endam) is an indispensable element of successful farming.

At this point in his commentary, a prolonged moment of silence and reflection occurred giving rise to our later conclusion that the comments were, perhaps, a just resumé of the feelings of Tahira farmers.

When D.S. spoke again, he reiterated that the key question remained the potential utility of the book that was being written about Tahira and Bussura farmers' agricultural knowledge. He figuratively suggested that, first of all, the contents of the book should be made of gold and not cheap metal.

In their closing remarks, several Tahira men, including D.S., suggested that the major agronomic problems for the villagers are a penury of soil fertility and organic matter (ñolu), too thin topsoil, excessive runoff, and lack of access to credit. To address these problems, all of which affect local food production, D.S. suggested that Tahira farmers must expand the height of their fields (i.e., the height of the plants in the fields) as well as field breadth. The meeting ended soon after these remarks with no real resolution to the issue of how the research might become more practical to Tahira farmers.

meeting with the women of Tahira

The meeting with the women of Tahira started somewhat late. Many of the women who had arrived "on time" passed the waiting period peeling taro for drying. This peeling continued during the meeting as well. There were eleven women present at the beginning of the meeting but double that number at the meeting's end.

Following presentation of the interview results, N.B. started the open discussion by saying that we all must work together to avoid humiliation, shame, and insults both during the meeting and in the contents of the book to be written. She suggested that the contents of the book be reviewed several times before publishing in order to edit that which may not be pleasing to the readers and that which would bring shame upon the community. She said that the central objective of everyone at the meeting is to maintain community solidarity. To support these remarks, another woman, N.H., who more or less maintained order throughout the meeting, noted that a study such as that which we were conducting is no laughing matter, because schooling is a serious business[222].

As to the question of the study's usefulness, N.B. said that, above all, the people who have studied are those who should know how a study such as this can be useful. In any case, she said, there is one thing of which she is absolutely certain, that studying is definitely a useful endeavor (jande no wondi e nafa). At this point in the discussion, N.H. suggested that the words of someone who can neither read nor write, nor has traveled much beyond the village, are the words of a naif (ko haala jofo). This remark brought considerable laughter from the women. N.H. added that she made this remark, not to draw a laugh, but only because she did not care to be ridiculed if and when she offers her opinion. Our colleague, Ibrahima Seck, assured N.H. that, in any case, even a naif knows enough not to speak out in a crowd (jofoojo yettataa haala hakkunde mbatu). This was an acknowledgement of our belief that N.H. is smarter than she gives herself credit for.

Another woman, N.K., then stepped forward and appealed to us to help the women of Tahira and Bussura to help their families improve their lives. N.K.

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[222]The residents of Tahira and Bussura were well aware by this point that I was a student at a university in the United States, for this had been explained repeatedly prior to each interview.

reminded us and the women present that, to that point in time, it was the people of Tahira and Bussura who had taught us, the researchers, new information about farming. Now, she said, it was the researchers' turn to teach something to the people of these villages. She suggested that all of their problems merit an urgent solution and she asked us our opinion as to which problem should be prioritized. She added a postscript to her remark, saying that all of their efforts are basically directed at ensuring an adequate food supply.

We, in turn, said it was true that we had lived in the two villages for a considerable period and had seen a great deal with respect to how the local people live. But, we repeated, it is their knowledge and understanding about how things work that should count the most . After all, we suggested, it could happen that an outsider arrives in a community in order, for example, to heal someone who is ill. With nothing but good intentions, the outsider proceeds to prescribe and administer medicine to treat the ill person but, in doing so, makes the person more ill.

M.J. replied that certainly their knowledge of farming and our knowledge can be shared with others and no harm will be done. She added that if no benefits to the people of Tahira result from this research, there will be no hard feelings whatsoever on anyone's part. This opinion was seconded by N.H., who noted that rarely does someone of the intellectual ilk ford streams and swamps to arrive at a remote place such as Tahira, let alone live there for a year. She said that it meant very much to the people of Tahira that we, the researchers, maintain contact with them after we leave and that, no matter what happens, they will always be with us in spirit.

Another woman, M.M., changing the subject, spoke to say that weeds are the major hindrance to women in their farming. This idea was supported immediately and wholeheartedly by N.B. Then, M.M. added a *caveat* in warning

that we, the researchers, do not have the power to change the fate of the people of Tahira and Bussura. Nevertheless, she suggested, we may have some power to help diminish their poverty.

Another woman, M.B., offered her opinion that the destiny of Tahira and Bussura residents consist of tilling the soil and eating the fruits of their labor (foddore amen ko jasa yakka). She said that the people of Tahira need to find a remedy for this limited fate, if possible. She mentioned as one such remedy the possibility of setting up some kind of plumbing system by which water would be easier to obtain. She said that the people of Tahira did not have a well yet due to a lack of money. She said that farming is not the way to make money, either. For her part, N.H. said that if any outside help was needed it would surely be to improve the water situation which, moreso than food, was a source of suffering for the people of Tahira.

After a prolonged pause and silence, we returned to the question of the utility of the research and the book to be written. N.B. said that anything written is often useful, especially in order to not forget what takes place. That is, writing is perceived by N.H. as a recording device. M.T. then admitted that she thought this day would be the first day when we, the researchers, would begin to teach the people of Tahira something, just like they taught is. We asked if it would only be this particular day that we would be their teachers. M.T. said that, no, even if we went away and returned we could still teach them something. We asked the women if they were ready to pay for someone (like us) to teach them because, we reminded them, in the world today everything must be paid for. Another woman, N.K., replied immediately that they were ready to pay for learning, of course. Hearing this, N.H. interrupted and told N.K. to be careful to not make false promises and fib about something as important as this. This observation brought laughter from the women.

N.B. rose and spoke, saying that this meeting was just a beginning and that even if the women do not arrive at a solution as to how the research and book (dissertation) can be useful, others will be able to carry on with this task, little by little. After a task has had a start, she noted, in time it can blossom into something bigger. She said it is hope that guides the people of Tahira. She referred to her son in high school in Conakry preparing to graduate and, possibly, enter the university. She said that, right now, his education has not paid off but that she has great hope that someday in the future it will. In any case, she said, any endeavor must have a beginning in order to have an end.

At this point, N.K. noted that because of our presence in Tahira, certain members of the community began to build a new road leading to Tahira[223].

Another woman, H.S., asked us to help the women of Tahira to obtain seed and fertilizer and then help them to learn how to use the fertilizer. She said she simply wants to experiment with these inputs to see if they work. If they don't work, she reasoned, she can always cease to experiment with them.

We asked how to close the meeting with a synopsis of what had been discussed and decided thus far. One woman said that we should start over the next morning and talk about these subjects all day. Another said that it would not kill them to pass the entire night in discussion. Everyone was quite jovial at this point yet serious that the discussion had been very good. One woman, N.K., stepped forward and made a plea to us to help them find others to educate (formally) their children. In addition, M.M. asked us to help the women find an alternative to bringing mulch from the forest to the suntuure to grow their corn.

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[223]This was an extraordinary activity. One day, an elderly member of the community came to my house to tell me that several men in Tahira had decided to carve a road out of the forest to connect Tahira to the old tax road. It was perhaps a month later that these men began this work amidst skepticism by other members of the community. A 10-15 meter wide swath was cut into the forest but, by the time we left Tahira, work had stalled. This initiative would have been ideal to build upon because it was an entirely home-grown idea that was a total surprise to us.

meeting with the men of Bussura

The meeting with the men of Bussura and Jam Weli was considerably more organized than the meeting with the men of Tahira. However, despite the orderly manner of this meeting, not as many men were given the opportunity to express their opinion, as was the case in Tahira where several men would try to speak at the same time.

The eldest man, M.Y., controlled the tempo of this meeting and was the first person to comment, saying it is possible that the book to be produced would be useful to the people of Bussura and Jam Weli and succeeding generations, although no one yet knew the exact nature of this utility. However, he added, if anyone would know, most likely it would be us, the researchers, because they initiated the project. In any case, he suggested, even if the book is not immediately useful to the people of Bussura and Jam Weli, it might be useful to others elsewhere in the near future.

M.Y. offered an analogy about building a house, noting that the walls for the house, as well as the roof, the door, and the lock for the door can be constructed. But, he noted, if there is no key to the door of the house, then a person can neither enter nor exit the house. He said that this particular "house" (i.e., the dissertation) is constructed using the knowledge of Bussura and Jam Weli farmers. However, he said, the researchers (us) have the house key. M.Y. suggested that the people with the most knowledge, that is, people who have studied, most often have the best solution to problems. He claimed that the knowledge which Bussura and Jam Weli farmers have shared, though valuable, is not useful without additional support. Moreover, M.Y. granted it possible that only Alla truly knows how the book might be useful. In any case, he concluded,

if the book broadens the knowledge of others who read it then this is proof of the book's value and usefulness.

Another man from Jam Weli, M.S., pointed out that we, the researchers, have had the opportunity to see how the people in the villages live. We are therefore able to analyze what is needed. He then cited the peoples' need for commercial fertilizer and wells and asked for help in obtaining these.

A younger man, J.D., reiterated that we, the researchers, have held the pen used to write this book and the people of Tahira, Bussura, and Jam Weli have supplied the information. These, he said, are the two actors involved in the production and use of the book. He suggested that if the book brings in wealth, money, or is used to fulfill needs, then it is useful.

M.Y., who had spoken earlier, offered his opinion that knowledge is a major aspect of farming and, without knowledge, there is no farming. Another man, C.B., not a resident of Bussura or Jam Weli but from Pelli, said that the act of farming is prerequisite to knowledge about farming. He also suggested that even when farmers are not able to read books they are able to "read" their hoe. M.Y., who along with the visitor from Pelli dominated the discussion in the early portion of the meeting, then said that the more a person farms the more knowledge that person gathers about farming.

The visitor from Pelli, C.B., stated in no uncertain terms that the ability to read and, especially, to write is definitely useful to a person. M.Y. observed that whoever holds a pen and writes words is the only person who really knows what is written until someone else reads the words. He noted that when the farmers of Tahira and Bussura provide information to us, the researchers, we appear to record in writing what we have been told but the farmers really cannot verify what we are writing. Only those people who are able to read will know what is written, concluded M.Y. Moreover, he explained, just as when a letter is

written to someone, the writing is not useful until someone reads it. Likewise, this book must be read in order to be useful.

The man from Pelli, C.B., then suggested to those in attendance that writing itself, not just reading, is useful. We asked him to repeat what he had just said, which he did: "Bindol no wondi e nafa (lit. "Writing is with usefulness)". Writing is useful, he said, because writing helps people to memorize and remember what they learn. M.Y. noted that we were even taking notes of the meeting, without which we might forget what was being said. Thus, he concluded, writing is obviously useful. C.B. added that it is impossible to learn well without knowing how to write and read.

Our colleague asked if there is an age when people should cease to study and learn. C.B. replied that studying and learning should continue until death. He also said that the person who fails to study will always lag behind the person who studies. Moreover, if a child studies to become a doctor, for example, they will even have the ability to heal older people and will thus have surpassed the older person in a certain sense.

Everyone continues to learn and acquire knowledge until their death, claimed M.Y., and if a person records their knowledge in writing, then the knowledge will always remain for others to know . Otherwise, it may be lost forever. Knowledge that is written down will always have roots, added C.B. Furthermore, continued C.B., knowledge must be build upon other knowledge. Learning to write Arabic characters in Koranic school is a good example of this, he said. That is, a student of the Koran cannot master a given lesson in writing Arabic without having learned the previous step well.

Finally, K.N. noted that studying furnishes people with one kind of means to accomplish what they desire. C.B. returned to the discussion and stated that many people would like to study but Alla does not give them the means to

study[224]. However, noted K.N., who had just entered the discussion, a person cannot lay around asking Alla to provide everything. Rather, people must make an effort, including the effort required to study.

J.D., the younger man from Bussura who had spoken earlier, then suggested that people who have studied and those who have not studied should exchange their respective knowledge. He asserted that study without the ability to read and write is possible, especially if a person can learn how to earn the means necessary to fulfill their needs. He added, however, that study which uses reading and writing as a basis for learning is always better than study which does not rely on reading and writing skills. But, he noted, some people have passed their time for schooling of a formal nature.

meeting with the women of Bussura

The final meeting was held with the women of Bussura and Jam Weli. Just as for the Bussura and Jam Weli men, attendance at this meeting was punctual as compared the Tahira meetings. The women, not us, began the meeting with opening remarks of welcome by N.S., the eldest woman in the village.

M.T. initiated the open discussion on how the research can be useful by stating that people live by their thoughts and everyone thinks with their own intelligence. N.J. then quickly observed that Bussura farmers need inputs like plows and fertilizers (angere) to improve their soils, plus more money.

J.N. then noted that we, the researchers, came to Tahira and Bussura, saw how the people live and obtained the information that we were looking for. She

[224]Several residents of the watershed indicated to us that certain people, even certain lineages (the Ngeriyaaße, for example) are predisposed to learning through formal study, and may have an a gift for memorization.

reasoned that we should thus be able to imagine where peoples' difficulties lie. We asked J.N. to be more precise about what she meant by that remark. She replied that she could not be more precise but could only think that we should be able to see better than them what could make their lives easier.

We replied that this observation could be true or not but that it is also important to note the positive as well as the negative aspects of life in the village. We suggested the possibility that two people can have totally different perceptions of the same thing just as they might have the same perceptions. In addition, we said, there is always the problem of not seeing things as they really are. For example, a person able to buy and wear the fanciest of clothes may appear to be leading an easy life but could have serious problems at home. Moreover, we suggested, as we are all created by Alla, we should be equally able to see and understand what should be done to change a situation.

M.T. then returned to the discussion with the remark that people do what they can with what they have. Nevertheless, she said, the solutions to some peoples' problems may well be contained in the book that was being written.

J.N. rejoined the discussion, noting that we, the researchers, were not just any people. Unlike many others, she said, we have seen firsthand some of the problems that the people of Tahira and Bussura must live with. She noted that we had just completed reiterating the information that the peoplehad shared with us over the past year and that this review was possible because of our ability to write. And, she said, although by virtue of having lived in the villages we have become similar to the people of Bussura and Tahira, it is the ability to write that separates us from the people of Bussura and Tahira. The people of Bussura and Tahira know how to handle the hoe, she said, and that's it. J.N. finished by saying that we, the researchers, know ways of assistance that the people of Bussura and Tahira do not know simply because we have studied.

N.K. said that there are problems other than those related to having studied or not. For example, the farmers of Bussura can cultivate the hillsides for as long as they want. However, when it comes to the bottomlands, these are always susceptible to confiscation (by the Kal duyaaɓe).

N.G. then said she knows one thing for certain, that use of the pen is for people with knowledge. When asked why the women don't take hold of the pen and learn to write, she replied that this ability is distributed by Alla. But M.T. disagreed and said that intelligence determines who holds the pen and who doesn't. She added that farmers generally don't know how to write and that the writers of the world are truly the people of knowledge. M.T. did acknowledge that a person can know how to write as well as farm. N.G. added that the farmer who knows how to write has a chance to be a better farmer than the farmer who can't write because of differences in knowledge between the two people.

N.G. reminded us that the people of Bussura and Tahira taught us what they know and now it is up to us to make sense and use of this knowledge. M.H. added that when the knowledge that the people of Bussura and Tahira shared with us becomes the basis of our success, then the knowledge will be appreciated. Moreover, if this knowledge and this research is not useful, then we can say that the past year in Dara Pelli district has only been recreation. However, she said, if this knowledge helps us, the researchers, to advance, it will also be good for the people of Bussura and Tahira[225].

N.G. said that some of Bussura's children will go to school and learn to read and write, particularly the Koran. When asked if Koranic school study will help their children to farm, N.K. said the hoe and the pen are "close to each other", that is, "allied" (Ko keri kiŋ e karambol ngol takkondira). M.T. said

[225]The implication here is that we, the researchers, will not forget the basis for any success linked to the research.

that when a farmer working in their field suddenly becomes ill, the farmer who has mastered writing is able to access knowledge to rid them of this illness[226]. She said that study will always prove itself to be useful in the long term, if not immediately. K.N. added that Koranic study helps people to obtain Alla's blessing (barke Alla) which will help with the success of the crop.

M.T. closed her comments by saying that we, the researchers, should help to share with others the knowledge that the people of Bussura and Tahira have provided us. N.K. said that this sharing should be elementary because we have written it down and, thus, it cannot be forgotten.

Then, M.B. suggested to us and the group that what would really be useful to the women of Bussura is fertilizer, herbicide, and a replacement for the task of mulching. She emphasized that, above all, the latter request would be the most helpful because this task is the most difficult.

At this point, the meeting was drawn to a close because we noticed the women were becoming fatigued. H.M. asked that Alla help us to make this research useful because her knowledge has reached its limit and that the rest is up to us. Here, she said, their knowledge and our knowledge diverge.

The summaries of four meetings held at field work closure with the men and women of Tahira and Bussura provide evidence of at least two key elements of any future agricultural extension education effort in these villages. These key elements are 1) the recognition by Tahira and Bussura farmers of the value of education, particularly the ability to read and write and 2) the importance of educational leadership. These two key elements are the bases for defining the role of agricultural extension educators in Tahira and Bussura for future action.

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[226]The subtle implication here that such an illness could have supernatural spirits as its source. The person who knows how to read (the Koran) and write (Arabic) will know which Koranic verses to recite and write in order to exorcise such undesirable spirits.

CONCLUSIONS

Introduction and review

This ethnographic case study is intended to illustrate the "culture in agriculture" of two remote villages in the Fuuta Jalon highlands of Guinea and to suggest a strategy by which culture would become the basis of curriculum development for agricultural extension education in these villages, if not the region. The research points toward several directions for research and action based upon the strategy, which emphasizes an understanding by agricultural extension educators of farmers' perceptions of their agricultural environment.

The primary research problem was originally put forth as an issue of how to consider soil erosion from a sociological perspective. It was decided that this fundamental issue would be examined using a methodology that elicits farmers' environmental perceptions. It was suggested that how farmers perceive their environment is a reflection of their culture. It was reasoned that should agricultural extension educators and other professionals wish to develop a sense of empathy and homophily with the farmers they represent, then they ought first to understand how farmers perceive their agricultural world. It is assumed that the efficacy of communication between agricultural extension educators and the farmers they represent is positively influenced by such an understanding. Allied to this assumption are important implications for effective information exchange between farmers and agricultural extension educators.

In the research, a methodological process was tested, a process by which the perceptions and knowledge of soil management and conservation by farmers may be elicited and interpreted in terms of farmers' perceptions of land use and the agricultural environment. In RESULTS AND DISCUSSION, there

is ample evidence to suggest that the perceptions of Tahira and Bussura farmers of their agricultural environment are cultural amalgams built upon agronomic, social, economic, religious, historical, and political factors. The evidence also suggests that there is some potential for practical use of farmers' environmental perceptions as learning tools for agricultural extension educators, as planning tools for agricultural development, or as guides to the development of curricula for agricultural extension education. Above all, it has been noted that the use of local farmers' environmental perceptions as the basis for educational program curricula would instill a sense of local ownership in the program on the part of participants who have offered what they know as a point of departure for their acquisition of additional knowledge and information.

The scope of farmers' knowledge

The data obtained during this research show that the farmers of Tahira and Bussura most definitely understand the value of organic matter for maintaining both soil structure and soil fertility, major factors in whether a landscape's soil is resistant or disposed to erosive forces. These farmers are also aware that trees anchor the landscape to their local agricultural system. Without trees, there are no leaves, and without leaves, little or no upland rice, nor corn, will grow well in farmers' fields. Most Tahira and Bussura farmers know the practical uses of many tree species in Dara Pelli watershed, including those trees whose leaves are the best mulch for corn fields or best source of fertility for rice and *foñe*. Likewise, these farmers have considerable knowledge of grasses that grow in the watershed which, with trees, ought to become the focal point of agricultural development and extension education in Tahira and Bussura.

Tahira and Bussura farmers know which trees and grasses are of value both economically and agronomically. The grass fugulu (Hyparhenia rufa), for example, is preferred as non-metal roofing material. Yet, in Tahira and Bussura, fugulu is a scarce resource. Already, many farmers in Tahira and Bussura either purchase bundles of fugulu or pay others to cut and gather it for them, or both. Similarly, bamboo (keewe; Oxytenanthera abyssinica) is in great demand in Tahira and Bussura as material used for the support structure of non-metal roofs. Bamboo grows well in a variety of sites including relatively poor sites like hansaŋere soils and is reportedly easy to propagate[227].

Farmers in Tahira and Bussura would also have insight as to which local grasses or broadleaved plants might be suitable as a cover crop overseeded into corn and taro. This prospective, innovative practice could be implemented in late August when four to seven weeks of rainy season remain, in an attempt to produce organic matter for the following year's suntuure . A shade-tolerant, shallow-rooted legume or grass species would be ideal for this role which, if successful, could serve to alleviate women's burdensome task of hauling tree leaves to their suntuure land for use as mulch. Likewise, tree sources of leaf biomass for mulching corn could be planted and maintained as small plots or as part of the fence (hoggo) that encloses suntuure land. If tree planting were included in this strategy, then labor availability would be an issue, as it is for most problems associated with the farming system of Tahira and Bussura.

Trees and grasses would also be good subjects for young and older adults learning to read and write as well as being convenient "entry points" for agricultural extension educators to initiate discussions about agricultural

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[227]During the rainy season, a segment of bamboo approximately 25 cm in length is cut from a growing plant and one end is inserted into a soil pocket at a 30° angle to the soil surface. The end of the segment in the soil pocket is then covered with soil.

practices with farmers. In any case, it is evident that in Tahira and Bussura, trees and grasses have central roles in the local farming system.

It would be culturally appropriate for agricultural extension educators to adopt strategies that accentuate the roles of trees and grasses (or broadleaved plants) in the local farming system, based upon how farmers already perceive and use this vegetation. For example, while many farmers utilize the principle and technique of g i r i n j i, cleared tree branches and trunks laid perpendicular to the slope, not all farmers do this. This labor-accommodating, short-term soil conservation measure should be encouraged.

For the long-term, selective cutting to clear land after fallow periods could be oriented toward establishing more permanent cropland configurations. A field of rice and f oñ e could be nurtured and "pruned" over two, three, or more cropping cycles such that locally desired species grow well and less useful trees are minimized, while being mindful of maintaining biological diversity. No new trees would be planted by hand, and larger trees would be left in the field area. In time, trees might grow only along the landscape's contour lines or as live fences that would permanently delimit existing fields. Tahira and Bussura farmers already discriminate in selecting which trees and grasses be allowed to dominate their fields. Plus, these farmers are certainly cognizant of current field boundaries. At present, however, many agricultural extension educators are neither trained to discuss the cultural and agricultural implications of these short-term and long-term practices with farmers nor to encourage their use.

Even if agricultural extension educators are trained to encourage the use of such practices or others, we may ask if they acquire their knowledge about intricate agronomic, social, economic, religious, historic, and political issues through village-level observation and inquiry? In Guinea, for the most part, they do not. Consider, for example, the issue of land tenure, which is linked to every

one of the cultural factors cited in the preceding text. In the village of Bussura, the establishment of permanently delimited dantaari fields using live fences is an idea with long-term, practical advantages in agronomic and, especially, economic (labor) terms. But, any attempt to popularize a "live fence" strategy on dantaari land cultivated by Bussura farmers would surely be a controversial issue becasue of Kalduyaaɓe claims to this land. Does this mean that a live fence strategy should be limited to the non-dantaari hillsides? That is one solution, perhaps, but another would be to work with Kalduyaaɓe religious leaders, greatly respected by Bussura farmers, to slowly implement this model as a soil management plan, not as a plan for Bussura farmers to stake their own claim to dantaari ownership.

This is but one example, particular to one watershed, of the complex, culture-based agricultural issues that abound in the rural areas of Guinea and elsewhere. To begin to perceive this or other, site-specific agricultural issues as culturally grounded requires one to look at a particular issue in ways that local farmers would perceive the issue. Many Tahira and Bussura farmers would hastily reject a live fence strategy because the practice is not ko ko finaa tawaa, that is, not what they were born into. Yet, there are partially live fences surrounding all suntuure lands. Furthermore, complaints about cattle ruining crops due to tardy fence construction are commonplace. Moreover, Tahira and Bussura farmers consistently cite the importance of hearing new ideas from janngooɓe, people who have studied. There was one new idea.

The point to be made is that the manner by which a new idea or technology is introduced is critical. If a prospective technology can be linked, in discussion, with existing cultural realities, then farmers and agricultural extension educators would have a frame of reference and point of departure by which to mull and examine technological options. Once decided, more traditional extension

approaches such as on-farm demonstrations can be called upon. However, to know which demonstration to establish, and where, an agricultural extension educator must know which cultural keys unlock which cultural doors. Perhaps this skill is best acquired through a systematic learning experience at the village level, not from a book, not from an agricultural research station, and not from such evaluation procedures as rapid rural appraisal.

In Tahira and Bussura, the encouragement and promotion of agricultural practices by which trees and grasses are highlighted but which may differ with what farmers already practice or perceive can be problematic. If, for example, farmers were advised to "prune" their fields such that, over time, vegetal hedges would be formed along contour lines without manually planting trees, then permanent "living g i r i n j i " could be established[228]. But, problems like loss of arable land, changes in labor input, and the menace of grain-consuming birds and rodents that would inhabit the vegetated areas would require considerable discussion among farmers and evaluation before this technique could be put forth as a demonstration. It is often insufficient for agricultural extension educators to suggest to farmers that a particular technology be tried as a demonstration because many farmers will say, in effect, "sure, go ahead, why not . . .", as long as it doesn't cost them in time, labor, cash, social status, a reserved seat in heaven, or the next local election. Rather, what is needed are agricultural extension educators with the skills to sit down with a farmer or group of farmers and lead discussion that touches upon, one way or another, the cultural factors or, as identified in this research, the soil management domains allied to traditional agricultural practices and prospective innovations.

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[228]The transfer to West African farmers of a technique by which cropland contour lines can be marked out using plastic hose filled with water is feasible, as evidenced in the celebrated Oxfam soil conservation project in the Yatenga region of northern Burkina Faso (personal observation).

Should certain soil management and conservation strategies be taken into consideration by policy makers, this consideration ought to include the pros and cons of incentive programs that encourage farmers to consecrate their labor to the tasks often associated with adapting innovative practices to local farming systems. Incentive programs need not be grandiose nor necessarily driven by promises of financial reward. They do require creative thinking and should be designed by the farmers who stand to benefit by them. It is a responsibility of agricultural extension educators to provoke discussion of such incentives at the local level using site-specific, culture-based themes.

What else besides trees, grasses, and organic matter do farmers in Tahira and Bussura know to be important in soil management and conservation? To summarize, these farmers are aware that a fallow period of seven years is the minimum length that upland rice and foñe cropland can be idled yet sustain current grain yields. They know that soil surface roughness (e.g. pebbles, stumps, and girinji) facilitates rainwater infiltration. They understand that the placement of wood or rocks in a systematic fashion perpendicular to the slope gradient during cultivation of hillsides is a wise practice for countering potential soil loss. These farmers are also cognizant that overburning can be detrimental to soil resources and that the judicious burning of cropland is advantageous to crop yields and these farmers' use of available labor in the short run.

Many farmers in Tahira and Bussura understand the principles of the watershed system and the existence of underground water tables. They know that trees are affiliated with rainfall and evapotranspiration. They know the basics of fruit tree horticulture in addition to vegetable gardening. They know about the use and potential value of plows, pesticides, and fertilizers in terms of labor and grain yield. They understand the role and value of animals in maintaining and improving the farming system, particularly with respect to soil

fertility and farm income. They know that maintaining good interpersonal relationships with others within and outside the community is beneficial to farming. They also understand that health and educational constraints are limiting factors for the improvement of their present level of food production.

What is it that Tahira and Bussura farmers do not know? Well, they do not know the details of chemistry and physics involved in assessing and planning soil fertility and soil moisture management. They cannot explain in detail the process of *bowalisation* or *cuirassement.* They know very little about the specifications of pesticides that might be of potential use in their farming system. They are not familiar with irrigation systems nor are they too familiar with farm equipment that has moving parts. They are not well informed about the potential influence that properly designed and implemented agricultural policy could have upon their lives. They know little about the national and international banking and credit system and its potential effect upon their production of food. They do not know how to read, for the most part, which is such an integral aspect of modern agriculture in much of the world.

Any exercise in determining what the farmers of Tahira and Bussura do and do not know could continue *ad infinitum.* A list of "do knows" and "don't knows" that would fill reams could be compiled. However, it is evident that much of what Tahira and Bussura farmers don't know about soil management and conservation can be included in the realm of Western agricultural science and, in this sense, is a function of farmers' access to education[229].

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[229]One morning I uprooted several wild bean plants that were growing in an unused portion of the sunt uure where my enclosed latrine was located. The roots of the plants were covered with nodules which, when sliced in half, exhibited an internal pinkish red color. This color is commonly believed by agricultural scientists to indicate that the root nodules of the plant in question may be fixing nitrogen. Two Tahira farmers were shown what I had observed on the bean roots and inside these nodules but their opinions did not suggest that they gave much significance to either the nodules or to their internal color. I explained that we learned that the pink or red internal color means the plant was obtaining an important plant "vitamin" from the air and storing it in its leaves, but the farmers were not impressed. It suddenly occurred to me that this theory of nitrogen

The information presented in RESULTS AND DISCUSSION can be considered the point of departure for future action in agricultural extension education in Tahira and Bussura. Whatever action would be or could be taken, it ought to involve information exchange between farmers and agricultural extension educators, who to some extent would be cultural outsiders to these or other Tahiras and Bussuras, at least initially. Moreover, as a matter of course in any village or watershed where agricultural development action is being considered, the first order of business ought to be the documentation of farmers' knowledge, even before information exchange proceeds, so that the farmers' knowledge would not be discounted and set aside as inutile. This exercise can be followed by a series of discussions about this knowledge with farmers so that decisions can be taken as to the immediate direction of agricultural extension education in a particular community. If Bussura women want to test herbicide and fertilzer, for example, it is the educator's role to ask how evaluating these inputs would mesh with the current practice of mulching. If Tahira women want their children to learn to read and write, which trees and grasses do they write about, first of all? If Tahira men want a credit system established in the village, what investment options accord with what people truly value? Should Bussura men want plows for the dantaari lands that they farm, is this technology the only labor-saving implement that could be evaluated, and what land tenure issues are linked to potential productivity should the plows prove be effective? These are examples of issues that agricultural extension educators should be

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fixation could indeed sound a bit bizarre to the "untrained ear". However, the nitrogen fixation theory may be no less bizarre to certain "untrained ears" than the idea that the twig of a parasitic plant mixed in with corn seed can enhance crop production. The point is that education can be double-edged, capable both of opening new worlds of knowledge but also of closing minds with respect to what is valuable and useful knowledge and what is not. Agricultural extension educators should therefore learn not only to value science-based agricultural knowledge, which may at times seem odd to farmers, but also to be receptive to knowledge that is dear to farmers but perhaps unorthodox to agronomists.

prepared to ferret out from their understanding of the local cultural milieu and then discuss with the farmers they represent and serve. Such discussions would serve in the long run not only to enhance the agricultural program that is finally implemented, but to better ensure the success of the program and the future credibility of the agricultural extension educator who serves a community.

The exchange and acquisition of farmers' knowledge

Among other objectives, this ethnographic case study has attempted to point out how farmers in Tahira and Bussura learn about soil management and conservation. The important roles of elders, parents, and religious leaders in the transmission of agricultural information throughout a community such as Tahira or Bussura have been noted. On the other hand, it has been observed that the farmers of Tahira and Bussura generally do not acquire new information via the written word except for what is written in the Koran.

Farmers in Tahira and Bussura do listen to the radio, however, and are thereby able to hear the opinions of others outside of the two communities. Unfortunately, Tahira and Bussura farmers cannot directly respond to these opinions, nor do they have the skills and opportunity to transmit written forms of communication to the sources of radio-based opinion. In order to facilitate village-level discussion of radio-based opinions, some nations have, in the past, organized "rural radio clubs". The Republic of Guinea already airs a brief national radio show about rural affairs and is currently developing some form of rural radio to serve farmers. At issue is whether or not farmer literacy as a tool for modern Guinean agriculture should be superseded by such long-distance, radio-based agricultural extension education. Is a modernized food production system replete with farmers who cannot read and write a realistic scenario?

These issues are for Guinean policy makers to answer. At best, both the radio and literacy would be of help to modernize Guinean agriculture through information exchange. Villages like Tahira and Bussura have clearly marked, cultural pathways that are open to information exchange between external knowledge sources and those which are internal to the farming community. These cultural pathways -- parents, religious leaders, commercial interests -- can and should be utilized for agricultural information exchange.

As for the organization of soil management and conservation, Tahira and Bussura farmers organize themselves for this purposes in several ways: First, with their immediate household members. Second, with those who share the family lineage in the community. Third, at the local m i s s i i d e, led by local religious leaders. Fourth, in accordance with the local, established political administrative unit. New information, externally sourced, can be obtained by through these same structures. These organizational structures could be purposefully and systematically integrated into the national and regional networks and institutions of agricultural information exchange.

For Tahira and Bussura, and perhaps elsewhere in the world, it may be more effective to work within established information exchange systems than to rely solely upon a structure that would be, by and large, culturally alien to farmers. An influx of new information and knowledge is necessary to help move agriculture forward in villages like Tahira and Bussura. However, the exchange of new agricultural knowledge and information between agricultural extension educators and farmers can be built upon tried-and-true features of traditional agricultural knowledge. Explicit use of grandparents, parents, aunts, and uncles to teach future farmers new ways of thinking merits consideration. The potential role of religious leaders has already been discussed. The decision to use these local resources to target the future of agriculture in such places as

Tahira and Bussura would be novel despite its logic. Agricultural extension educators could work with "parent-professionals" to develop a culture-based learning curriculum for educating young community members[230]. The extension educators could also work directly with the local religious leaders who could act as advisers to the parent-professionals. This approach is in every way consistent with how information is exchanged in Tahira and Bussura and does not preclude the generation and exchange of new information.

Cultural domains and the exchange of information

In this dissertation, the relative influence of seven cultural factors of soil management and conservation in the villages of Tahira and Bussura has been discussed with regard to farmers' perceptions of their agricultural environment. These cultural factors -- agronomic, economic, social, religious, historical, political, (but not aesthetic) -- comprise the "soil management domains" reviewed in the previous chapter. Also discussed, indirectly, are those cultural elements of soil management and conservation -- technology, power relations, social organization, social learning processes -- that ground soil management and conservation to a particular community, in this case, Tahira and Bussura.

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[230]Although this study did not begin with the idea that youth education be as major a research consideration as adult education, we asked a small sample (less than 10) of men and women their preference for one or the other in Tahira and Bussura. We asked them to choose between one of three general age groups: the sukaaɓe (approximately 10 to 16 years-old) the ɔiwɓe (17 years to marriage age), the *hakkundeeɓe* (married with children, up to about 50 years old), and the mawɓe (50+ years). Most people agreed that every group should be included in community-based education programs, but nearly all pointed especially to the hakkundeeɓe as the key group to encourage to participate in such programs. The prime reasons for this choice are practical: The ɔiwɓe are often absent, working elsewhere, while the hakkundeeɓe are fairly well-positioned socially and physically and thus have enough experience, influence, and energy to teach the sukkaaɓe and the youngest age group for children, the fayɓe (aged 1-7). For such an education program, a learning curriculum can be envisioned as one which utilizes the knowledge of the mawɓe as a foundation upon which new knowledge can be developed among the hakkundeeɓe, ɔiwɓe, sukaaɓe, and fayɓe, and applied to their unique problems.

A major need in Tahira and Bussura agricultural production is the need to substitute some type of input for the human labor and energy resources that are presently overtaxed. The farmers of Tahira and Bussura nevertheless seem preoccupied with what may be called "traditional modern" agricultural technologies as their only technical options. These options include specific inputs such as tractors, plows, fertilizers, pesticides, and the like. Each of these technologies has great potential for reducing labor inputs, given one *caveat*, that key constraints to their adaptation and use can be alleviated. These constraints include access to credit, stoney and sloped agricultural land, poor road systems, the price of petroleum, the availability of replacement parts, parts reparation itself, and a host of ancillary factors.

Above all, it is the time consuming activity associated with agricultural production in Tahira and Bussura that constrains the farm labor sector in these villages. These activities include fence building and repair, field clearing, hauling leaf mulch to the sun t uur e, peeling taro for drying, and house construction, among other tasks. Thus, it is now worthwhile and warranted to look beyond "traditional modern" agricultural technologies to other means by which to alleviate the strains on local labor.

For example, the potential exists for overseeding grass or legume cover crops into standing corn and taro prior to corn plant yellowing, as previously discussed. These cover crops could grow for a month to six weeks, then die and decompose as the rains cease. The appropriate cover crop, one with a shallow root system, would not compete with the taro or manioc. When the taro and manioc are dug up, this action would incorporate the decomposed organic materials into the soil. This practice might reduce the mulch required for corn. Mulch may yet be required for weed suppression but fewer trips to the forest would suffice to ensure an adequate supply of sun t uur e mulch.

Alternatively, the forest could be brought to the suntuure by the planting of compact blocks of closely spaced trees near to suntuure land or perhaps as live fencing, as alluded to above. The appropriate tree species would be those which provide a "suntuure's worth" of leaf mulch for one year of cropping. Tree leaves would be gathered from the mulch production plots early in the rainy season when the corn is normally mulched in accordance with the current practice. This would give planted trees ample time to resprout for the following growing season. The combination of cover crops and nearby trees might provide enough organic matter and mulch to eliminate or, at least, alleviate the need for women to retrieve leaves from the forest.

How to relieve women of the burden of labor required to manage the suntuure, while maintaining suntuure productivity, is not only problematic but also a major agricultural issue in Tahira and Bussura, both now and for the future. Suntuure land will arguably bear increasing importance in Fuuta Jalon in the years to come. At the same time, young men will continue to migrate to the cities and other rural areas. The tenure laws regarding the suntuure may not change quickly, if ever, but the labor required by the women and children who work these fields can, perhaps, be diminished or substituted for.

For agricultural extension educators who work with farmers to solve this or any other agricultural problem, appropriate agricultural technologies can be discussed with farmers using themes similar to those presented in this case study as soil management domains. In meetings with villagers, through the use of village-specific soil management domains, reciprocal discussion between agricultural extension educators and farmers could center upon such themes as soil organic matter (ñolu), trees, community solidarity (jokkere endam), that which Islam counsels about farming, study and knowledge, courage and perseverance (wakki laare), and other soil management themes. An

agricultural extension educator could cite virtually any of the paraphrased interview responses of Tahira and Bussura farmers to initiate discussion that would possibly lead to agricultural development action. This approach is attractive because discussion would be grounded in local culture as reflected in farmers' perceptions about their agricultural environment.

As for power relations in Tahira and Bussura, it is clear that considerable socio-political power rests with the local religious leaders, due in large part to historical events and to the religious leaders' ability to read the Koran and write Arabic. Power relations are not likely to be equal between those who have knowledge of the Koran and those who don't, at least until those who don't read and write at present do learn to read and write either Arabic, Pular, or French. In the villages of Tahira and Bussura, it is evident that a certain mystique associated with the ability to read and write exists in the perceptions of local farmers, particularly with respect to the Arabic of the Koran. This mystique serves to increase the power of those with this ability to read and write. However, just as the paraphrased interview responses presented in this dissertation research could be used by agricultural extension educators to initiate and maintain discussion, these or other culture-based perspectives can be used as "textbooks" for youth or adult reading and writing instruction.

It ought to be recognized that in the watersheds of Fuuta Jalon, religious leaders likely have some influence on the decision-making process of the normal, everyday person. This is due in no small part to the fact that religious leaders are perceived to embody moral values and spiritual power that normal, everyday people hold dear but cannot always attain. Nevertheless, there seems to be a certain reluctance on the part of policy-makers and planners in some nations around the world to actively incorporate religious leaders into government agricultural programs. This reluctance may be the product of a

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Western-born bias for the separation of church and state, or paranoia by government leaders towards powerful religious leaders, or a general distrust of allegedly corrupt religious leaders by allegedly corrupt government leaders.

In any case, for agricultural extension education activities in Tahira and Bussura that might involve demonstration fields, the cropland of the religious leaders in the watershed would be an ideal venue[231]. Alternatively, agricultural extension educators could work closely with religious leaders, asking them on occasion to discuss specific agricultural issues at the Friday prayer, which is what already occurs anyway among farmers in Dara Pelli district. Religious leaders might also be asked to publicly acknowledge certain farmers for their innovative efforts. This is what is meant by culture-based agricultural extension education, an approach that makes use of existing power relations, with no intent to overthrow the government. Let us not be cynical either about the intentions or motivations of the religious leaders in places like Guinea or elsewhere. These leaders, as much as anyone, have the right to be trusted.

Parallel curriculum development

The concept of parallel curriculum development can be understood as a process by which agricultural extension educators in-training establish a foundation for a youth and/or adult education program in some rural community. This aspect of their training, education, or "regular job", would be a field experience of much the same spirit as the *étude de milieu* [232] used in some

[231] In Tahira and Bussura, an optimal site would unquestionably be the fields of the saint (ɯɑl i ɣɣu) who resides in nearby Taybata, provided that the saint be included in planning the demonstration. These fields are cooperatively farmed by local farmers on at least one day every year in a show of solidarity and respect. Plus, the prestige allied with these fields is unparalled.

[232] In practical terms and usage, this translates as "baseline study" or, more literally, "place study" or "site study" or "environment study".

West African extension agent training programs, notably in Niger, but different in process and objective. Instead of completing an exercise in gathering quantitative data about a community's households in order to describe and type the households, the prospective agricultural extension educator would seek to understand how farmers think and view the world. This understanding is vital because agricultural extension educators represent the farmers and to do this job well she or he ought to understand their constituency. Certain aspects of the methodology applied to the case study of Tahira and Bussura can be utilized in this education and training process, such as the semantic-based questions posed to farmers, the use of participant observation, and most certainly the field work closure meetings.

This process would be but one part of an agricultural extension educator's training curriculum and, likewise, one part of a community's total education program. An agricultural extension educator would systematically select a site at which to reside for a period of six to twelve months, continuous time or split time. During this time, she or he would put to practice a scaled down, streamlined form of the learning process employed in this case study of Dara Pelli watershed. Soil management and conservation is but one of the myriad domains of rural culture that could be examined using this process.

Whatever the theme chosen by the prospective agricultural extension educators for their training experience, their objective would be to identify the cultural bases for the development of adult or youth education curricula. At the very least, using this process, community members' knowledge and points of view will be documented for future reference. Just as this case study attempts to illustrate soil management and conservation in Tahira and Bussura, a similar exercise in another watershed might develop a sourcebook on health care, credit systems, animal husbandry, or another theme.

These sourcebooks could be used in literacy education programs, or for agricultural experimentation, or perhaps for a hands-on enterprise such as strategic tree-planting or innovative fence-building. As long as a plan for learning and the rudiments of a thematic sourcebook result from the training activity, then the parallel curriculum development process would be served.

Future directions

The capacity of agricultural extension educators to understand the perspective of the farmers they represent will encourage appropriate agronomic research and effective communication among farmers and between research agronomists and farmers. This hypothesis begs to be tested in the field. Another hypothesis, that a village-level field experience by prospective agricultural extension educators in training will influence their capacity to understand farmers' perspectives, should also be tested.

In Guinea today, no apparent provisions exist in the training program of agricultural extension educators that would challenge, defend, or refute these hypotheses. Neither does a training component exist for Guinean agricultural extension educators that includes the utilization of a field experience having similar objectives as the methodology employed in this case study. Just the same, the results of this ethnographic case study of Tahira and Bussura suggest that, by asking farmers what they think, using appropriate vocabulary in simple questions and scenarios, a cultural outsider to a farming community can systematically understand and appreciate farmers' environmental perceptions. It may be proposed that training programs for Guinean agricultural extension educators, perhaps integrated into the World Bank's Training and Visit (T & V) System program, begin to apply methods that value, accommodate, and use

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farmers' points of view. Few people would disagree with this proposition, yet few people have proposed a framework by which to apply the concept.

An experimental testing of the hypotheses noted above could be planned for a five-year period. A trainee group could be divided into halves, one half subject to the current, conventional T & V training procedures for one year while the other half substitutes a six-month field experience for certain portions of the current training procedure. An attitude survey of trainees before and after they are subjected to the two divergent training methods would ascertain if and how the alternative "field experience" methodology affects prospective agricultural extension educators' attitudes toward farmers' opinions. The training groups could be monitored as they work to popularize technological change. Each group would utilize discussion as well as on-farm research and demonstration as their primary instruments of technology dissemination. Finally, the quality of communication and information exchange among farmers represented by agricultural extension educators and between farmers and research agronomists could also be measured during the four years of experimentation. This testing procedure could be replicated in succeeding training groups.

An ancillary research project would entail a semi-structured survey of farmers perceptions of soil management and conservation throughout the Fuuta Jalon region in order to design and implement a regional agricultural extension education program that would include literacy training and applied agronomic research using cultural themes common throughout the region. This survey could be based upon and developed from some of the questions and scenarios presented to the Tahira and Bussura farmers interviewed in this case study.

As noted earlier, the results of this case study represent a foundation for developing community sourcebooks for soil management and conservation in Tahira and Bussura. These sourcebooks can be complemented with a

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teacher's guide developed and tested in the field. The plan for use of this dissertation is to publish excerpts from RESULTS AND DISCUSSION as a sourcebook in four languages (English, French, Pular, Arabic). The format would follow the chapter outline presented in RESULTS AND DISCUSSION.

Other directions for research of an agronomic nature are presented throughout this dissertation. All the proposed research projects would work closely with Guinean government officials and with local religious leaders.

A final word about the future of agricultural extension education in Tahira and Bussura is in order. During the field work closure meetings, comments made Tahira and Bussura farmers were indicative of their educational desires. There is little doubt that the ability to read and write in any language is highly valued by Tahira and Bussura farmers. The overall lack of educational prowess in these villages, given the expressed value placed on education, is puzzling. Either the strength of this value has been misjudged or mitigating factors and circumstances inhibit the development of education in these villages.

The most evident inhibition is a penury of time, labor, and money that would be helpful to develop an educational program. A less obvious factor, though repeatedly articulated by Tahira and Bussura men and women, is educational leadership. Consistently, the men and women of Tahira and Bussura referred to the benefits of interacting with people who have studied.

The planned integration of farmers and formally trained intellectuals is more than a matter of sending university students to the countryside, as was tried by the Sekou Touré administration with mixed, mostly negative results. That program's objectives were obtuse and politically ideological. What is needed are well-trained, professional agricultural extension educators whose objectives are sometimes more fundamental than the dissemination of new technology. Villages such as Tahira and Bussura need creative, technological ideas that go

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beyond the standard formula of increased chemical soil fertility and pest management inputs, though these inputs should not be neglected. The future farmers of Tahira and Bussura need other farm management skills which, ironically, are not generally considered to be the domain of agricultural extension education but would complement farmers' capacity to modernize.

The most fundamental of these skills is the ability to read and write. It is inconceivable that Tahira and Bussura farmers can ever truly have control of their agricultural destiny until they are able to stand on equal footing with agricultural professionals and administrators in this respect. Professionals in the field of agricultural extension education ought to seriously consider this fundamental issue because, in a real sense, agricultural extension educators are inhibited in their own effectiveness by having to interact with clientele who lack reading and writing skills. Consequently, when farmers themselves do not have the capacity, for example, to maintain farm management records, document a charter for a soil conservation association, and read extension bulletins or fertilizer and pesticide labels, the credibility of agricultural extension education is liable to suffer from accusations of ineffectiveness.

However, agricultural extension educators in Guinea, given a new training and action mandate, would have an opportunity to forge a new direction for Guinean agriculture, starting with farmers' knowledge, and acting as farmers' advocates and representatives. The development of agricultural extension education programs in Guinea with which Guinean farmers share ownership is past due. A framework for this mandate is illustrated and suggested in this dissertation, beginning with the training of extension field agents and ending with culture-based, community-based education programs designed and implemented locally. Additionals details on tailoring such a mandate to existing Guinean programs are a matter for Guinean policy-makers to determine.

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APPENDICES

APPENDIX A

Glossary of selected Pular words

Alla walli woo wakkiliiɗo : Allah helps (walli) any (woo) person who is courageous and perseveres (wakkiliiɗo).
almaami : supreme leader.
angere : mineral (i.e., commercial) fertilizer (from the French term *engrais*).
angere buruure : mineral fertilizer (angere) of the bushland (buruure).
arsike : good fortune.
arsikenaaɗo : a person bestowed with good fortune.
aybingol leydi : ruining (aybingol) land (leydi).
aynde : pasture land, most commonly in a valley or intermountain zone.
baape : shrubs or the leaves of shrubs.
ballal : assistance, help, or a work group of peers intended as such.
bete : integrity in character.
beteeɓe : people of integrity.
birgaad : adaptation of the term "brigade" (also *brigade* in French).
bu'e : organic excrement.
bu'e ñirtoto : organic excrement (bu'e) of earthworm/s (ñirtoto).
ɓawli : designates a darkened color or being black in color.
ɓe finaa : literally, "they (ɓe) have not awakened (finaa)".
caldi : branches, the plural of saldu.
ceeɗu : the hot period of the dry season (e.g., February-April).
cellal e nguurndam : health (cellal) and life (nguurndam).
colli : birds (s. sonndu).
conki : an iron skewer used by blacksmiths.
coppi : cut, cleared, and cropped agricultural lands, the plural of soppuuru.
coppi e fakkere : cleared cropland and land in fallow.
cullaare : airborne dust.
dabbunde : the cold period of the dry season (e.g., November - January).
daggal : elevated storage rack.
dankitagol leydi : taking care of (dankitagol) land (leydi).
debeeje : large woven baskets, plural of debeere.
deftere taariik : book (deftere) of history (taariik).
delbi : vine-like plants.
demal (also ndemal) : agriculture.
diidere (pl. diide) : pool of water.
diina : religion.
dingiray : small corral or place for tethering and holding cattle.
diiwal (pl. diiwe) : province.

doole : strength, power, force.
ɗaati : soft and friable, as pertains to soil.
ɗaɗi geenal e ɗaɗi ñaamateew weldaa : roots (ɗaɗi) of weeds and roots of foodcrops (ñaamateew) are not complementary (weldaa; literally, are not mutually agreeable).
e: and, with.
e miijo moŋ : with (e) thought (miijo) your (moŋ); i.e., in your opinion.
faamu : understanding.
faamuuɓe : those people who have understanding (of a certain subject/s).
fayi : fattened.
fakkere (pl. pakkeeji): fallow field/s.
farilla : 1) obligation to tithe or the tithe itself; 2) a woman's menstrual period.
feere : means (to accomplish something).
feto (pl. pete) : boulder/s.
finaa tawaa e woowugol : tradition (finaa tawaa; literally, being awakened and found; being born into) and being habituated or accustomed to (woowugol).
foyuŋ : leaf mulch.
Fulɓe : Fulani people.
galle : household.
ganndal : knowledge, especially from studying, as opposed to knowledge obtained from practice and experience (anndal).
geeɗe e dulagol : weeds (geeɗe) and weeding (dulagol).
girinji : log or branch used to interrupt the flow of water.
haaju : need(s), concern(s).
haako waggo : fresh, young (waggo) leaves (haako).
hakkil : intelligence.
henndu : wind.
himpaare : curved-blade hand ax.
hoggo (pl. kolle): enclosed compound or the fence enclosing a compound.
horumba : cropland where nothing grows well; from horaade (to become thin and small from weight loss) and ngesa mba (the cropland).
huɓeere : metal-roofed home.
huuwooɓe : workers.
jamaa : society, group.
jamfe : trickery.
jangooɓe : people who have studied formally, i.e., where books and reading are integral to study.
jasugol e rentagol : turning the soil by digging or tilling (jasugol) and weeding (rentagol).
jinnaaji : supernatural beings or spirits.
jippagol : descending, getting down from.

jokkere endam : following up, continuity of (jokkere) breast milk (endam); in use, this refers to community solidarity.

jofooɓe : people easily duped, naive people.

jofoowo or joofoojo: someone easily duped, a naive person.

joom : proprietor, possessor.

joom ganndal : possessor of (joom) knowledge (ganndal).

jufu jufu : onomatopoeia for a hand hoe digging in good soil.

juudɗe e keri : hands (juudɗe) and hand hoe (keri).

juulirde : prayer place, mosque.

kaaba yonkataa ka reedu : corn (kaaba) does not shake around (yonkataa, i.e. sits well) in the stomach (reedu).

kaalis e luumo : money (kaalis) and market (luumo), technically a weekly market.

kala leggal e ɗowdi muŋ : each (kala) tree (leggal) with its (muŋ) shade (ɗowdi).

kawtal : neighbor(s) .

kese kese : onomatopoeia for a hand hoe digging in poor soil.

kile : work group.

kile futu : work group (kile) comprised primarily of in-laws (futu).

kisiyee : liberation, deliverance (from the tribulations of the world); also used as a reference of that which is valuable.

ko harmee : it is (ko) sinful, illicit, prohibited (harmee).

ko hawri : it is (ko) moderate, convenient, agreeable, "just right" (hawri).

koccu : gravel, pebbles, small rocks.

kulleeji e mummunteeji : in usage, wild animals (kulleeji) and domestic animals (mummunteeji ; lit., beings that cannot speak).

kulloy buruure : bushland (buruure) smaller animals (kulloy).

kulloy leydi : soil (leydi) animals, i.e., organisms (kulloy).

laaɓal : goodness, purity, cleanliness.

laakara : the Afterlife, the Beyond.

laamu : authority, rule or ruler, government.

laamu jeyi aduna : the authorities (laamu) own (jeyi) the world (aduna).

ladde : bushland, wilderness.

leɗɗe e huɗo : trees (leɗɗe) and (e) grass (huɗo).

meŋ waawataa lugginde miijo : We (meŋ) cannot (waawataa) to deepen (lugginde) thought (miijo).

lekki piihoy : remedy for, i.e., medicine (lekki) little things (piihoyi).

ndiyam : water, rain.

ndunngu : heart of the rainy season (July - October).

neene nguuri : mother of (neene) survival, livelihood (nguuri).

neene toore : mother of (neene) crop (toore).

ngalu leydi : riches, wealth of (ngalu) land (leydi).

njaatigii weldudo : agreeable, i.e., very close (weldudo) friend (njaatigii).
ñoldi : organic matter.
ñolu : organic matter, soil fertility.
paljol : error, fault.
sardin (pl. sardiñe): land located near streambeds, primarily used as an orchard, from the French word for garden (*jardin*).
sariya : law, justice (particulary Islamic).
sasi : wage labor.
setto : early period of the rainy season (May - July).
sirku : black magic, sorcercy, idolatry, heresy.
sohu : sorcery, curse.
sohugol : cursing with sorcery.
sotto : general name for a parasitic plant.
soŋŋaare : meal served at or around the noon hour.
suudu : house, home.
suusindirde : to dare each other, usually in order to become more familiar with each other.
tagaaɓe e aduna : human beings, literally, "those created" (tagaaɓe) and (e) the world (aduna).
tagoore doole : power (doole) of creation (tagoore).
tamba wula : wilderness (wula) of the Tambacounda region (in Senegal).
tampere : fatigue, poverty.
toɓɓe ndiyam : rain (ndiyam) drops (toɓɓe).
to'e e wahugol : foodcrops (to'e) and (e) harvesting (wahugol).
tutateeri : orchard.
wakkiliido : a courageous person, someone with perseverance.
wakkilaare : courage, perseverance.
waliyyu : saint, holy person.
welsindaare : negligence.
wirtugol : exposing, uncovering.
wurnitugol : making live again, reviving.
yiite e sunnugol : fire (yiite) and burning (sunnugol).
ŋawugol : ascending, climbing.
yimɓe buruure : bushland (buruure) people (yimɓe).

APPENDIX B

Map of Guinea