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Maasai oxen, agriculture and land use change in Monduli District, Tanzania

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Maasai Oxen, Agriculture and Land Use Change in Monduli District, Tanzania

Volume I
Chapters 1-6

By

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DISSERTATION

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This dissertation has been examined and approved.

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April 24, 2001

This dissertation with all the work and travel it entailed would not have been possible without the continuous support of my wife Janet A. Conroy.

For her efforts, sacrifices, patience, and most of all never a discouraging word,

I would like to dedicate this dissertation to her.

Acknowledgements

There are so many people to acknowledge in this dissertation, it is hard to find a starting point. My work in Africa truly began by having my skills with training and working oxen recognized by Richard Roosenberg, of Tillers International in Kalamazoo, Michigan. Without his interest in my work, and subsequent invitations to participate in Animal Traction training programs, beginning in 1991, in the USA and later in Africa, I suppose I never would have taken my skills and interests to the level I did in this project. Our work in Uganda and in Tanzania changed not only my perception of the importance of draft animals worldwide, but his ideas were central to understanding how my skills might somehow be of interest to others. For this I owe him a great deal, in helping me to take my skills to a new level, and in pushing myself to learn as much as I could from other cultures.

Next, I must acknowledge Bob Eckert. In 1995, I was frustrated with a Ph.D. program I had begun two years earlier. I wanted to start fresh with the idea of studying the use and adoption of oxen in Africa, after working in Uganda. Bob not only recognized my sincere interest, but he helped me believe this project was worth pursuing. Casually exploring this idea within the realm of the Natural Resource Program at the University of New Hampshire, Bob assured me we could make it work. He outlined with me early on what I would be required to do, and pointed out that neither he nor the department would be able to offer funding. While Bob had no personal interest in traveling to Africa (I asked him to come visit me numerous times) he seemed to always offer words of encouragement when they were needed. In a quiet way he prodded me along. If he did not have the answer he urged me to find it. When I needed funding he seemed to forward just the right ideas. Through most of the program I both taught full-time and took classes. Somehow with Bob behind me, offering

subtle encouragement, I was able to find my way to Africa and back three times. Finally, in lieu of his training as a Geneticist, Bob was able to look outside the box, and recognize that there are many ways to do research. Never once did he discourage my interest in qualitative methods, but instead helped me recognize their value in the context of my work.

My academic training in Animal Science left me with the impression that the only research projects were those conducted in controlled environments. Call it my own ignorance or unwillingness to look outside my professional interests, but it was not until I took some classes with Dr. Mimi Becker that I realized there were many other ways to evaluate and conduct research in agricultural systems. Her courses were eye openers for me. They brought into perspective so much of what I never understood about the impact of politics, NGO's, environmental issues, and human nature on agricultural systems. Mimi essentially became a co-advisor with Bob. Her interest in this project helped me refine many of my initial ideas and focus on what I knew I could do. At every stage she was both my best critic and my greatest teacher. In the end her editing of this document, helped me remain focused and not drift away from the main issues I explored with the Maasai.

Next, I have to thank Professor Joe Lugalla. Without Joe's urging and advice I would have never chosen Tanzania as a place to do research. He met me in Tanzania in 1996, and helped get me started by introducing me to his colleagues at the University of Dar es Salaam, who later became critical to my success. Joe set me up to get all the necessary paperwork and permits to conduct research. He opened both his home in Dar es Salaam and his home in New Hampshire to me. He gave me some wonderful tours of Dar es Salaam, and some great lessons on staying out of trouble in Tanzania. Joe also encouraged me to pursue my training in Swahili, which was essential. He invited me to his home to practice my skills, and his wife Sapiencia often tutored me when I was taking a class at Boston University. I only wish I

could have kept up with my Swahili. There have been so many ups and downs in my language training, I have gone from feeling fairly fluent to totally inept.

My grasp of Swahili at the moment is no reflection on my outstanding instructor at Boston University, James Igoe. Jim not only offered a wonderful introduction to the basics of Swahili, he helped focus my limited skills on the most critical areas of basic grammar and speaking, as I would only have one semester of formal training. At the time, I was taking the course, Jim was finishing up his own Ph.D. having just returned from years in Tanzania. His interest in the Maasai, their changing landscape and the institutions that surround this of course caught my attention. Without meeting Jim, I would have never met Lobulu, who was also his research assistant. I would have likely traveled down a very different path, both literally and physically. My hope is that someday Jim and I may combine our skills and interests in a way that will benefit the people and the environment of Tanzania.

In Tanzania, there were many people that were critical to my success. First, I must thank Dr. Hussein Sosovele, of the Institute of Resource Assessment. He was my in-country advisor in Tanzania, yet his ideas and influence went far beyond that role. He was my first point of contact at the University of Dar es Salaam, and the Institute of Resource Assessment was the perfect place from which to springboard into this work. Dr. Sosovele offered his friendship as a colleague interested in Animal Traction. He was essential in my being granted permits to conduct research in Tanzania. Early on my ideas for study were pretty vague. However, with his critical help and feedback at numerous stages, I was able to overcome the challenge of narrowing down my research topic. He taught me many lessons about conducting research in Tanzania, and helped me refine my study, so that I would ask appropriate questions and get the data I wanted. I have to thank him for being patient with me, as a naïve American in Tanzania. I will be forever grateful for the time and energy he spent on my behalf.

There were many other people that were critical to my success. At the University of Dar es Salaam, these include Dr. Mark Mujawahuzi and his family for opening their wonderful home whenever I was in Dar es Salaam. I owe a great deal to Mr. Msongonzila, the librarian at the Institute of Resource Assessment for helping me find many documents and articles I would not have found otherwise. Mr. Alex Ngowi was fantastic in helping me literally put together a map of my research area, when no other maps could be found. Dr. Kasim Kulindwa was a friend, who offered kind words and concern when I needed it.

There were many people outside the University who must be mentioned as well. First and foremost is Lobulu Sakita. Lobulu was my research assistant who worked tirelessly with me in both 1998 and 1999. His translation skills, professional integrity, intuitiveness, and insight were critical to me accomplishing anything at all with the Maasai. Lobulu was experienced in conducting this type of research, and had a special way with putting people at ease, with regard to both the concept of research and the questions we asked. Lobulu was forever patient. He taught me more about Tanzania, Swahili, the Maasai and conducting research than anyone else I acknowledge in this project. He was a teacher, a researcher, a friend and a colleague. It is my hope that I can someday help Lobulu as much with his professional development as he has helped me with this endeavor.

I rented a car throughout much of my fieldwork. This I rented in Arusha from Alfonse Martin. His assistance and flexibility with this rental was wonderful. Our Suzuki Samuri was not only the perfect vehicle for the job, it was also efficient and was always well-maintained. This vehicle was driven by Alfonse's cousin Fratern Shirima. "Shirima", a Chagga, became part of my tiny research team. Shirima, Lobulu and I not only conducted research very efficiently, we had a great time. Shirima was the most dependable, hard working, and dedicated man I could have ever found to do this job. He was a friend, a great traveling companion, a careful driver, a stalwart bush mechanic, and a great under-cover

researcher. During the days while Lobulu and I conducted interviews, he often took on other assignments. For example, I would ask him to find out why someone did not appear to be telling the truth about something in an interview. He would always return with the greatest of stories and most revealing information. I can only hope that Lobulu and Shirima enjoyed their work as much as I enjoyed working with them.

When Lobulu was not available I worked with Ngaai Suyaan, a district extension officer in Monduli. Mr. Suyaan is a Maasai. His professional training was in agriculture and his contacts in the area were fantastic. He was a great resource not only for his understanding of the local agriculture, but also his understanding of land tenure, environmental issues, and the local and national political situation. My only regret is that we could not have spent more time together. He was encouraging, very supportive of my work, and he had a great sense of people. His humor, integrity and attentiveness were a real asset.

In both 1996 and 1998, Mr. Mike Mziray, then the Liason Officer of Sasa-Kawa Global - 2000, offered advice from the perspective of a well-seasoned extension officer familiar with animal traction. He invited me to a national animal traction meeting in Dodoma in 1996, and put me in contact with numerous extension officers during my both that year and two years later, when I had narrowed down my research area. His ideas were critical to narrowing my study and finding people to discuss animal traction within the first phase of my study.

Mark Lyimo, an extension officer with the Agricultural Mechanization Unit, in the Ministry of Agriculture (KILIMO) in Tanzania offered many insights into the use of draft animals in Tanzania, as well as, the critical issues facing farmers who were using them. We met numerous times over the course of my study. His ideas, advice and good humor were always appreciated.

There were so many people that shaped my study in Tanzania, to create a list would take volumes, but I must include the many local extension officers I met such as, Mrs. Theresa Mhindi, Mr. Joseph Mwalley, and Mr. I.H. Magogo. Mr. Mwalley, a field extension officer in Arumeru was essential to my work in 1998. He helped Lobulu and me get a sense of animal traction use in that district, and offered many ideas on the ins and outs of agriculture among the Meru and Arusha people. Mr. Magogo, was also a great asset to my early work, as his experience in the field with draft animals was exemplary.

Of course, I must also acknowledge the many government and district officials that permitted me to work in the Arusha Region, as well as, the Monduli and Arumeru Districts. Without their approval my work would have never been possible. I must also openly thank the many village authorities, village and the sub-village leaders, who not only permitted me to venture into their villages, but provided so much hospitality, insight, and regular assistance to my work.

Before leaving my list of acknowledgements from Tanzania, I must also acknowledge the wonderful hospitality of Jo Driessen and Judith Jackson. In 1999 their home provided a wonderful retreat from my weekly treks into the field. Their home offered not only the comforts that are non-existent in the field, but the food they served was the best I had in Tanzania. Finally, the company they kept was the most interesting group of people I could have ever met. Hosting some of the most well known wildlife researchers in Tanzania, and also sharing their Arusha home with Paul Oliver, of Oliver's Camps, these people offered endless ideas and perspectives into my work. I returned to the field each Monday morning, refreshed, refueled and full of new ideas.

Next, I must acknowledge the people closer to home that have supported this work. First, my parents Bernard and Kathleen Conroy, deserve a special note. They encouraged my childhood interests in oxen and wildlife. They allowed all of my crazy activities with oxen

and animals since I was about 5 years old. Most importantly they never said "no" when I pursued my interest with animals. I always dreamed of going to Africa on a Safari. I never imagined that safari would span 5 years.

My wife's parents, John and Janet Fuller also deserve special recognition. Over the last several years they have offered support and a retreat for my family when needed throughout this long research and writing process. Their experiences in Africa were quite a contrast to my own, but their encouragement in this endeavor was always genuine and appreciated.

During the first year I traveled to Africa, my wife Janet and I had our first child, Ross. Ross grew up hearing tales of Africa, seeing thousands of pictures, dozens of films, and received every postcard I could find with animals on it. He likely understands more about the Maasai, Tanzania and oxen than most college students. My research trips and the time away were particularly hard on him. The most memorable moment for me was when he was 3 years old. I had called Janet from Arusha. Janet told me, "Ross thinks you are dead because you've been gone so long." Her statement brought tears to my eyes. I was ready to quit the whole project. Yet, as hard as that was on me, I don't think it will have any long lasting impact on Ross. Writing this dissertation has been even more difficult for him. Both because he is older, and I was "at home" unable to spend the time with him he desired. Far too many times the last few years, I have not participated in family activities, gone on family vacations or "played" when he wanted to. He thought my dissertation was particularly boring when he saw it had no pictures. His sincere interest in pictures inspired me to engage the assistance of Analesa Harvey, a former student to draw the superb original figures in this work, based on my photographs and poor drawings.

I must thank Peter Cook and Dave Howell for being advisors and readers of this dissertation. Peter deserves special thanks for being eternally optimistic about this endeavor,

despite my sometimes, grueling schedule. His sincere interest in this work always made telling stories about it fun. He and his wife were also there for my family when they needed them. Dave Howell's ideas were critical early on in both developing my funding ideas, exploring possible future options with regard to part-time work abroad, and testing my ideas in the classroom, which inevitably is where I will continue my career.

Finally, I must acknowledge the many sources of funding I received which made all of this possible. Over the research period my funding came from The Switzer Foundation, The National Security Education Program, the Columbus Zoo, the University of New Hampshire's Office of Sustainability, and the University New Hampshire's Center for International Education. I also received funding from the Yankee Teamsters 4-H club in Strafford County, New Hampshire, and support from Tillers International of Kalamazoo, Michigan.

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ABSTRACT

MAASAI OXEN, AGRICULTURE AND LAND USE CHANGE IN MONDULI DISTIRICT, TANZANIA

By Andrew Bernard Conroy

University of New Hampshire , May, 2001

This dissertation examines the sustainability of the use of oxen by the Maasai and Arusha (WaArusha) people, in Monduli District, Tanzania. Traditionally pastoralists, the Maasai are undergoing a social and agricultural transformation process of sedentarization in this region. The villages included in the case study were Arkatan, Engaruka, Esilalei, Lashaine, Lendikenya, Lolkisale, Losirwa, Mbuyuni, Mswakini, and Selela. Using semi-structured interviews the heads of 130 Maasai homesteads (*bomas*), as well as, other informants were interviewed. The history, issues of technology transfer and future prospects of animal traction were examined, as well as, the obstacles and constraints facing the Maasai in their adoption of this technology. This case study also documents and compares the agricultural development and cropping strategies of the Maasai and WaArusha people related to the adoption and sustainable use of animal traction.

The adoption of oxen and other forms of agricultural power, including tractors, by the Maasai has transformed their view of land tenure, their access to common grazing areas, and their ability to share grazing resources with wildlife. Adopting well-known

agricultural development strategies, the Maasai have also tried to maintain their livestock keeping and pastoral culture. Monduli District, located in Northern Tanzania, is adjacent to many wildlife areas and National Parks, including Lake Manyara National Park, Tarangire National Park, Arusha National Park, and the Ngorongoro Conservation Area. Nearby Maasai grazing areas have been considered important wildlife corridors. The proximity to these wildlife areas has created a situation where large numbers of wildlife frequently pass through and raid crop fields. The Maasai and WaArusha people face a shrinking land base, reducing their ability to survive by pastoralism alone. Crop growing has become an important part of their economic survival.

The landscape in the research area has changed dramatically in the last 15 years. This land use change, particularly in highland areas, has created environmental problems, such as overgrazing, soil erosion, as well as, decreased vegetative cover leading to lower soil moisture levels. The result has been decreased crop yields in many areas, with increased social and wildlife conflicts, as well as, rampant environmental problems.

CHAPTER 1

WHY MAASAI AND OXEN?

1.1 – Prelude to Research

This chapter will outline the process that led to my decision to study the Maasai in Monduli District Tanzania. I will also outline the factors and people that led to my decision to study Maasai oxen, agriculture, and land use change. I will briefly outline my research process, which will be discussed in much greater detail in Chapter 5. Finally, I will also introduce the first questions that arose from my initial research, and how these questions developed into this case study project.

In 1996, I was looking for an area in Tanzania where I could do research on the use and adoption of oxen. I had worked briefly in Uganda on a draft animal training program in 1995. There was a lot of interest in animal traction in Uganda, due to numerous failed tractor schemes. The presence of oxen was limited in some areas, and the systems of using the animals were pretty crude. I could see a lot of potential for both research and teaching. The rapid adoption of oxen and expansion of agriculture by the Karamajong , had particularly intrigued me. They were historically pastoralists [1], but like many pastoral people in East Africa are now moving toward a more agropastoral lifestyle. I had an open invitation to return, but decided that the political situation was not to my liking. The presence of automatic

[1] Ndagala (1996) defines pastoralism as a system of agricultural production in which the household derives more than half of their social and economic well-being from livestock keeping. Agropastoralism on the other hand refers to a system of agricultural production, where livestock and crops have almost equal significance in the social and economic well-being of the people concerned.

weapons in the hands of most of the Karamajong herd boys was a little unnerving to say the least. I decided Tanzania, despite the possible language challenges, would offer a safer research environment. My initial research ideas did not include wildlife, soil conservation or Maasai. Initially I wanted to explore the impact of adopting oxen on agricultural biodiversity. However, like most research, initial ideas often change, as you begin to learn more about your research area and topic of research.

1.2 –Developing a Research Topic and Strategy

1.2.1 – Phase I – Scoping Study

In July of 1996, my first trip to Tanzania, flying from London to Dar es Salaam, Tanzania, I met Jane Goodall on the airplane. We briefly discussed her work with chimpanzees. She in turn inquired about my work. When I mentioned that I was interested in working with farmers using oxen, there was a change in her expression. It seemed to be from one of interest, to one of concern. She said that agricultural expansion was one of the leading causes of problems with wildlife areas. Gombe Stream National Park was no exception. As we parted ways, I began to rethink my original intentions, which in her 1999 book Reason for Hope, she points out is often her intended effect on people. I was interested in the spread of ox technology and its adoption as a way to improving food security for the people. I had given little thought to the consequences of this spread of technology on the natural resource base. I had never thought about its implications on wildlife or even the land upon which oxen were used. Of course I knew from American, European and even Ugandan history that farmers using oxen have rapidly changed the landscape. The more I thought about this topic, the more I was convinced it would become my Ph.D. research project.

During that first trip to Tanzania, I traveled around, visiting ox-training centers, and talking with extension officers interested in animal traction both at the national, district and village level. I visited with University researchers and made numerous contacts with NGO[2] leaders that would prove invaluable. In this endeavor I gained a sense of how oxen could be used, but I was disappointed in a way, as I had not seen many ox teams at work. One problem was that I visited during the harvest season, not the plowing season. Another problem was that I was trying to see oxen in larger villages and from paved roadways.

It was not until some very kind extension officers took me far off the main roads in Dodoma, did I begin to see oxen at work. In these remote areas oxen were being used for harvesting and the presence of many plows and yokes offered evidence that oxen were used frequently, but possibly at other times of the year. I realized there was great potential for research. I also gained a few other valuable lessons. My pocket photo album, with pictures of my own cattle and oxen helped me gain access to people almost immediately. It certainly captured people's interest a lot faster than my limited Swahili.

1.2.2 - Returning to Tanzania – Phase II

In order to begin my research, I spent much of 1996 and 1997 trying to secure funding for return trips to Tanzania. In March of 1998 I did return, by then I had a basic grasp of Swahili and I had done a considerable amount of research into the ethnic groups like the Meru and the WaArusha [3] of Northern Tanzania. I was familiar with their history from the colonial period. I knew there were still oxen in the flatland areas surrounding Mt. Meru. This area was also of interest, because I wanted to be near enough to an urban center to have

[2] NGO is an abbreviation for Non-Government Organization, which in a broad sense could mean exactly that. However, in many developing nations NGO's are often organizations that provide technical, financial, and other forms of assistance to people, the government or branches of the government.

[3] I use the Swahili term *WaArusha* instead of Arusha as they are often called in the literature, as this helps eliminate confusion between the town Arusha, which I frequently cite in my text, and the Arusha people, that have for many year inhabited the Western slopes of Mt. Meru. These people are described within the text, but they have over the last 35-40 years moved in large numbers onto the Kisongo Plains.

regular communications with my wife and son. Finally I wanted to see wildlife. I not only wanted to see them from a purely Western perspective, but I wanted to see for myself how the use of oxen might have been impacting wildlife and the wildlife areas.

Before departing for Tanzania, my Swahili instructor, Jim Igoe, at Boston University told me that I would accomplish little without a research assistant who knew the language and the region.

Finding Lobulu was an adventure in itself. Months later in Arusha, I wandered around the crowded bus stand, looking for the bus to Monduli in order to track down Lobulu Sakita. As the lone "*Mzungu*" (white man) at the bus stand, I was immediately barraged by a group of local boys trying to con me into buying things I did not need and trying to inspire me to take a bus to places of which I never heard. Being new to Tanzania, and not very fluent in Swahili, I had a lot to learn. When I said, "*Kuenda Monduli*", I figured out how it all worked. A boy promptly took me to the Monduli bus and shortly after, the conductor gave him a few shillings.

I found the bus filled with elegantly dressed Maasai wearing heavily beaded earrings, numerous necklaces and bracelets. To my surprise, many also wore watches, carried umbrellas and had small radios. Traveling west out of Arusha toward the Monduli Mountains, I couldn't help staring at the people on the bus. My staring didn't seem to bother the Maasai, and their wide-eyed children didn't bother me. I knew little about these people and was intrigued by their presence. Due to heavy rain, the road was slippery and full of ruts and puddles. As the bus spun its way up the slopes, I thought I might end up walking to Monduli without an umbrella in the pouring rain.

Once in Monduli, I needed to find Lobulu Sakita's *duka* (shop)[4]. I knew it was near the main market, but I did not know where that was. So at the bus stand I asked for help in my best Swahili. It was obvious to some locals I was struggling to find him. A Maasai man speaking Swahili told me to follow him. As we wandered through the back alleys of Monduli, I wasn't sure he even understood what I wanted, but I followed. We soon arrived at a small *duka* (store) with a woman behind the counter. She was also Maasai and greeted me as she would any customer. The warrior indicated that this was the place. I paid him for his assistance and began to inquire about Lobulu. The dialogue was very difficult, mostly because of my limited Swahili. The woman soon disappeared into the back and brought out a note I had written months before. She said she was Lobulu's wife and she knew who I was. She said simply that Lobulu was not available.

I was dumbfounded. My first thought was that he couldn't help me at all. I asked when he would be back. She said, "kesho" (tomorrow). I jotted down on a slip of paper where I was staying and asked if Lobulu could come to visit me there. She took my note.

The next morning a small balding man found me at my breakfast table in a cheap hotel in Arusha. He introduced himself as Lobulu Sakita. Describing my research Lobulu nodded and listened carefully. He asked many questions, and gave me some insight into the challenges of my project. He said this area was full of oxen. He also said it was the beginning of the long rains and travel could be difficult. We negotiated a price for his services and that morning we began our work.

Lobulu helped me gain research clearance in the Arusha regional office, as well as the Arumeru and Monduli district offices. I had originally targeted a number of villages in the Arusha region, so a few days later we left on local buses to find a village in the lowlands of Arumeru. One of those first days in the field we rode on two buses that slid off the road. We

[4] This is the Swahili word for shop or small store.

hired bicycles to take us to a village, and we walked when bicycles couldn't take us any further, because of the mud. Hours later we saw the village in the distance. Between the village and us a river had overflowed its banks. Afraid of contracting Schistosomiasis, I didn't want to cross on foot. Lobulu insisted we had come this far and we must continue. Taking my shoes and socks off, at his insistence, and putting our packs on our heads, we crossed the chest deep water. Halfway across, I jokingly asked a local on the riverbank if there were crocodiles in this water. The man laughed and said something I couldn't understand.

Upon reaching the other side safely, Lobulu smiled and translated, *"If we see any crocodiles, we should catch them and we will be heroes in the village."*

I began my preliminary research in April, during the wettest season of the year. Farmers were actively plowing and planting their crops at the tail end of narrow window of opportunity that many Tanzanian farmers have in getting crops planted. To see their use of oxen was exciting and each day was a grand adventure. However, my idea that I could easily study land use change, and the impact that oxen had on that change was going to be a challenge. These farmers had been using oxen for generations. Much of the native grasslands and forest had been removed, as this was a very fertile and highly regarded agricultural area, and had been for hundreds of years. As the weeks progressed, I tried to visit different tribes, different areas, and discuss different opportunities and challenges the farmers faced. I was probing for information, I was learning a lot, but nothing that I felt was really original.

1.3 - Why Maasai and Oxen

As my first three months in the field drew to a close, I asked Lobulu if there were other tribes nearby that were using oxen?

Lobulu's answer, *"There are many, even the Maasai are using oxen."*

His comment was like music to my ears. "*The Maasai were using oxen.*" I repeated.

During my trip to Tanzania in 1996, I had seen a few Maasai. They were on the fringes of the cities I traveled to and were seen in rural areas near towns or villages that I traveled through by bus. Their presence was rather unsettling, wearing only long red robes and sandals made from car tires, while carrying long steel spears. I did not even consider approaching them. They seemed a people that were distant from my interests and far from my abilities to communicate in the local language. I never considered them as users of animal traction, nor did I consider them as a possible source of information in my examination of the use of draft animals in Tanzania. In visits to university, extension and NGO offices I also never heard any mention of the Maasai.

Of course, upon my return in 1998, I again noticed Maasai. In Dar es Salaam, near the university, they could be seen walking along the roads. I inquired about their presence. Apparently they are frequently hired as guards or *askari* (private soldiers) [5] in the city for private residences. Many of these were young men were trying to earn some income in order to establish their own herds, once they returned home. The Maasai were said to be more trustworthy and more frightening than other *askari*. I took this passing comment and continued about my business at the University and in and around Dar es Salaam, as my priority was getting my research and residency permits.

In 1998, prior to finding Lobulu, I had met a Maasai man who spoke Swahili at the cattle market in Mgagao (Same District). He had asked about my interests. I told him I was interested in oxen. I showed him a few pictures of my oxen. He then tried to sell me some of his cattle. He said he had oxen, eight of them at his *enkang or boma* (the pastoralist's home)[6].

[5] This is a Swahili word for private soldiers.

[6] This is the Maa word for home or compound. Maasai speaking Swahili would call it their "boma". To see a picture of the layout of a boma, see Figures (5.8 & 5.9) in Chapter 5, describing the homestead layouts in Esilalei and Losirwa. These are some of the best examples showing how the homes of a polygamous family are arranged around a central corral.

When I asked what he used them for, he had said farm work. I had not really believed him. I thought he was telling me what I wanted to hear, in order to sell me some of his large steers. Now with Lobulu telling me this, I began to seriously think this was a topic I should research. Only in one sentence in Pingali et al. (1987) which was one of the many books and articles I read in preparation for this trip, had I read about oxen being used by Maasai.

Beginning the first day I tried to find Lobulu, the Maasai in the town of Arusha intrigued me. I had seen them outside Arusha on the Great North Road, the gateway to many of the famous wildlife reserves (see Figures 1.1 and 5.1). My fascination was captured by their clothing, their presence, and their ability to remain true to their language and culture amidst so many forces that would draw them into the mainstream of Tanzanian culture. Lobulu was a Maasai. Why had I not ever asked this question before?

About forty days after beginning my research, it was still raining.[7] Lobulu had not exaggerated that travel would be difficult. We traveled on the muddiest roads rural Tanzanians had seen in a long time, as the 1998 rains were not typical. The locals called them the *"El Nino Rains"*. We were trapped by flash floods. We were so often stuck and sliding off the road with our vehicle that we finally gave up on trying to drive at all. It was a little disheartening. I was just beginning to get some original ideas on oxen and land use change. I really wanted to continue despite the weather, as my first research trip to Tanzania was drawing to a close.

Lobulu never wavered. He suggested that we simply walk like the Maasai. He warned me that it would not be easy.

[7] This was during the month of April, which is the normal month of high rainfall, but in 1998, it rained so much that most roads in lower areas were completely flooded. The main road from Makuyuni to Mto wa Mbu was like a canal, with 2-4 feet of water in the road for miles. Essentially Lake Manyara had simply expanded into the flatlands of Esilalei and Losirwa. It wreaked havoc on the crops, essentially flooding most crop fields, ruining most of the crops in lower elevations.

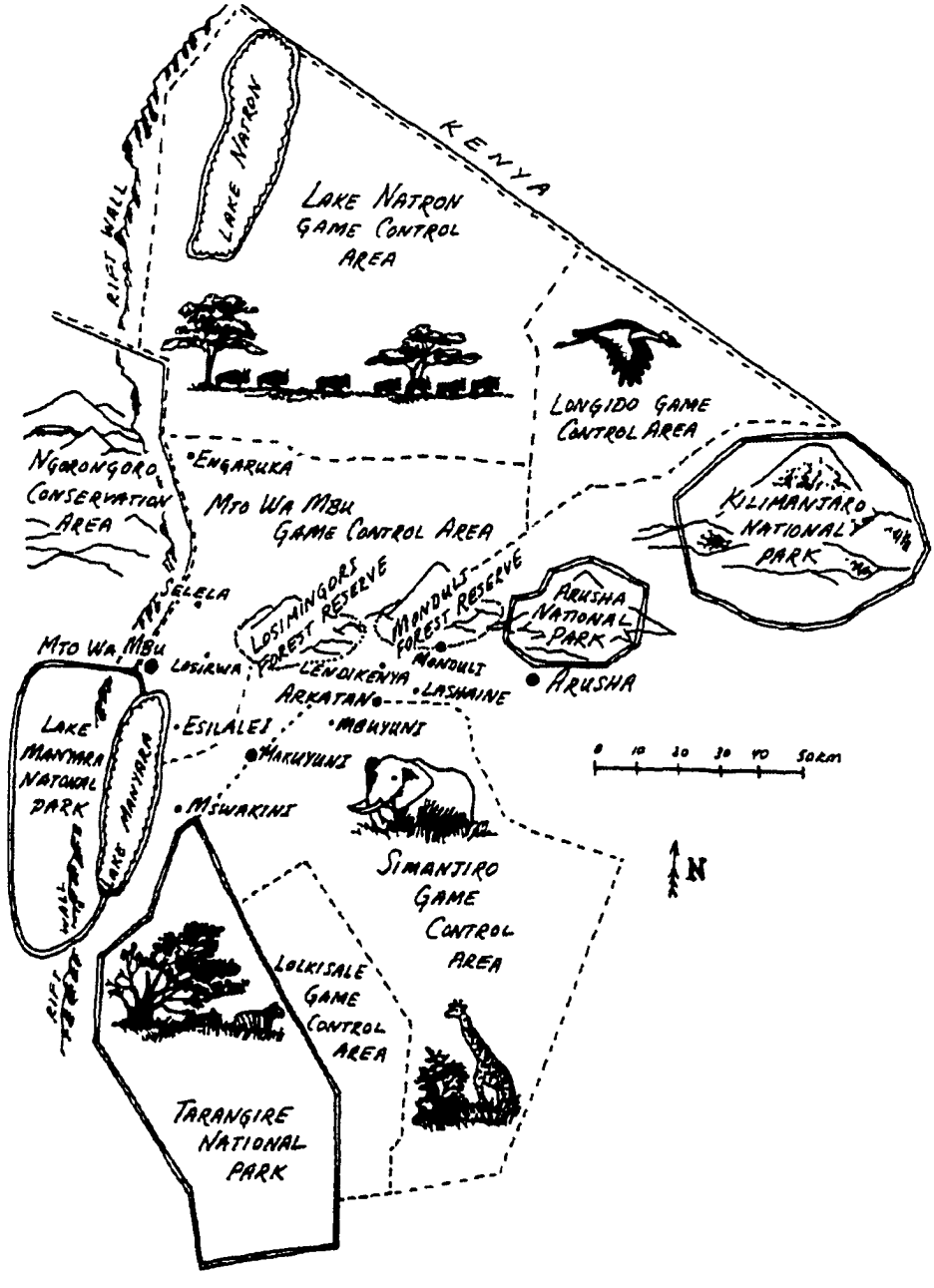

Figure 1.1 - Research Villages and Wildlife Areas in Monduli District

During the last few weeks of my 1998 field research we began to walk upwards of 32 kilometers per day to interview Maasai farmers. The most memorable moment and one that will keep Lobulu with me forever, was as follows;

After four hours on the trail, I told Lobulu this was not a short walk today, as he had said it would be.

Lobulu turned to me and with his incredibly dry Maasai philosophy said, *"Do you know why the White man invented the car?"*

In reply I said *"no"*.

Lobulu replied, *"The white man invented the car so he wouldn't have to walk. Now one hundred years after the invention of the car, the white man has already forgotten how to walk."*

He went on to say, *"I am a Maasai, four hours is a short walk. If we walked for a week then I would call it a long walk."*

It was a statement I will never forget.

Lobulu Sakita was the most influential person I worked with on this project. He often referred to himself as my assistant. Having worked for numerous researchers in the past, as well as being trained to be a teacher, Lobulu was a very bright young man. After a few weeks, I jokingly referred to him as the research director. His assistance in 1998 helped shape my research and my ideas about Tanzania. Without him, I would have never have accomplished what I did with the people we interviewed all over the Arusha region. He helped introduce me to farmers who had been using oxen for decades, others that had just adopted them. He would assist me daily with my Swahili, and with ever so much patience, he would offer thoughtful feedback to my ideas in the field. His experience was invaluable; his friendship will last a lifetime. Later when he introduced me to Maasai using oxen, we visited

Maasai at their homes, in cattle markets, weddings, and special ceremonies. We shared meals, shared stories and shared our cultures. Many nights in the field we even shared the same bed, and we always shared many laughs. I knew it was with the Maasai and Lobulu that I would be able to conduct research and write a dissertation on something of real interest to me.

Returning home and back to my job at the University of New Hampshire, I learned all I could about the Maasai and the Monduli district over the course of the next 9 months. As I dug a little deeper into the literature, I found out that the Maasai had been adopting oxen and agriculture quite readily in recent years, in both Kenya and Tanzania (Ndagala 1992a & 1992b, Baxter 1990).

1.4 - The 1999 Field Research

In May of 1999, I returned once again to Tanzania. I was back in the field as soon as my research and residency permits were cleared in Dar es Salaam. Lobulu knew what I wanted to study and in late in the month of May we resumed our work. In contrast to our work in 1998, the weather during the 1999 trip was so dry we sometimes had dust infiltrate every package, bag and book that we carried in our vehicle. We targeted numerous villages in the Manyara and Kisongo divisions of Monduli district. Both divisions together are called the Kisongo Locality, a traditional Maasai locale within Monduli District (Meindertsma and Kessler 1997) (See Figure 4.1). There were many oxen in the area, and it would be easy to see the landscape change, as it was changing almost daily. There were also many issues related to agricultural sustainability. I soon learned that these traditional grazing areas which are rapidly being converted to agricultural lands are also in major wildlife migration corridor. I chose not to interview Maasai in the arid sections of Monduli, which continue to be largely

pastoral, such as Longido. The agricultural system there was much more pastoral, and the ecology of that region more arid.

This project is a reflection of my passion for oxen, agriculture, cattle and people. I never imagined that wildlife would somehow be interwoven into this project as well. However, as my formal interviews began in 1999, it was obvious that the Maasai in this region considered most wildlife agricultural pests. This I came to learn is a pressing issue in the region (Ole Saitoti 1978, Jonsson et al. 1993, Lama 1998). The Maasai occupy lands that are critical to the seasonal migrations of wildlife in and out of Tarangire National Park, Lake Manyara National Park, and Ngorongoro Conservation Area, as well as, lands within the Mto wa Mbu Game Control Area (GCA), the Lolkisale GCA, and the Simanjiro GCA (See Figure 1.1). I did not go into this project with any preconceived notions about wildlife in Maasai areas or Maasai in wildlife areas. I was interested in the adoption of oxen by the Maasai and its impact on land use. However, land use in this area is more complicated then farmers planting seeds and tending crops. The adoption of agriculture among the Maasai of Monduli has its roots in colonial policies, the establishment of wildlife parks, and the politics of land tenure and the rapidly growing Tanzanian population. Oxen have largely been a tool to expand agricultural areas. This agricultural development has been largely at the expense of grazing areas, and seems to be expanding, with little regard for the environment. It was within this complex system of culture, politics, agricultural expansion, and wildlife areas, that I began to try to make sense of how oxen have impacted and will continue to impact the Maasai and the surrounding landscape.

1.5 - Developing Research Questions

Many questions arose as I began to explore the adoption and use of oxen by the Maasai. How long had they been using oxen? Their skill level appeared to be far beyond

what I had seen in other Tanzanian areas, particularly among farmers in the Tanga and Kilimanjaro regions. When compared to the Karamojong of Uganda, the Maasai skills in training and handling the oxen were exemplary. Why was there such a widespread adoption of largely unsustainable agricultural practices? Their skills with cattle and ample supply of animals allow them to readily put the animals to work in many tasks, yet they appeared to be facing numerous obstacles to creating a sustainable food production system. They in fact appeared to employ few, if any, sustainable agricultural principles, as indicated by comparing their system of production to the principles and indicators of sustainable agriculture put forth by Holmberg (1991) and Shao (1999), which are outlined in Chapter 2. A few striking examples included, the lack of soil protection measures, and fields of crops with no chance of producing a yield worthy of harvest.

Their traditional herding strategies, which have been considered a much more sustainable agricultural system by some (McCown et al.1979, Stiles 1981, Kjaerby 1983, Howell 1987) have been in part abandoned in much of the lower Monduli district. This process outlined in Chapter 3, was not by choice. Many of the best dry season pastures and watering areas, have been converted into wildlife areas, commercial bean, barley and wheat farms (most owned and controlled by white settlers) and small plots controlled by an ever increasing and expanding native agricultural population (Jacobs 1980, Campbell 1984, Lama 1998, Igoe 2000). Some of these changes were led by government policy, but other people were moving to this area out of desperation. The expansion by others into traditional Maasai lands seemed to be having an impact on their adoption of oxen and agriculture. This will be discussed in more detail in Chapters 2 and 3.

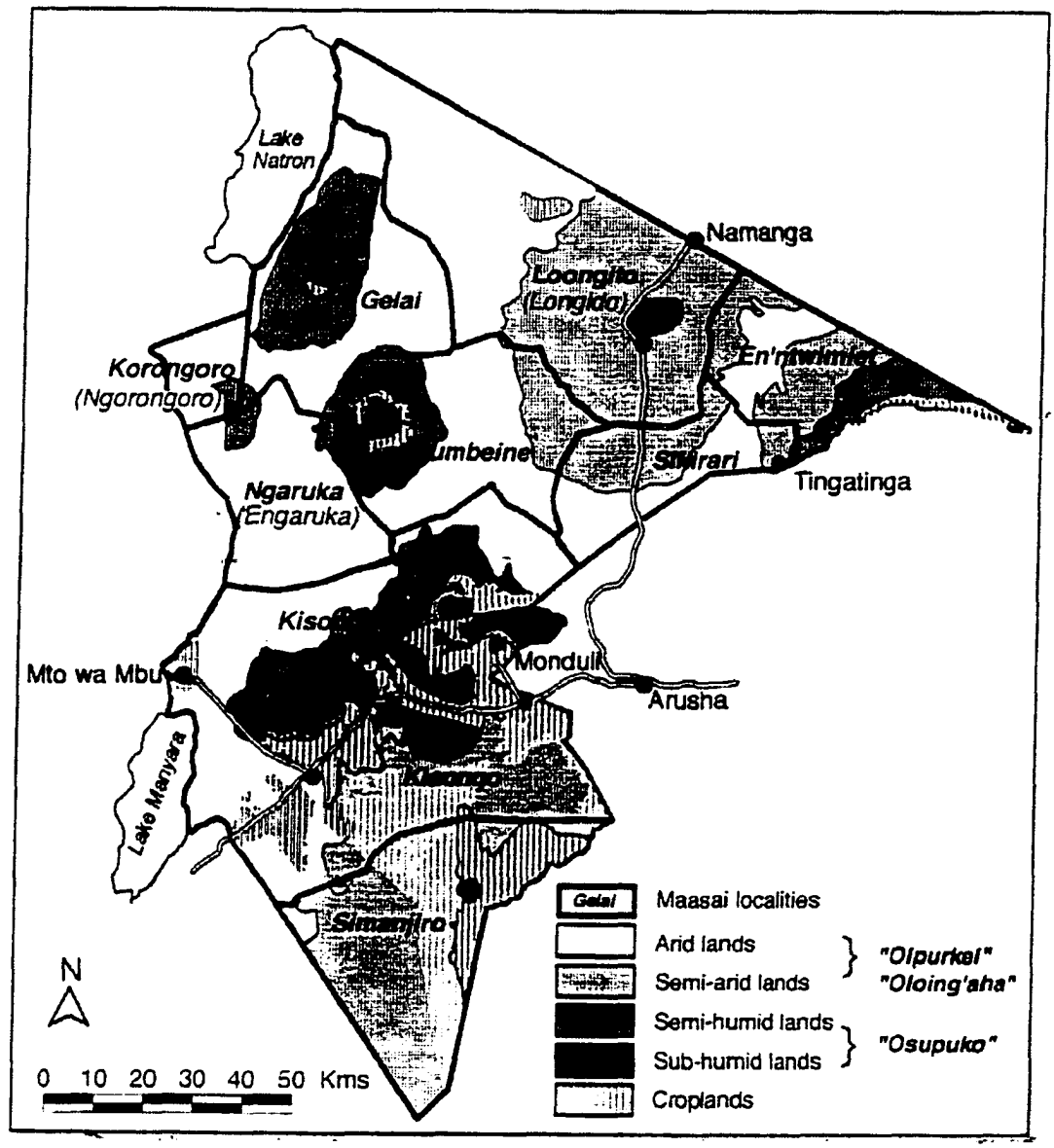

Figure 1.2 - Maasai Localities in Relation to Climatological Zones

My initial sense in 1996 was that as draft animal adoption increased, monoculture cropping seemed to rise, largely through the expansion of cropping areas. This was the classic extensification through the use of draft animals that has been described by many other

authors (Boserup 1965 &1990, Kjaerby 1983, Sosovele 1991). This was almost identical to previous models and cases of agricultural development. Monduli was stepping through a series of well-known agricultural development stages. However, there were deep cultural traditions of cattle keeping that would certainly impact this model of agricultural development. What were the trends in this Maasai system of agricultural development? Were oxen different when in the hands of the Maasai? These questions will be addressed in more detail in Chapters 2, 3, and 7, but I did have some initial sense of what was going on in the district.

There was an obvious lack of "native crops", such as millet and sorghum, which pointed to an existing challenge with regard to agricultural genetic diversity, specifically, a lack of crops that had been naturally developed in semi-arid Africa (NRC 1996). Agricultural extensification, purchased inputs, and poor marketing options also appeared to be major issues. There were also many crop production challenges, such as poor weeding and pest control problems. All of these could have easily been affected by the adoption of oxen.

The adoption of oxen by itself is not necessarily unsustainable. However, without combining this agricultural power source with more sustainable methods of soil conservation, soil fertility enhancement, and crop and pasture management strategies, the inevitable seemed to be further degradation in the very short term (Boserup 1965, McCown et al.1979, Kjaerby 1979 and 1983, Sosovele 1991). It seemed there were possible long term consequences, like what has been seen in the Sahel, Ethiopia and other dryer African regions (Sandford 1983, Sinclair and Fryxell 1985). Many farmers understood improved agricultural practices and techniques, but were reluctant to adopt them, especially if they could still attain crops (even minimal production) with little or no outside inputs and minimal labor. Why? I wanted to know from the farmer's perspective what they knew and understood and why they made these choices.

There also seemed to be a lack of adequate rainfall for growing a wide variety of crops, and there was competition from wildlife (see Figures 1.1 and 1.2). These two factors alone would make growing crops tenuous, add to this a rapidly growing rural population, inadequate land tenure, and diminishing grazing areas, the future of agriculture in the area seemed bleak. I wanted to explore this concept of sustainability and where agriculture was going with the people that were living through this rapid change of their landscape.

On the established hillside farms in my research area, largely controlled by the WaArusha people, there was little evidence showing farms that were intensifying their agriculture, toward more sustainable practices. Yet, I knew from my initial observations of unsustainable agriculture, is certainly not always the case with the adoption of draft animals. There are examples from around the world where draft animals can be used in more intensive and sustainable systems (McCown et al. 1979, Balcet 1998, Kilemwa 1999). Yet, the lack of water, the crop selection, draft animal use, and land use change were all pressing issues in Monduli district.

Thus arose the major question of my study:

Is the use of oxen in agriculture among the Maasai in Monduli district a sustainable practice?

In 1998, I wondered how I might approach this question. What else did I need to know in order to answer it. The following list of questions was developed in 1998, in order to try to answer the question above. Many of these questions were posed in the informal interviews that year, [8] and were furthered developed an used in my final interviews in 1999.

- What are possible indicators of sustainability for the Maasai adoption of oxen?
- Why did the Maasai seem to have such great skill with their oxen compared to other groups that had been subject to numerous NGO and extension training programs?

[8] See Appendix 2, which summarizes that work.

- How do the Maasai, who are relatively new adopters of oxen, compare in their use of oxen to the WaArusha who originally brought the ox technology to the plains?
- What crops are they growing, how has their selection of crops changed?
- What were the major challenges they were facing in growing crops?
- What sustainable agricultural practices were they using?
- What influences their choices of agricultural practices?
- What were there signs of agricultural intensification?
- How had their crop yields and soils changed over time?
- What was their perception of the environmental problems?
- What is their perception of local environmental change over time?
- How do the Maasai and WaArusha agricultural systems differ?
- What about their cattle and other livestock, the Maasai and WaArusha are great cattle keepers, how has the adoption of agriculture impacted their herds?
- To understand the Maasai and WaArusha choices and the possible alternative options with regard to agricultural development.
- What are the Maasai and WaArusha perceptions of ways to solve these problems?
- Finally, what can be done to remedy the unsustainable land use change challenges, with regard to food security, cultural integrity, land tenure, and wildlife.

In Chapter 2, I will describe the theoretical factors I considered in asking these questions, including both agricultural development and sustainability issues. This chapter is largely a review of the literature, to provide background into the issues of agricultural development, sustainability and pastoralism, which are central to both the questions above and the dissertation as a whole. Chapter 3 explores the cultural factors that impact the Maasai adoption of agriculture and oxen. These are important in a case study, because the Maasai are

unique. Their pastoral past, livestock, culture and food preferences have all impacted the adoption of the agricultural system I will present and discuss in later chapters. Chapter 4 outlines my research methods, expanding upon the two phases described in this introduction. It will also describe in detail my interviews, the selection of interviewees, and the specific questions posed in the field, as well as the analysis of this data. Chapter 5 highlights my research area, including the research villages, their specific characteristics, and general descriptions of the farming system.

The remaining chapters present the bulk of my data. They will examine the answers to questions asked in the field. Chapter 6 will highlight and frame the current land tenure situation in Tanzania, with examples from the research. Chapter 7 describes the adoption and use of oxen by Maasai and WaArusha, and how this has changed the agricultural system. Chapter 8, presents the agricultural crops and practices used by these people. Chapter 9, describes the land use change, which has been largely impacted by the issues and data presented in all the previous chapters. The final chapter of the dissertation will discuss how the data collected helps answer the questions posed above, as well as the criteria with which the data was judged against and compared to the existing literature. I will also offer some recommendations for the future with regard to agricultural development and the use of oxen in this area.

1.6 - Summary

This chapter highlights the process by which I came to study the Maasai using oxen in Monduli District Tanzania. I highlight this for two reasons, first the events I described above were truly part of my research process. The research process is covered in much more detail in Chapter 4, but these events were important to the research process and presentation of data that follows. There was a great deal of chance that influenced the choice of both my

research area and the topic itself. Lobulu Sakita, my assistant deserves not only an acknowledgement, but I feel he became part of this research. In a small part this chapter is a bit like ethnography about him. He is certainly the epitome of a modern Maasai. He walks that fine line between trying to remain true to his culture, while at the same time preparing for a future in a changing Monduli District. I searched for years to find the right topic on something I was truly interested in. Having raised cattle and oxen since my childhood, to find Lobulu and the Maasai was like finding long lost brethren. This topic became not only a research project, but an obsession and something that has changed my life. I hope my work can in turn offer some degree of assistance and understanding to the Maasai and WaArusha of Monduli, and researchers who might take this topic further.

CHAPTER 2

TANZANIA'S AGRICULTURE AND AGRICULTURAL DEVELOPMENT

2.1 - Introduction

This chapter will provide a glimpse of Tanzania's agriculture today, providing a context for the review of agricultural development theories and the discussion of agricultural development in Tanzania. I will review many of the issues with regard to agricultural development and land use change, which will be discussed in more specific detail in later chapters. The sedentarization of Maasai and their adoption of agriculture, could be viewed as a normal step in agricultural development. The adoption of oxen and land-use change has certainly been the norm in the development of many nations. However, more current thinking, with regard to pastoral development, may be contrary to what is happening in Monduli. This chapter in part examines other case studies and theories that help describe this situation.

The idea of sustainability is central to this dissertation. The concept of sustainability is a well-known international issue. With regard to agricultural development, there have been many cases, over the centuries that offer insight into future developments. Yet, development itself has often lead to environmental degradation and severe hardships for the people, especially pastoral development. The examination of sustainability as a concept that can be measured or assessed are an important part of this chapter. Applying these concepts of

sustainability and indicators of sustainability to the Maasai agricultural system, in a farming systems case study became the focus of this study.

2. 2 - Tanzania Today

Tanzania is a nation about half the size of Mexico, with a land area of 945,000 km^2 (Bagachwa et al. 1995). It possesses the most varied ecology of any country in Africa (Coulson 1982). Its political stability and peaceful people have become the envy of many surrounding nations racked by turmoil and instability (Raikes, 1986, USAID1998). Tanzania is comprised of over 120 ethnic groups (Hodd 1988, Bagachwa et al. 1995, Igoe 2000). With a population of about 33 million people (TCMP 1999), the diversity of the people and the diverse physical environments within which they live, as well as the availability of land, offer many possibilities for improving agricultural productivity (Raikes 1986, Hodd 1988, Lyimo and Kessy 1997). Agricultural areas vary from the highlands of Mt. Kilimanjaro, with dependable rainfall and almost temperate seasonal patterns to the hot humid coastal climate near Dar es Salaam, and the extremely dry and arid regions of the highland plateau near the capital of Dodoma. The crops that can be grown are also as varied as the climates, with the capacity to produce everything from vegetables, tea, and corn, to tropical fruits and dryland crops such as wheat, millet and sunflowers. Virtually every agricultural crop known to mankind will grow in one of Tanzania's agricultural zones (Mapolu 1990).

For many people, especially tourists, Northern Tanzania brings about images of great wildlife areas like the Serengeti (14,500 km^2), Lake Manyara (325 km^2), and Tarangire (2600 km^2) National Parks, as well as the Ngorongoro Crater Conservation Area (8300 km^2). The region is also known for Mt. Kilimanjaro (5895 m) and Mt. Meru (4566 m), the two beautiful snow-capped mountains that tower above the drier landscape. For many Europeans and Americans interested in conservation, these wildlife areas represent a glimmer of hope for

species such as the African Elephant, the Black Rhino, and other unique species of animals. For all its beauty and wildlife this region is also the home of many Tanzanian people. One of the most visible tribes is the Maasai. For many Tanzanians these areas are places they will never see, as most cannot afford to visit game parks. For the Maasai this is their land, the best of it having been appropriated from them by swelling human populations, agriculture and the game parks and reserves, most of which were established between 1959 and 1970 (Homewood and Rodgers 1984, Ndagala 1992a, Galaty 1999). Many older Maasai are resentful of these changes, and remember the days when traditional grazing lands and strategies were easily employed (Taylor et al. 1996, Olol-Dapash 1999). The Monduli district, and the specifically the Kisongo locale is unique because it has been a Maasai stronghold for centuries (Jacobs 1980, Meindertsma and Kessler 1997, Spear 1997). Today there is tension, there is change, and although there is no physical conflict like that seen in neighboring countries, the Maasai in this part of Tanzania realize the future of the best land they have controlled in the past, is now largely being controlled by others.

Land use is changing rapidly all over Tanzania. There has been the expansion of cities and towns into the countryside (Bagachwa et al. 1995). There has been the expansion of farms and agricultural fields into the rangelands, forests and mountains. There has also been the expansion of wildlife reserves into the same. All of these land use changes have reduced the size of the available grazing lands. At a time in Tanzania when populations are exploding, every household in rural areas desires to grow crops and increase its cattle herd and flocks of small stock. Sperling and Galaty (1990) call this a "*land squeeze*" which has broken down and tightened the social arena around pastoral resource control. They also pointed out that the flexibility and opportunistic use of resources has declined. There has been a general decline in the rangeland, with vegetation changes to more unpalatable grasses and weeds, gullies obstructing livestock paths, and the dry season grazing areas which have

been converted to cropland. Livestock therefore start their migrations away from the home earlier and stay away longer. Recurrent droughts, escalating erosion, scarcer pastures, less labor[1], all add to this unsustainable intensification of the landscape. Even so a few authors were optimistic that there are alternatives and options still available (Goodall 1999, AWF 2000), although the heyday of the "pure" pastoralism of the Maasai may be near its end (Sperling and Galaty 1990).

The adoption of agriculture by a pastoral people has often been a step down a path from which it has been difficult to return from (Ciss`e 1981). When oxen are added into this equation the pace of agricultural expansion has drastically changed (McCown et al. 1979, Boserup 1981 & 1990). Draft animal power has allowed farmers to go from cultivating a few acres to many. Draft animal use cannot be considered a benign technology. Those who adopt oxen should be well aware that despite its many advantages, if used without regard for the soil and natural resource base, there can be dire social and environmental consequences [2] (Sandford 1983, Kjaerby 1979 & 1983, Morindat 1997, Meindertsma and Kessler 1997).

2.3 - Tanzania's Agriculture

Agriculture is the dominant force in the economy of Tanzania, accounting for most of the Gross Domestic Product, and much needed foreign currency and trade. Smallholder or peasant farmers continue to be the most important producers, contributing to over 75% of Tanzania's agricultural export earnings, and 60% of its total export earnings. Small farmers also produce 85% of the corn, 50% of the rice, 90% of the legumes, and 95% of the drought staples, like millet, sorghum, cassava, sweet potatoes, etc. (Bukuku, 1993, Bagachwa 1995). The problems these farmers face on a regular basis, other than the market's fluctuations, taxation, and often ill-designed government policies include: the vagaries of weather, plant

[1] As more children go to school and later leave the traditional pastoral lifestyle.

and animal pests, transportation and storage bottlenecks, insufficient supplies of seeds and fertilizers, and basic production technology and hardware, including the jembe or hand-hoe (Bukuku, 1993, Bagachwa 1995). Tanzania has continually tried to move from peasant farms to more modern forms of agricultural production. However, such change has often been hindered by a lack of infrastructure to support the movement of required fertilizers, pesticides, tractors, spare parts and/or other essential ingredients for modern agriculture, as well as, a lack of capital on many farms to purchase such inputs (Raikes 1986, Kjaerby 1989; Masawe 1992, Remple 1993).

Today's agricultural sector has been based largely on exotic crops. Not one of the major cash crops are indigenous (NRC 1996). Sweet potato, finger millet, sorghum, pasture crops and some oilseeds are indigenous, but most crops like corn, rice, beans, and even cassava (from Brazil) were imported (Kikiro & Juma 1991, NRC 1996). Despite the challenges when growing maize in semi-arid Monduli district, most people (including the Maasai and WaArusha) rely and have relied on maize as a staple food crop for some time. Millet and sorghum are more appropriate given the rainfall patterns (NRC 1996, O'Connor 1966, Meindertsma and Kessler 1997), but the production level and resistance of maize to pests has made it a more popular choice. To a lesser extent beans are used as a food supplement, but are more often the cash crop of choice. Both are usually grown in a monoculture cropping system. Few Maasai and WaArusha, on the Kisongo plains, were practicing crop rotations, intercropping or traditional fallowing. The result seemed to be declining soil fertility and low or declining crop yields.

Livestock are and have been considered very important as a part of the food and economic security systems in Tanzania (Ruthenberg 1964, Kjaerby 1983, URT 1997) and

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[2] Many of these consequences, such as poverty, soil degradation , and even livestock production are presented in Chapters 4, 5, 7, 8, & 9, as well as, in Figures 4.2, 4.3, and 8.1.

throughout Sub-Saharan Africa (McCown et al. 1979, Sandford 1983, Winrock 1992, de Haan 1997). This has been especially true of the Maasai (Rigby 1985, Homewood et al. 1987, Talle 1990). Their cultural tendency to acquire cattle, sometimes in excess of available grazing, has been a hedge during droughts. The more cattle one has going into a drought, the more cattle they will likely have coming out of it (Rigby 1985). Throughout the nation cattle are considered an excellent indicator of wealth, status and security (Ravnborg, 1990, Rugumamu 1995). Even the poorest farms will have a few small ruminants like goats or sheep, and poultry. Swine are not very common, and represent the least desirable meat to most folks (Lindstrom and Kimgamkono, 1991). They are completely non-existent in Maasai households. To even ask about swine brings about great laughter, as they are not an animal that is easily herded, corralled or grazed.

According to some sources (Ezaza, 1989, Masawe 1992) Tanzanian peasants have often been onsidered inefficient, and lacking proper technical know-how, as well as, being plagued by poor administrative and government policies and its shortfalls. Despite many interventions by Foreign Aid, NGO's, and the national extension service, the results have been rampant environmental degradation and loss of productive resources (Raikes 1986, Mapolu 1990, Ndagala 1992c, Igoe 2000). The Maasai have certainly suffered from a stereotype of being more backward and inefficient than other ethnic groups in Tanzania (Ndagala 1990, Igoe 2000). Low to nonexistent travel budgets (Sosovele 1991, Winrock 1992), and the fact that Maasai typically live far from any roads plague the extension service. These combined forces have perpetuated the adoption of agricultural strategies by Maasai that are less than what is currently recommended by the Ministry of Agriculture and NGO's such as SNV.

In contrast there are many authors and researchers who believed the only Tanzanian crisis is in the government's inability to honestly monitor and understand the nation's

agriculture sectors (Coulson, 1982, Raikes 1986, Forster & Maghimbi 1992). So much of the production and trade of agricultural products in the country has never accounted for, that most estimates have been inaccurate and were most likely exaggerated in order to ensure continued foreign aid. This was largely due to much of the agricultural production being used for home consumption and not ever making it to a market where it could be accounted for. Even the pessimistic Ezaza admits that of the 55% of Tanzania's land that has been earmarked as potentially productive land for agricultural purposes, only 5% is actually used. This difference was due in part to National Parks and conservation areas, but also huge sections of the country infested with deadly tsetse flies. Many nations in Africa, like Tanzania have a tremendous resource base, but "*Kilimo ni siasa*", Farming is politics.

There has also been a loss of traditional methods, as modern agriculture and modern forms of communication find their way to rural Tanzania. Many of the traditional methods of using indigenous plants at home and in the market and food system are being lost (Lindstrom & Kingamkono, 1991; Calestrous, 1991). Among the Maasai living in semi-arid areas in Monduli, very few grow millet, a traditional dry region crop. Traditional methods of handling and storing crops are lost or being lost. This is due to storage in sacks or silos with the use of pesticides, over traditional sun-drying, fermentation, or storage in ashes, to prevent crop damage and pest damage (Ezaza, 1991). The Maasai have been very successful in maintaining their traditions of cattle herding and pastoralism. However, even this form of livestock management and the resource base necessary to maintaining it are being slowly lost, as younger generations see better opportunities through education and wage labor (Rigby 1981, Ndagala 1990, Galaty and Bonte 1991).[3]

Agriculture in Tanzania is as complex as its land and people. Unlike many of our so called "more" sustainable systems, the Maasai pastoral strategies have worked for centuries

to beat the odds of drought, pests, or war (Raikes 1981, Sperling and Galaty 1990, Spear and Waller 1993). They have systems that are rapidly being lost or replaced because Western scientists and policy makers have thought they know how African agricultural development should work (Raikes 1986, Anderson and Grove 1987, Winrock 1992, Igoe 2000). This has been the case time and time again in Africa. So for the Maasai in Tanzania, there was change. This change was not new, as seen in a 20- year old statement by Rigby (1981:158),

> *"The manifestation of the penetration of capitalism in East Africa is the loss of water and pastures, because of the encroachment of government sponsored cultivation, and other activities such as the creation of wildlife and tourist sites. The result is an almost increase in the interdependence of pastoralists and their agricultural neighbors, and sometimes this interdependence is accompanied by at least some minimal engagement in agricultural production, by such people as the Barabaig, Ilparakuyu, and Pastoral Maasai.... cultivation is on the increase, and he acknowledges that there is no "pure" pastoral society, as they are always adapting."*

Yet this change was creating increased conflict in Monduli and the surrounding sections of Maasailand (Ndagala 1990 & 1996, Ole Kuney 1994, Lama, 1998, Igoe 2000). This change was what I wanted to explore, from the perspective of the Maasai people and particularly with reference to how oxen may have impacted this adoption of agriculture by a largely pastoral people.

In rural Tanzania the people have been free to produce their crops, and use whatever methods they want. The Maasai farmers were certainly not unsophisticated or oblivious to more modern farming methods. Some in my study used tractors, herbicides, and insecticides, as well as, the most modern animal health products. Their simple strategies, and willingness to use manual labor[4], and willingness to evaluate and even try new systems reflects their genuine interest in improvement. However most Maasai farmers who had little cash savings,

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[3] Much like the young Maasai *askari* I saw in Dar es Salaam

[4] For the Maasai man, manual labor in the field is something they often avoided. Labor in this context means their women and children, or even *Mswahili* (non-Maasai Swahili speaking laborers) did the work. Due to both

no government to support them and few forms of external support have not been very likely to risk their family's livelihood on some new agricultural crop, especially those suggested by "*wazungu*" (white men) (Raikes 1986). The many failed pastoral development schemes throughout Sub-Saharan Africa have provided testimony to the pastoralist's conservative nature (Goldschmidt 1981, Sandford 1983, Lindsay 1987, Kelly 1990, Hogg 1990).

The conservative peasant farmers have probably been the only fabric that has held Tanzania together through the last 30 years. Between a failed program called "*Ujamaa*" a socialist-communal agricultural scheme in the late 1970's (Coulson 1982, Kjaerby 1989, Mapolu 1990) and the near economic collapse of the country in the 1980's (Sarris & van den Brink 1993, Bagachwa et al. 1995), it is amazing that the people have been able to survive as well as they have under such a challenging political environment. Combined with a national population that grew from 23 million in 1988 (Bagachwa et al. 1995) to what is now estimated to be 33 million (TCMP 1999), the people of Tanzania have somehow managed to avoid many of the political dilemmas facing many of their neighboring countries. My hope was learn enough to begin to understand their choices and their possible options with regard to agricultural development.

2.4 - Agricultural Development

The topic of agricultural development has a lot more written about it than I could or would like to include here. However, a discussion of the sustainability of any agricultural system would not be complete if all of the theory and history behind agricultural development was ignored. With regard to my work and the use and adoption of draft animal power and pastoral development , the best sources I have found included (Boserup 1965, 1981 and 1990) for well known and respected general theoretical ideas. Sosovele (1991)

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observations and interview data, I believe that one reason they readily adopted both tractors and in many cases oxen at a later date, was to expand their agricultural holdings without the use of a hand held hoe or *jembe*.

presented a complete overview of the process of development as it relates to draft animal power in much of Tanzania, as well as, Europe and Asia. Kjaerby (1983) also discussed this at length in his work on the problems and contradictions of ox cultivation and agricultural development in Tanzania. Sandford (1983) presented the many challenges to pastoral development all over the third world, and finally Ndagala in numerous published works discussed the development of the Kisongo Maasai (1990, 1992a, 1992b, 1992c, 1994, & 1996). Despite these and many other well written works on agricultural development and/or the development of pastoralists, this issue is critical to highlight within the framework of my own discussion. This well documented process will be used as a framework to discuss the issue of sustainability, as well as, to frame the issue of pastoralism and sedentarization and lastly to discuss my final conclusions.

2.5 - Development Theory

Worldwide there has been a natural progression of most developed societies through a series of sequential steps in agriculture. This process begins with the gathering of wild plant foods, later growing crops using hand tools, through the adoption of animal power to the more mechanized agricultural systems (Boserup 1965 & 1981, Pingali et al. 1987). Boserup (1981:3) stated that "*Human history can be viewed as a long series of technological changes.*" This sequential process is not random and irrelevant, nor is it universal, despite its antiquity.[5] This progression relates to Boserup's (1965) conditions of agricultural growth. In order for a society to develop there has to be an impetus to do so. Most often this is population pressure, and to a lesser degree external factors such political change, economics, or the influx of new ideas and cultures.

[5] It often leads to problems as development programs have often taken a "cookbook" approach to agricultural development. This was certainly my approach when invited to assist in a program in Uganda to work with extension officers to improve their understanding and use of oxen in agriculture.

This theory developed by Boserup, an economist, was one of the first to formally dispute the theory put forth by Thomas Malthus over 150 years earlier. Malthus pointed out that a growing human population is dependent on agricultural productivity, much like the carrying capacity of wildlife and livestock on rangelands, and therefore population was limited by its environment (Boserup 1965). His early theory has been widely used by many NGO's to support ideas like family planning throughout much of Africa.(Boserup 1965, Gould 1994). However, Boserup disputed the Malthus theory, because it failed to address the creativity in human nature, that ultimately leads to the development of technology, that can overcome many natural and man-made disturbances and agricultural constraints.

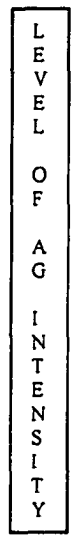
According to Boserup, this agricultural development process normally begins with an extensification of the agricultural sector, where the farmers expand their agricultural base. This is stimulated by the growth of the human population. At some turning point the population swells and more intensive agricultural practices and growth begins (Benderly 1977, Reynolds 1993).

Boserup (1965 & 1981) describes 5 general stages in agrarian development, which she points out was one of the main problems with the Malthus theory. She explores the concept of fallowing land[6], beginning with long fallows, to successively shorter and shorter fallow periods, until finally there is a permanent multiple cropping system employed (see Figure 2.1 below). These changes, as well as, technology adoption and new land tenure arrangements are brought about by population pressure. This loss of fallowing is occurring in Monduli District, but there are many challenges for the Maasai in achieving what Boserup assumes below.

Table 2.1

Stages of Agricultural Development – related to crop growing

Stage of Development	Agricultural Activities
Gathering	Wild plants, roots, fruits and nuts are gathered
Forest Fallow	One or two crops followed by 15-25 year fallow
Bush Fallow	Two or more crops followed by 8-10 year fallow
Short Fallow	Two or more crops followed by 1-2 years fallow
Annual Cropping	One crop per year, followed by a few months of fallow
Multi-cropping	Two or more crops in the same field each year, no fallow



Adapted from Boserup 1965 & 1981

Under Boserup's model agricultural intensification results in higher yields per unit of land, but it does so at the expense of higher labor input. Thus, under rapidly growing populations, where there is plenty of available labor, there can be employment, increased production and an adoption of more labor saving and intensive techniques over time. Land ownership generally moves from communal ownership to more individual ownership, with more institutional support for public works such as roads and other infrastructures according to (Shao 1999), which in turn help support the more intensive agricultural model.

Boserup's statements above are very relevant to my study, as they readily apply to numerous components of my own work. For example, Boserup considered the pastoral

[6] The process of fallowing is simply growing crops and then abandoning the fields, returning to them later. Long or Forest Fallows may be 15 or more years, long bush fallow is where the crop fields are abandoned for 6-10 years, and short fallow is where the fields are abandoned for 4-5 years before returning to grow crops.

system is considered a subsistence-level production system., being similar to the bush-fallow system primarily in its employment of extensive systems of land us. However, with even the highly successful Maasai pastoral system, I will build a case that they have succumbed to her theories given population pressure and insecure land tenure.

This quote from Boserup (1981:5) accurately displayed what I was seeing in Tanzania among the Maasai, and can apply to their adoption of oxen,

> *"The interrelationship between population and technological change is a complicated one. Increasing population size may make life easier, because there will be more people to share the burden of collective investments, but it will also make life more difficult because the ratio of natural resources to population decreases... A growing population gradually exhausts certain types of natural resources, such as timber, virgin land, game and fresh water supplies, and is forced to reduce its numbers by emigration or change its traditional use of resources and way of life. Thus the increase of a population within an area provides the incentive to replace natural resources with labor and capital* [However] *...The transmission of important new technologies may be a means to reduce or eliminate the disadvantages of a declining ratio of natural resources to population..."*

In Africa, because the rates of population growth were slower in the past than they are now (Rodney 1982), extensive land use, based largely on subsistence farming has been the norm. There were two prominent systems in Africa long before colonial intervention, these were the long fallow system and pastoralism (Raikes 1986, Boserup 1990). However, systems such as pastoralism and long fallow agriculture can support only a sparse population. Thus, as populations grew, there was an incentive to increase the intensity of land use or move out to more marginal lands. For many agriculturists feeding rapidly growing populations, this meant the developing more intensive uses of the land. The case of the Chagga and Meru are certainly some of the best known and most successful Tanzanian examples of agricultural intensification. (Maro 1975, Spear 1997).[7]

[7] The Meru and Chagga have lived on Mt. Meru and Mt. Kilimanjaro, respectively for centuries. Their agriculture has long been hailed as some of the most intense in Tanzania, maintaining agricultural population

In reviewing the literature on African land-use change, Boserup is certainly one of the most commonly quoted economic theorists. Her work cleverly highlights the general theories that induce land change, which can be seen around the world. In the case of this research, these theories are relevant to how similar human nature is, despite cultural and geographical differences. However, Boserup is not without her critics.

Spear (1997:151) pointed out,

> *"Boserup has been rightly criticized for failing to consider historical factors, as well as differences in natural endowments and agricultural potential, however the Meru and (Wa)Arusha are, in many respects, exemplars of Boserup's thesis, relentlessly improving the productivity of their land and their labor to achieve increasing yields and returns in response to increasing population and limited availability of land."*

Yet, as a prominent historian of a pastoral people, Spear still did not specifically point out the ever-present challenge of cultural traditions and values that impact agricultural development.

Furthermore, I would challenge Spear's comments, as it may not be appropriate to generalize WaArusha's success in intensifying the landscape. The WaArusha ran out of land near Mt. Meru. Many of them abandoned their small plots, moving west into the semi-arid plains (Ole Kuney 1994, Spear 1997). Their well-known agricultural skills did not have as great a chance for success on the drier plains. They quickly reverted to more extensive land use patterns. In some cases this was a process of reversing agricultural intensification. Other East African examples put forth by (McCown et al. 1979, Sutton 1993, Conelly 1994, Gould 1994,) show and dispute that there is not one single and simple path of agricultural development, as Boserup (1965) implies in her statements about the importance of population pressure.

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levels that are the highest in the country if not in all of Africa. The system is characterized by intense multi-cropping, manuring and composting, extensive irrigation systems, and small livestock kept in zero grazing environments.

In fact, this research will show that the WaArusha were much less optimistic than the Maasai, in part because those that have been relocated (sometimes numerous times), have smaller herds, and were promised things like water and wells that never materialized. When and if they did materialize, these water sources often quickly fell into disrepair. Thus other than areas like Lolkisale and the Monduli highlands where the WaArusha have been blessed with more reliable rainfall, many WaArusha have come into direct conflict with their Maasai brethren. In many cases their herds have been further limited by inadequate grazing areas, disease, and increased poverty, compared to their life on or near the Mt. Meru.

In addition to Spear's comments about the lack of attention to history and agricultural potential, there is also the huge issue of cultural differences. McCown et al. (1979:321) pointed out,

> *"The technological skills, organizational principles and preferences of the group, as aspects of culture form the basis for behavioral solutions to problems of adaptation. Practices related to cultivation and animal husbandry, and their relationship with reference to economic, political and ecological contexts, all impact the agricultural system. The resulting agricultural practices are not simple, but are the result of a complex evolutionary process."*

While Boserup (1981 & 1990) does not totally ignore the challenges that society faces along the road of agricultural development, she offers little in the way of case studies to show how negatively this process can affect people (Jorgensen 1993). This process of agricultural evolution or development within a culture is one that must be explored if the process of agricultural development is going to be something that the people themselves can adapt to without rampant political and economic chaos. There can be, and often is, a great deal of suffering and conflict that goes on amidst the population growth and shifts in agricultural practices. These challenges and how to face them are huge issues for the people who are living through Boserup's process of agricultural development. Her ideas offer little

in the way of support to the Maasai and WaArusha farmers who are living through this change today. In addition, her theories of agricultural development have been used to try to create development shortcuts, through Western Aid, NGO programs, and poorly guided government programs (McCown et al 1979), whose goals were to simply move from one stage of development to a "higher" or more modern stage.

Raikes (1986:134), eloquently points out that many of the development challenges in Tanzania are due to government policies that have interfered with a process of development of which people are often very aware and to which they are trying to adapt.

> *"In tracing the development of agriculture it is striking how often one of the major underlying problems is the development policy itself, whether directly or indirectly by the costs it imposes. As one looks more closely it emerges that much of this derives from the perceived need to control peasant production, based on the widespread notion that peasant farmers cannot be trusted to develop themselves and must be pushed into doing so. This in turn derives from a paternalist ideology of modernization or development through the adoption of externally-derived innovations – and from the conflicts arising from many decades of enforced policy. Both reinforce the view that peasants are traditional and non-responsive to opportunities for betterment."*

Much of Sub-Saharan Africa has been affected by other factors, which totally disrupted their economies, cultural identity, and systems of agriculture. These were different than the challenges faced during the development in Europe and the Americas. Slavery and the removal of huge numbers of people, particularly young people, inflicted a great setback of many African cultures to develop in the 1700 and 1800's (Rodney 1982, Kjekshus 1996). The Europeans who dominated East Africa for much of the last century, did so in a way that exploited the local people on their own land (Igoe 2000). Government policies were implemented to encourage and/or force people to produce crops and raw materials for the European market, while at the same time largely ignoring the needs, environment and development of the local people (Raikes 1986, Maddox et al. 1996).

2.6 - Tanzania's Agricultural Development

In Tanzania, like much of Sub–Saharan Africa, there was a system of development that was somewhat different than the notion of development in the Western sense (Rodney 1982, Kjekshus 1996). Before Europeans invaded Africa, there were numerous societies that had developed into powerful kingdoms without European ideas or animal power. In fact, it was largely through the intervention of Europeans that the path of development was altered (Griffin 1989, Maddox et al. 1996). Because of these disruptions in the path of indigenous development, and largely the result of colonial powers that used African resources for the development of their own economies, according to Griffin (1999:2), any chance of *"self reliant, autonomous development was impossible in the third world"*.

Prior to a European presence in Sub-Saharan Africa, any change or development was largely a result of simple adaptations to the local environment, with cultural change due to contact with other tribes through warfare or trade. The "white" invasion of East Africa occurred abruptly and with a great influx of new technology, new values, beliefs, and systems of governance and agriculture. There was initial resistance, but the Colonial powers quickly dominated and subdued the local population (Maddox et al. 1996, Spear 1997).

In Africa a great deal of anthropologic work has addressed the way in which societies adapt and change. While the numerous ethnic groups in East Africa were far from static, they were simply overwhelmed by Western power, ideas, and governance. Any change of this degree in a society is bound to have great ramifications. It certainly has in Tanzania. While a culture can adapt relatively quickly to technological change, the changes in social structure, beliefs, and values have been much slower than the adaptation to technology (Benderly et al. 1977). Research on this "cultural lag", shows that societies that are disrupted will suffer from a "disjuncture (Benderly et al. 1977)" in two or more of their systems. My own feeling was

that Tanzania, and especially the Maasai, have suffered from a disjuncture of many of their beliefs, techniques, values and societal norms. These disruptions have largely left Tanzania in a static, if not backward mode of development since the Europeans first arrived in East Africa, in spite of the theories put forth by Boserup.

Below is a quote summarizing the way in which Europeans disrupted East Africa's path of development. This is from Kjekshus (1996:17), where he quotes Sir Charles Eliot about conditions in Kenya in 1903:

> *"It was only a few years ago that East Africa was nothing but a human hunting-ground where hunters did not even take ordinary precautions for preserving game... The native tribes warred with one another in order to get slaves to sell to the Arabs, and this picture of slavery and bloodshed was chiefly diversified by interludes of terrible famine... How great the difference now! There can be no doubt of the immense progress made in rendering the civilization of the African at least possible, as it is a progress which need occasion no regrets, for we are not destroying an old or interesting system, but simply introducing order into a blank, uninteresting, brutal barbarism."*

As a result of this type of thinking, the structure of indigenous agricultural systems was greatly disrupted. In their place, new crops and new techniques, as well as, new values and systems of governance were forced upon the people on their own land (Rodney 1982, Raikes 1986). These were some of the reasons that Tanzania and other Sub-Saharan African nations never developed along traditional "Western" paths of development. What was instituted instead was a sort of slavery where the people produced for others, where as they had before primarily produced for themselves (Rodney 1982).

This context is essential to understanding the Maasai agricultural situation. It portrays the history of colonialism that had a great effect on Tanzania, and as Spear (1997) mentions is largely ignored in Boserup's work. Even after independence in the 1960's, Tanzania and much of Africa still had many colonial values and systems of governance, which dominated the political sector. Most educated Africans had been educated under a colonial system (Ruthenberg 1964). Once independent, many nations pursued paths of development that were

still based on providing raw materials for Europe and America and in return purchasing most of their manufactured goods from the same. Any chance of indigenous development, even at this point, was largely a dream, as Europe still had a firm grip over much of Africa (Rodney 1982).

According to A.M. Babu (1982:284), "*There are no shortcuts in development*". In fact, he boldly stated in 1971, that "*as long as we continue, as we have for centuries, to produce for the so called world market, which was founded on the hard rock of slavery and colonialism, our economies will remain colonial*". Despite the many "Western" ideas, programs and handouts that have been provided to Africans, there are very few which have generated solid results of benefit to local people or the environment.

Interestingly, Tanzania's first president, Nyerere, also had his own great ideas for transforming Tanzania into a nation of self-reliant people. His Arusha Declaration of 1967 represented the basic statement on Tanzania's long term objectives. The policies for future development revolved around four overlapping themes: socialism, rural development, self-reliance and economic growth (Bagachwa et al. 1995). Between 1967 and 1980 the government constructed a strong political system backed by a single strong political party called the CCM (Chama Cha Mapinduzi), this also had a great influence on the agricultural development of the nation.

As Julius Nyerere said but never successfully put into practice(in: Bagachwa et al. 1995:37),

> *"Rural Development is the participation of people in a mutual learning experience involving themselves, their local resources, external change agents and outside resources. People cannot be developed, they must develop themselves by participation in decisions and cooperative activities which affect their well being. People are not developed when they are herded like animals into new ventures".*[8]

[8]Yet it was Nyerere who forcibly (using the military) applied his Ujamaa villagization scheme onto the Tanzanian people, including the Maasai of the lower Monduli District.

His dream of self reliance included a villagization scheme called *Ujamaa*, or among the Maasai *Operation Imparnati* (Ndagala 1992b). This emphasized a socialist type of communal living for all of Tanzania, complete with tractors and other foreign inputs, which ultimately made his dream largely unsustainable (Berry et al. 1982, Griffen 1989). He and his early independent government was largely dominated by many outside influences, including industrial development monies and schemes (Bevar 1993), as well as, world market prices that ultimately caused the failure of his *Ujamaa* Villages (Ndagala 1992b).

According to Bagachwa et al. (1995:48),

> *"Until 1982 the government paid no serious attention to agricultural development. It's budgetary allocation was only 16.6%, compared to 20% for industry, and the per capita food output by 1982 was only 85% of the 1970 level. The 1983 policy addressed this "crisis" in the agricultural sector. It's goal was to develop an egalitarian agricultural community using up-to-date technology, to increase self sufficiency in food production, improve foreign exchange and raise the standard of living."*

Under Nyerere, producer prices were set by the government. Agricultural inputs were supplied by parastatal [9] monopolies, state controlled farms and ranches (Bevar et al. 1993). Government controlled cooperatives served as intermediaries between farmers and the government authorities, which were trying to control the agricultural sector (Raikes 1986). This system failed in a relatively short time. The black market or informal sector became an extremely lucrative place to buy and sell crops, and this system quickly undermined the governments hope for control (Hodd 1988, Mapolu 1990 & Foster and Maghimbi 1992). By 1986, Nyerere had stepped down as president, and a new agricultural sector adjustment program was formulated. The goal was to liberalize the marketing and pricing of grains and cash crops. It shut down the non-viable public sector investments in agriculture and restructured several parastatal farms, industries and ranches (Maliyamkono and Bagachwa

1990). Between 1986-1991 agricultural output grew by 4% per year, and the decline in agricultural exports was reversed Bagachwa et al. (1995). However, this was not without great hardship due to the International Monetary Fund's strict fiscal policies and debt restructuring, made necessary by the huge debt load that had been accumulated during the early years of socialism and villagization.

Despite Nyerere's failure to develop Tanzanian agriculture in the long term (Goldschmidt 1981, Raikes 1986, Powelson. 1990), Nyerere did have a pronounced effect on developing his people (through better education and healthcare in the 1960's and 1970's). He also united Tanzanians, which has largely been a dream of other nearby nations (Igoe 2000). He was a highly respected statesman, and despite his failures, the Tanzanian people still speak favorably of him.[10] Yet the legacy of failed development programs is something Tanzanians have suffered with for almost a century. This failure and the challenges that the people have had to face have had a great impact on their willingness to invest their own resources in things that can quickly be taken away by government policies or world prices. Rural Tanzanians have learned to grow food for themselves first, as even food was hard to come by in the early 1980's. This fundamentally subsistence and localized economic strategy, limits the sale of excess crops to when they were available.

2.7 - Pastoralism and Sedentarization

Pastoralists live on sparsely populated marginal lands throughout the world. (Boserup 1981, Sandford 1983). They live in environments where there is great risk due to unreliable rainfall, often extreme temperatures and rampant disease problems (Salzman 1980, Spear 1993). This is not an environment in perfect balance, where humans coexist beautifully in

[9] Being a largely socialist country under Nyerere, the government or one of its many branches owned all major businesses, these government owned entities were called parastatals.

harmony with nature. It is largely a feast or famine environment. To survive here pastoralists developed strategies that allowed them great flexibility in adopting strategies to their changing environment.

Pastoral herding is one way to make use of large tracts of land where rainfall is insufficient to support viable crop production. It requires not only considerable skills, but complex social organization for protection and mutual support against a great many possible disasters (Talbot 1972, Raikes 1981, Campbell, 1984, Homewood and Rogers 1991).

Ciss'e (1981) defines pastoralists as a group for whom pastoral activities (herding and caring for animals) account for more than 75% of working hours and provide more than 50% of the total income. In the past the Maasai neatly fit into this definition. They adopted their strategy of food production largely due to their environment. They had strong social organizations, and they understood their land base that allowed them many possible options.

According to Spencer (1990:122-123),

> *"Maasai are surrounded by risk... Drought decimates their herds and aspirations, but (amazingly) it does not crush their optimism. They keep their livestock in difficult times, rather than selling them off at their prime, in order to gamble that as times improve they will have the larger herds that will rebound. It is a huge risk, but one in which they are ready to gamble."*

With regard to the environment they live in and the great risks they face, Sandford (1983) and Scoones (1995), have considered the Maasai both rational and their pastoral system largely sustainable. That is until the development of wildlife parks, agricultural encroachment, and numerous failed development schemes interfered with their traditional pastoral system (Talbot 1972, Raikes 1981,Campbell 1984, Western and Finch 1986). It is

[10] Nyerere passed away while I was writing this dissertation. His death was something many Tanzanians told me they feared, as his presence has been a stabilizing one for the Tanzanian people and its government. Despite his many failures, many rural Tanzanians truly felt he had done great things for Tanzania.

this change in their agricultural production system, which has led to both this dissertation and many other research projects on the ways in which Maasai are adapting to change.

And according to Stiles (1981:370),

> *"Most pastoral people have been engaged in livestock management on marginal lands for centuries, if not millenia, and as a result have developed adaptive strategies."*

However this theory of sustainability is not universally accepted. Stiles (1981) and Western and Finch (1986), point out that generally many natural scientists, ecologists, agricultural scientists and economists view pastoralism as irrational. They believe pastoralism defies conventional economic theory and ecological norms, and it is principle cause of environmental deterioration and desertification.

Yet, according to Western and Finch (1986), social scientists, and primarily anthropologists have taken the view that environmental degradation on rangelands and desertification is caused by many factors including:

- *Natural disasters such as drought or long term climatic deterioration.*
- *Restriction of natural pastoral movement patterns by colonial or independent governments.*
- *Population Pressure.*
- *Lack of Land Tenure.*
- *Artificial concentrations of high density populations resulting from the creation of permanent water sources (like wells or water basins).*
- *The establishment of permanent health, education and commercial centers, often associated with administrative posts.*

Western and Finch (1986) assumed that under natural conditions pastoral practices are rational. Environmental degradation and desertification are not the result of normal pastoral practices, but of pastoral practices that are operating under stress conditions. Conditions that are often the result of political decisions made by poorly informed governments or politicians. Furthermore, pastoralists are being forced into ever more

marginal lands as the better lands are taken up for agricultural purposes and wildlife areas, creating a disastrous scenario for these already marginal pastoral lands.

Therefore Stiles (1981:373) concluded,

> *"The poor land use practices of the modern pastoralist are the result of development and modernization* (including the development of wildlife parks) *not of traditional pastoral practices."*

Pastoralism is not a static cultural adaptation, but one that requires constant change and adaptation to the ecological and economic environment (Goldschmidt 1981 and Rigby 1992). Hogg (1990) and Rigby (1992) both assert there is no such thing as a definition of "*Pastoral modes of production.*" This is because, as stated by Ellis et al. (1993:40), *"Pastoralists are opportunists, prepared to respond to the opportunities and difficulties which present themselves."* From the development perspective, this means they adopt strategies which allow high mobility and rapid destocking and restocking and other tactics such as growing agricultural products when they can, in order to deal with changes in rainfall patterns and available grazing lands (Lama 1998).

Kelly (1990:80) similarly points out,

> *"Flexibility has always been the hallmark of pastoral adaptive strategies, both in terms of strictly pastoral pursuits and in terms of secondary, but nonetheless important, economic activities, such as farming, hunting, gathering and trade"*

The fact is that most nomadic peoples heavily engaged in pastoralism usually do some agriculture as well (Goldschmidt 1981, Spear and Waller 1993). Past agricultural skills are not immediately lost upon adopting a more pastoral life. The skills and individual capacity remain available to be used as the natural environment and political circumstances change. To many pastoralists, agriculture is a temporary method of rebuilding one's flocks

and herds[11]. According to Ciss`e (1981), few pastoralists ever return to a primarily pastoralist way of life. The factors leading to sedentarization are reversible (Salzman 1980, Goldschmidt 1981, and Rigby 1992). According to Ciss'e (1981:319), *"Sedentarization is a tactic adopted by the nomadic herder to overcome or make the best of a difficult situation."* A bad year is followed by a good one. Epidemics reduce animal numbers, thereby allowing expansion by those who had herds survive the disaster. Despite all evidence that this has been the case historically, I cannot believe this will be the case for the Kisongo Maasai in the Southern part of the Monduli District. The adoption of agriculture has come at the expense of their grazing lands. There is little hope for returning to a more pastoral lifestyle (Ole Saitoti 1978, Galaty 1994a & 1994b).

There have been many difficult situations in Tanzania. The sedentarization of traditionally nomadic populations rarely takes place because of concern for them or because of ecological factors (Jacobs 1980). Usually it has been merely the outcome of a particular social, historical or economic situation (Boserup 1981). The process of sedentarization, occurs at two levels, the first has to do with physical space (Ciss`e 1981). A group will begin to settle basically in one location, while its herds wander over a larger area. In my research area the more open spaces are disappearing. All of the Maasai in my study have settled in one place. They are not nomadic, and may never have been truly nomadic, as some people are in Northern Africa. The Maasai in Southern Monduli are also losing their physical space. This makes any notion of "pure" pastoralism difficult, if not impossible in the area where I conducted my research.

The second is sociological. The group adopts a new way of life and adapts by raising other species or by making the land productive through growing agricultural products (Ciss`e

[11] This was certainly the case in my study, as almost every single interviewee pointed out that with good crop yields you could limit the sales of livestock in exchange for food. Thereby retaining more of your herd, or

1981). This was also the case as I viewed it among the Kisongo Maasai in Tanzania. Many Maasai continue to use their social networks to move cattle far from their home, despite being tied to their home by their agricultural activities. The cattle were often taken by relatives or *morani* to distant areas that are known to have both water and grass. The importance of the Maasai social network continues and the *morani* is as important as ever in moving cattle to distant grazing areas, with the dwindling land base in Southern Monduli District.

For example, both of my research assistants held jobs in town. They also had herds of cattle that often needed to be taken away from their family boma for grazing for periods of weeks or months. These would be entrusted to a morani who might be related, in exchange for cash or livestock, upon the animal's safe return. There seemed to be constant negotiations for taking one's cattle to better grazing, so the young elders did not have to be bothered with the chore of being away from the farm, business or paying job.

2.8 - The Emergence of Agropastoral Farming Systems

The model of agricultural development described by Boserup (1965 & 1981) describes the model of agricultural change toward more settled agriculture. Kjaerby (1983 and 1989) describes this in Tanzania among the Barabaig. Both provide models similar to the Maasai settling down and adopting a more agricultural lifestyle. This has occurred for all of the reasons related to the sedentarization mentioned above. But what is the difference between pastoralism and agro-pastoralism?

In context of my research Ndagala (1996:129) uses definitions which are easy to understand within the East African context.

> *"Agro-pastoralism refers to a system of production in which agriculture and livestock have almost equal significance in the social and*

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purchasing more goats, sheep and cattle with the proceeds from a good harvest.

economic life of the people concerned. Pastoralism, on the other hand, refers to a system of production in which household derive more than half of their social and economic well-being from livestock keeping."

He also defines mixed farming, which is what many non-Maasai practice throughout Tanzania, as a *"system in which crop producers keep a few animals to obtain milk and manure for their fields and to earn some additional income."*

Despite the Maasai's rise to the epitome of the East African cattle complex, this research, like others (Galaty and Salzman 1981, Kjaerby 1983, Ndagala 1992a, 1992c, & 1996) show that many Maasai are now agro-pastoralists, using to Ndagala's definitions. The Maasai adopting more sedentary strategies according to the times, representing a trend more like the "pastoral continuum", described by Salzman (1980), whereby I contend that Maasai simply adapting as they always have to a changing environment and population pressure.

This change is not without its' problems. Hjort (1981:140) points to the problem of increased competition over grazing resources between pastoralists and agropastoralists. By his definition, "(an agropastoralist is one whose*) main basis of food production is cultivation, but where the farm surplus is invested in livestock, only later to be reinvested in agriculture.*" In this system the food production from cattle is less important than their value as wealth (Galaty 1991). Farmers grow crops for cash and later invest their profits in cattle. While this alone does not seem to create problems, the Maasai culture of cattle keeping does not disappear with the growing of crops. Most Maasai continue to try to keep as many cattle as possible, it is part of their survival strategy in a largely uncertain environment (Sandford 1983, Sperling and Galaty1990, Scoones 1995, Western 1997).

This creates labor shortages, as the children needed for herding are also needed for crop production (Jacobs 1980, Kjaerby 1983). This "*development*" also further encourages keeping children out of school, as their labor becomes critical (Kjaerby 1981 & 1983, Galaty 1991). It also creates more work for women, as they are the ones who do most of the

agricultural work (Kjaerby 1981 & 1983, Von Mitzlaff 1996), in addition to continuing to milk the cattle, feed the family, and do the daily work of hauling firewood, water, and bearing children.

This in turn leads to the adoption of agricultural practices that minimize labor requirements. There is minimal investment in improvements to the land or using outside inputs such as weeding, fertilizer and pesticides. This is in part due to the high risk (low rainfall) areas the crops are grown in and the reluctance to put any more into the crop than is necessary to reap some benefit (Meindertsma and Kessler 1997). There is also little integration between the crops and the livestock system (Boserup 1965 & 1981, Kjaerby 1983).

Kjaerby (1983:29) says,

> *"A distinguishing feature of agropastoralism is its land extensive nature and the lack of organic integration between crop and animal production. The cattle are grazed extensively on grass fallow land and more permanent pastures and there is no fodder procurement for stall feeding, no manuring of crops with farmyard manure and no systematic inclusion of a livestock grazed grass ley into the system of crop rotation."*

Agro-pastoralism given these limitations is an ecologically destructive system (Jacobs 1980). It encourages an exaggerated Maasai system of cattle management whereby numbers rather than the quality of the animals is the main objective. While the Maasai have been criticized for this before, at least in milk based Maasai pastoralism, there is at least some regard for the pastures and the amount of milk produced. Now pastures are more often overgrazed, and there is an increase in environmental destruction (Brandstrom et al.1979). In a competitive environment the agro-pastoralist will exploit pastures more than pastoralists, as many are content with merely keeping the herd alive (Jacobs 1980). As their crops fields expand and yields improve, they expand their herds using the income from crops. This allows them to move into areas formerly monopolized by nomadic pastoralists. In turn, creating

double impoverishment for the nomadic pastoralists, who experience competition for the limited pastures and who can no longer obtain food within the region.

In a theoretical sense what has happened in Monduli is predictable. However, the major challenge is that the grassland resource base is shrinking rapidly, especially in the semi-arid areas where rainfall has been considered insufficient for crop production (see Figure 2.2). Crop production systems are being adopted, with little attention to long term sustainability, appropriate crop selection, as well as, appropriate soil conservation and water conservation measures These environmental issues combined with the cattle culture of the Maasai will continue to pose sustainable development challenges for some time. [12]

2.9 - Pastoral Development

"Agriculture is the best thing for us to have development. Cattle can die, but the land cannot die"[13]

If you asked a Maasai in the lower Monduli district what his definition of development and agricultural development would be, it would likely not be what others have defined as development. It would very likely not be anything like Boserup's definition of agricultural development. In Swahili "*Maendeleo*", the concept of development, is something that people feel they can have given to them or brought to them (Sandford 1983, Igoe 2000). The Maasai are very familiar with this term. I heard it frequently. During my interviews I was told that other than outside assistance, agriculture and cattle raising were the best way for the Maasai "to have" development. To some Maasai development would simply be to have better access to water and good grazing. To others it would be the return of free or state supported

[12] The environmental issues and trends toward a lack of sustainable agriculture are described later in this chapter as well, as in Chapters 7, 8 & 9

[13] Interviewee #53, a WaArusha man from Lashaine

veterinary services. Development is a word frequently used in Tanzania. It is used in a way that means to bring or get access to all the things one does not have, but would to like to have. I was asked often if I was going to bring development. I frequently heard Maasai and WaArusha agropastoralists ask for me to bring or make available such things as health care, veterinary services, schools, water, as well as, access to agricultural and household supplies. To them these things were development.

For many years development experts have answered the Maasai requests for development in Kenya and Tanzania, by simply providing these things that they asked for, such as water, health care, veterinary services, etc. The result was usually quite rapid improvements in those specific areas, but these were not long term solutions, as numerous problems quickly arose (Talbot 1972, Sandford 1983, MacKenzi 1987, Campbell 1993). Simply providing inputs or technical solutions largely ignored the many other aspects of agricultural development inherent to any pastoral or agricultural system. Over and above the technical solutions, there is a need to consider and integrate information about the ecology of the region, the economic and political situation, as well as, the sociocultural and demographic factors. These all affect how the technical inputs will be used, what they will impact, and whether or not they will truly successful in bringing long term sustainable development (Scudder 1969, Talbot 1972, Uchendu 1972, Sandford 1983, Komba 1992).[14]

Rigby (1992:92) explored the contradictions between the colonial powers that wanted to exploit and control the Maasailand to current development programs that want to "help" the Maasai become integrated into the capitalist society. He feels that there have been, for many years, unfortunate political effects due to policies and these were based on a lack of

[14] Some pastoral development, which has been based on technical solutions, has been so short term in its success (based on both the literature and my own work) that the concept of long term, in the sense that I have used it, here is actually not more than a 2-3 generations. Of course longer-term sustainability would be great, but in many cases, the loss of resources and demise of the system has occurred within one generation.

knowledge of the Maasai people. The language of development he says *"is imposed upon a people, who are assumed to occupy a place, time, separate form and even antagonistic to, those of the planners of "progress". And the resulting gap is presumed to be caused by Maasai, not by the alienated knowledge of the experts."*

Pastoralists and specifically the Maasai have suffered from a great many failed development schemes (Hopcraft 1981, Hogg 1990, Kelly 1990, Spear 1993, Igoe 2000). Despite pastoralism likely being *the "most adaptive and potentially viable system in semi-arid and arid land ecosystems"* (Stiles 1981:370), the settling of the pastoralist was long considered the only way to control them and get them to contribute to the colonial economy and governments. Colonial Development was based on the premise that Africans (especially pastoralists) were underutilizing their natural resource base, therefore were not capable of producing sufficient revenue for the colonial state (Hodson 1995, and Spear 1996, Igoe, 2000). Thus the needs of the pastoralist, and their long term approaches to land use management have been largely ignored, in the name of *"progress"*.

Goldschmidt (1981:117) addresses this point at length, concluding that the vast majority of development schemes for pastoralists have failed miserably.

He went so far as to ask,

> *"First, planners do not learn from their own mistakes. To see governments plan to make elaborate installations of water holes, or launch stock reduction programs after these have been repeatedly branded as failures, makes one wonder why writing was ever invented"*

Goldschmidt (1981:117), also points out that there is a often a complete disregard for the opinions and knowledge of the pastoral people.

> *"The fact that they have adapted to a difficult environment which they know intimately does not faze the experts who believe that they are armed with superior knowledge. Technological innovation, in the absence of social innovation, fails with dismal regularity. In more particular terms, neither*

fences nor walls can solve the problems of the pastoralists. What is needed is appropriate social devices."

The promise of President Nyerere's development of the people, by the people, was something that embraced Tanzania in the late 1960's and early 1970's. For the Maasai of the Kisongo and Manyara divisions, the concept of *Ujamaa* and later *"operation imparnati"* were political actions not necessarily looked unfavorably upon. These initiatives were going to bring development, which many Maasai were seeking (Ndagala 1992b) or had been influenced to to seek by Edward Sokoine (Igoe 2000). Sokoine was one of the most successful Maasai politicians, and was from Monduli district. The Maasai of this region continue to praise and speak highly of him, even though he was killed in a car wreck in 1984. He has had a large impact on their peaceful adoption both Ujamaa[15] and agriculture. In fact, many Maasai in my own study spoke of the time in 1983, when he traveled throughout the district promoting agriculture and the ox plow. It was at a time when the Maasai were still living a largely pastoral life in lower Monduli district. Having their home near the school or health center would be "*maendeleo*", as their mobile cattle herds could still move out to traditional grazing areas.

This development has brought education to Maasai and WaArusha who wanted to send their children to school. As I worked throughout my research area, children were always seen coming or going to local schools. This development has brought other benefits as well, including easier physical access to health clinics and grain mills. However, the settlement of the Maasai in Monduli, was just the beginning of a process of integrating the Maasai into the mainstream society. This has long been the goal of most politicians in Tanzania (Igoe 2000)

[15] Ujamaa in Tanzania was a socialist development program, that was introduced by President Nyerere, in the late 1970's. It was by design a policy that would forcibly encourage people into communal villages. The goal was to bolster health care, education and agricultural production. Health care and education were

and it has resulted in land use and ethnic conflicts which are now going on in the region (Ole Kuney 1994, Ndagala 1996, Lama 1998).

I do not believe that development has to be so destructive to culture and people's lives. If this was the case, why would there be so much research on trying to find ways to help the Maasai adapt to a changing world. The use of participatory development initiatives, which take into consideration the land base, possibly draft animals, and combined with simple soil conservation measures, may offer a small glimmer of hope in developing African agriculture, from the ground up (Christianssson et al. 1993, Assmo 1994, Morindat 1997). While the use of oxen is largely a "white man's" technology from a Tanzanian perspective, many other nations all over the world used draft animals to make the transition from hand tools to mechanized power throughout human history.

2.10 - Oxen and Land-Use Change

According to Boserup (1965, 1981), it is theoretically and historically accurate to integrate draft animals into the agricultural system, when the agriculturists reach the short bush fallow or grass fallow stages of development. This has certainly happened and is happening now with the Maasai in parts of Monduli district. While this is an expected reaction to increased population pressure, animal traction is exactly the type of agricultural improvement that can allow local people to use a local resource, in order to reduce labor constraints and improve productivity. At the same time it can provide incentives for employment in related industries like blacksmithing, carpentry, transportation, and animal and farm input trade, which will be necessary if the agricultural systems in Monduli are to ever intensify. This adoption of draft animal power should eventually lead to the

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improved. Agricultural production steadily dropped. The Maasai called this Operation *Vijiji* (village) or Operation *Imparnati* (permanent habitations). This will be discussed in more detail in Chapter 6.

intensification of the agricultural system (Boserup 1965 & 1981), and in past cases has allowed the people to benefit from increased production with less labor during this transition.

One downfall of Tanzanian agricultural development, was that the majority of the population consists of farmers on small plots of land and many of the technologies introduced were inappropriate. For example, during *Ujamaa*, agricultural development schemes have been based on using technology, inputs and equipment that were largely foreign made and very expensive (Ole Saitoti 1978, Shivji 1998). Developing large manufacturing industries or other foreign funded industries leaves a lot of people out of the realm of improving their own small businesses (Raikes 1986). Like the development of Colonial America (in only this regard), Tanzania has the resources and the skills to produce huge surpluses of agricultural products. But this alone will not develop their economy. They also need the development of small businesses and industries at the village level, using local resources and low or medium level technologies. Tanzanian small farmers need to develop themselves. This will not happen with any benefit to the local people, if they are not provided with an environment and political system that allows this to happen.

There are many reasons to be optimistic about the use of draft animal power in Tanzania and especially in the Monduli district. Below is a list that is a result of early observations and the literature review. This list represents briefly why oxen are being used. These and other issues will be discussed in more detail in Chapter 7.

1) Cattle and donkeys are readily available.
2) The extensification or the expansion of individual plots is an option in some areas (Sosovele 1991, Pannin & Ellis Jones 1994).
3) Using draft animals can improve the timeliness of plowing, planting and weeding.
4) Local cattle and donkeys have much more potential than tractors, which have failed time and again (McCown et al. 1979, Mothander et al. 1989).
5) Draft animals can reduce labor constraints and improve the lives of women and children (Starkey& Mutagubya 1992, Sylwander 1994).
6) Rural transport is a major challenge due to the condition of roads, the availability of fuel, and the cost of vehicles. There is a huge amount of human labor that could be released from the daily transportation of water, food, and firewood,

allowing more creative and productive uses of time (Starkey& Mutagubya 1992, Sylwander 1994, Rwelmira & Sylwander).

7) Draft animals can be used to intensify agricultural operations (Balcet 1998, Kilemwa 1999).

However, adopting draft animals is not without its' challenges (Sosovele 1999, Starkey and Kaumbutho 1999). Animal traction (draft animal power and/or the use of oxen) is worthy of study in the context of this research, due to its appropriateness theoretically (Boserup 1965 & 1981), and the fact that it has been culturally accepted and put to use among the Maasai. Its use has already impacted the agricultural development and the environment of the district and will continue to do so. The greatest challenges will be (and usually are) to utilize animal traction in a way that minimizes the risk to the environment, while maximizing agricultural intensification (Komba 1992, Kilemwa 1999). This would mean promoting and providing incentives to prevent soil erosion. This would include both soil erosion in the crop fields and the roads and paths leading to grazing areas. It might include less movement of livestock, and more intensive use of crops residues. Yet given the current state of land tenure and the cultural aversion to keeping herds and flocks in confinement, this could be the greatest challenge of all for the Maasai and WaArusha in the Monduli district. These issues will be addressed in Chapters 7, 8 and 9 in more detail, as they are a major focus of this study.

2.11 - SUSTAINABILITY

2.11.1 - Why Discuss Sustainability?

At the center of my case study is the concept of sustainability. The goal of this research project was to go beyond a simple case study of the Kisongo Maasai and their relatively new adoption of agriculture and oxen. I wanted to document more than the current state of animal traction and Maasai agriculture, I wanted to explore their agriculture with an eye toward the people's use of sustainable principles and practices. I wanted to examine the

environmental impacts of animal traction, as stated in the previous section. During my initial visits in 1996 and early research in 1998 it was obvious that this relatively new Maasai agricultural system is changing the environment. I wanted to learn how it was affecting the people and what its impact was on the environment. The people and the environment are both the major factors that impact sustainability and sustainable development. Both are popular terms in development and NGO circles (Eswaran et al. 1991, Holmberg and Sanbrook 1992, Pretty et al. 1992, Toman 1992, FAO 1996, De Haan et al. 1997). Therefore, I shaped my study around the principles of sustainability, outlined within the Agenda 21, put together in June or 1992, at the Earth's Summit, in Brazil, by the many government's and institutions from around the world. This included Tanzania.

According to the IUCN (2000)

> *"The world is in a crisis of unsustainability: not achieving wellbeing for all people, yet degrading and destroying the ecosystem. Human behavior is the main cause of this crisis and the only source of its solution. The ecosystem cannot solve our problems for us. We need to understand which human behaviors are problematic and the motivations behind such behavior."*

In order to understand sustainability in Monduli District with the Maasai, I had to first understand the concepts of sustainability. I then had to understand the Maasai, their agriculture and their perceptions of sustainability and the reasons for their actions.

2.11.2 - The System Conditions

In searching for a list of principles of sustainability I went to the notes from a seminar I attended called "The Natural Step". This is an international organization, which began in Sweden and is dedicated to helping society reduce its impact on the environment and move

toward a more sustainable future (Natural Step 1996). Their principles are called *Systems Conditions*[16] and there are four of them, which I have listed below:

1) *Substances of the Earth's crust must not systematically increase in nature (i.e. radically reducing mining and the use of fossil fuels).*
2) *Substances produced by a society must not systematically increase in nature (i.e. decreased production of natural substances that are accumulating, and a phase out of all persistent and unnatural substances).*
3) *The physical basis for the productivity and diversity of nature must not be systematically deteriorated (i.e. sweeping changes are needed in the way we use the Earth's surfaces). This would mean changing the way we farm, build cities and harvest and use the forest.*
4) *Just and efficient use of energy and other resources (i.e. an increased technical and organizational efficiency in the world). The principle here being to more judiciously use resources and our allocation of them to various populations.*

Initially reviewing these system conditions, they certainly seemed like rules that every society should try to live by. In fact, I could see that the Maasai live by these principles more than do many other societies. Their simple homes, corrals, cattle and agricultural systems all rely primarily on local resources, with few outside inputs. The household and agricultural wastes they produce are largely organic in nature, and easily assimilated back into the natural system. However, it appeared that all was not well in the Maasai agricultural system. Crop growing and expansion of agricultural lands with oxen was leading to rampant soil erosion, increased conflict with wildlife, and decreasing yields over time. This was a direct conflict with the Natural Step's third system principle.

While few people live in complete harmony with their natural environment, the Maasai were moving away from a pastoral system, which has long allowed them to coexist with wildlife and survive the challenges of the East African environment. They were just beginning to adopt what might be a less sustainable system. These changes were occurring

[16] Their systems conditions are based on the core principles of thermodynamics and ecology.

within one generation. Interviewing the Maasai agriculturists, it was obvious they were aware of these changes. Listening to their ideas and observations on the changes and sustainability of their new agricultural system became the focus of my study. This focus is important because it is the people that best understand the constraints and challenges that they face.

2.11.3 - Principles of Sustainability

The literature has many references to sustainability in principle, but I found none that actually listed principles of sustainability (Edwards et al. 1990, Dahlberg, 1991, Eswaran et al. 1993, Goldman, 1995, Goodland 1995). Hart (1998-1999) maintains there are many definitions of sustainability, as well as numerous principles of sustainability. Many of the principles and definitions she describes apply to sustainable communities and sustainable development. Beyond the four systems principles as described by the Natural Step, the principles of sustainability that most closely met my own needs for this discussion were *"The Hannover Principles"*.

The Hannover Principles is a 70-page statement of philosophy by architect William McDonough. He was commissioned by the city of Hannover, Germany, to develop a set of principles for the World's Fair in the year 2000. These principles were originally announced at the Earth's Summit, in Brazil, during the development of AGENDA 21, in June of 1992. Nine of the principles have been used in many contexts. They also helped me pose appropriate questions about the sustainability of the Maasai agricultural system.

These nine principles with some small modifications are as follows:

1) ***Insist on the rights of nature and humanity to coexist*** *in healthy, supportive, diverse and sustainable condition.*
2) ***Recognize Interdependence.*** *The elements of human existence interact with and depend upon the natural world, with broad and diverse implications at every scale.*
3) ***Respect relationships between spirit and matter.***

4) ***Accept responsibility for the consequences of design decisions*** *upon human well being, the viability of natural systems, and their right to coexist.*
5) ***Create safe objects of long term value.***
6) ***Eliminate the concept of waste.*** *Evaluate and optimize the full-cycle of products and processes, to approach the state of natural systems, in which there is no waste.*
7) ***Rely on natural energy flows.***
8) ***Understand the limitations of design.*** *No human creation lasts forever and design does not solve all problems. Those who create and plan should practice humility in the face of nature. Treat nature as a model and mentor, not as an inconvenience to be evaded or controlled.*
9) ***Seek constant improvement by the sharing of knowledge.*** *Encourage direct and open communication between colleagues, patrons, manufacturers and users to link long term sustainable considerations with ethical responsibility, and re-establish the integral relationship between natural processes and human activity.*

By William McDonough, 1992. (DOE-CESD 1998)

These principles expand upon the systems principles described by the Natural Step (1996). In theory they are even more comprehensive principles to live by, and can be applied within a very broad context. The traditional Maasai pastoral system certainly integrates most of them. These include: spirit and matter (Spencer 1993), a broad understanding of the ecosystem (Western 1997), a great understanding of the interdependence of nature, wildlife and humans (Western 1997) natural energy flows (Jacobs 1964 & 1980 & Saitoti 1986), the limitations of design (Mollel & Yunus –no date) and improvement of knowledge (Spear and Waller 1993).

2.11.4 - Agricultural Sustainability – Indicators and Ideas

Times are changing. There are now land uses and agricultural changes in the lower part of the Monduli district that certainly do not seem sustainable even in the short term. What do the Maasai consider sustainable? Does a system have to meet all of the principles above to be sustainable? Furthermore, what is the definition of sustainability? The definition certainly differs between economists, ecologists, farmers, as well as, government and NGO groups (Toman 1992, Kikula et al. 1993). In fact, there are many definitions of sustainability,

because societies differ, systems differ and the things people are willing to do without differs. The most appropriate definition of the sustainability of the use of oxen in African agriculture is one that I borrowed from Goldman (1995:294), who cited N. Perlas, of the International Alliance for Sustainable Agriculture (1988), *"sustainable agriculture must be ecologically sound, economically viable, socially just, and culturally appropriate."*

This definition is broad enough to describe the sustainability of any agricultural system. It is also specific enough that it may be applied to a technology used in agricultural systems. Thus for this discussion and in the context of this dissertation, I will use this as the most appropriate definition of sustainability. Beyond this simple definition, Shao (1999:16) points out, sustainable practices should include the following characteristics:

1. *Long term maintenance of natural resources and agricultural productivity*
2. *Minimal environmental impacts*
3. *Optimal production with minimized chemical input*
4. *Satisfaction of human needs for food and adequate economic returns to farmers*
5. *Provision of social needs of farm families and communities.*

These ideas about what sustainable agricultural systems should provide can apply to all agricultural societies, including the Maasai. Exploring whether or not the adoption of oxen by the Maasai was ecologically sound, economically viable, socially just and culturally appropriate has essentially become my thesis. However, Shao's ideals are hard to measure without understanding the system of agriculture, the people, their needs, and their expectations. Certainly a Maasai farmer has different expectations than a white farmer in Tanzania or a farmer in Europe. Therefore, to get a sense of how sustainable the farmer is or how sustainable his practices are, you have to go beyond principles and practice. This requires the development of indicators of sustainability. Yet not all indicators can be applied easily to all populations.

Boserup (1981) provided ways to measure the changes in agriculture that were likely to take place given her own indicators. She used the number of small livestock per person and the ratio of pasture/arable land, as good indicators of the predominant system of food supply within in an area. Using Boserup's ideas, and applying it to the population, land area and small livestock numbers in Monduli district (Meindertsma and Kessler 1997) would indicate a greater use of the bush fallow system, and a more than an adequate food supply. However Meindertsma and Kessler (1997) point out that Monduli is an annual importer of food. There is more going on in Monduli than Boserup's indicators of sustainability and agricultural development can explain in an agricultural development sense.

Boserup first and foremost was not discussing the culture of the Maasai and WaArusha. Their pastoral traditions are difficult to give up, even with the presence of agriculture and more intensive systems. There are numerous very large commercial farms, which have taken some of the best lands out of the hands of the local people (Lama 1998, Igoe 2000). There are also lots of wildlife in game control areas and in the government controlled lands adjacent National Parks and Conservation areas. This wildlife pressure will not allow a simple adoption of Boserup's theory, without either the wildlife or the people suffering. These factors I believe make the Maasai adoption of agriculture and oxen, in the Monduli district, a particularly interesting case study, requiring both a study of the agricultural systems and indicators of sustainability that have to be unique.

Discussing the Assessment of Sustainability the IUCN (2000) offers these critical points, which differ considerably to Boserup (1965 & 1981), who generalized her indicators of agricultural development without taking into consideration the unique nature of the people and the region.

"Human societies are an integral part of the surrounding ecosystem. They can be sustainable only if both the human condition and the condition of the ecosystem are good or improving. The second feature of the (assessment) approach is that it fosters questioning.

Only when we know what questions we are trying to answer can we find indicators and other tools to help us. The more an assessment method requires users to question their assumptions and expose their judgements to scrutiny, the more robust the method will be.

Basic questions for developing an understanding of the system are:

1) *What are the conditions of the people and the ecosystem?*
2) *What is the nature of the interactions of the people and the ecosystem?*
3) *What motivates people to do what they do?*
4) *What should people do to improve their situation and that of the ecosystem?*
5) *How can these actions be taken?*
6) *How would people know whether things are getting better or worse?"*

The questions above apply directly to the research I have conducted and will present in later chapters. These questions point to the importance of understanding culture and the nature of the ecosystem being examined. Answers to such questions allow people at all levels to begin to formulate programs and solutions that directly address the problems local people are facing. It is my hope that this preamble to my own data, sets the stage for a presentation and discussion of the indicators of sustainability I have developed, as well as, how these indicators are showing that things are not well in Monduli District.

2.12- Summary

Sustainability depends on improving and maintaining the well-being of both people and the ecosystem. There is no single combination of factors that will allow sustainability to happen. Agricultural development does not imply sustainability. Agricultural development, although somewhat predictable, usually brings only more intensive methods, improved yields and income, at least in the short term. The Maasai are unique in that they have resisted change and agricultural development for centuries. Now due to outside forces, change is something they are embracing. This change could be for the better or for the worse. Achieving sustainability depends trying to understand our ignorance and uncertainty, and basing actions on questions learned through groups of people reflecting and acting in their

communities (IUCN 2000). I do not believe the current process of agricultural development in my research area has embraced this concept. I wanted to learn from the Maasai, to understand their new agro-pastoral system, and if possible, explore their agricultural system with an interest in its ability to meet certain principles of sustainability. The principles outlined above were used to develop a list of indicators of sustainability, which were used to develop the questions asked in the field. These will be described in Chapter 4.

There have been many factors that have influenced the Maasai and their change from a pastoral to a more agro-pastoral system of agriculture. Simply evaluating indicators is not enough, as this is a complex system and a unique culture. Both this chapter and the next set the context for the people and the challenges they have faced with regard to land use and agriculture.

CHAPTER 3

THE MAASAI

3.1 – Introduction

This chapter will describe the Maasai and how they live in lower Monduli district, including the foods they eat, and how their livestock and agriculture meet their food needs. I have also discussed gender issues, and a few points that make them culturally different from their neighbors. This difference, as well as, their proximity and mingling with their WaArusha brethren, puts the Maasai in this research in a unique situation. The WaArusha are sometimes called Maasai, and the WaArusha sometimes call themselves Maasai. However, despite their many similarities, they have a different history, they have different experiences with agricultural crops, and the WaArusha are the newcomers to the research area. All of these factors are important, as they, in some ways have been the force behind the changes this research addresses.

3.2 - Ethnic Identity and Culture of the Kisongo Maasai

The Maasai are likely the most well known of all the ethnic groups in Tanzania (Lama 1998, Igoe 2000). Their dress and culture certainly sets them apart from other groups in Tanzania, making them easily identifiable. Their prominence in the Rift Valley of Tanzania and Kenya was noted by some of the earliest European explorers, and their independence has always been admired. Photographs of the Maasai are frequently at the

center of tourist guidebooks and pamphlets in Tanzania, as well as documentary films about East Africa and its wildlife. Their prominence in the international media makes them one of the most frequently sought after tribes by everyone from casual tourists to professional camera crews. Maasai can be seen on the roads and paths leading to many of the great wildlife areas. Their traditional dress, lifestyle, homes, and culture are certainly a highlight to visitors.

Most people think of Maasai as a nomadic tribe that constantly follows their herds to better grazing lands and water. Even among neighboring tribes, I frequently heard them speak of Maasai in a derogatory manner, saying they did not live in homes at all; *"The Maasai live in the bush."* This is not really the case. Maasai tend to live within certain areas and only move their homesteads in Central and Southern Monduli if there is a severe lack of water and/or grass. According to Rigby (1992) Maasai pastoralists are not truly nomadic, although they move their homesteads frequently. Today in much of Monduli district, the Maasai still search for good grazing and ample water for their cattle, but it is usually the *morani* (young warriors) that temporarily take the cattle herds away from their family's permanent home. Goats, sheep and donkeys usually stay at the main homestead, as they cannot travel as far as cattle in a day. Their requirements for water and grass are not as critical as the cattle herds, which are the most treasured asset a Maasai can have. But in times of severe grass shortages, even the small stock will be moved. Maasai life has for centuries revolved around their herds and the ability to find them areas for grazing. To the Maasai nothing matters more than cattle and children (Spencer 1993).

3.3 - Maasai Demographics

There is currently no formal census information on ethnic groups or their numbers in particular districts (Sosovele 2000). Given the large and rapidly growing population in

Tanzania, the Maasai are definitely a minority. Jacobs (1980) Maasai occupy some 62,176 km^2 in Tanzania, representing about 15% of the nation's land area. Yet, their visual presence is much larger than their numbers might suggest. Using the literature, I looked at population estimates other researchers had used. According to Jacobs (1980) there were an estimated 226,000 Maasai in both Kenya and Tanzania. From this total he estimated the population of Maasai in Tanzania to be 62,000, of which 55,000 were likely Kisongo Maasai. Later Galaty (1988) estimated the entire Maasai population to be about 300,000, 2/3 of whom live in Kenya. Thus his estimate would put about 100,000 Maasai in Tanzania, at that time, concurring with Homewood and Rodgers (1991). In 1992, Ndagala estimated the entire population to be 140,000, of which he stated 100,000 were Kisongo Maasai. In any case, using Ndagala's total Maasai population numbers, the population density of Maasai in the area provided by Jacobs would put their population density at slightly over 2 people per km^2.

The Kisongo Maasai live primarily in the Monduli, Simanjiro, Kiteto, Ngorongoro, and Arumeru districts (Morindat 1997). Using the above figures as a guide to the current population of Kisongo Maasai, the 1995 estimate by Meindertsma and Kessler (1997) that in Monduli District there are 56,758 Maasai (the vast majority of which were Kisongo Maasai) was the best estimate I could find for my research area. Meindertsma and Kessler also estimated 28,379 WaArusha are currently living in Monduli district, which given the estimate of 97,000 all WaArusha by Jacobs (1980), was likely the best guess at this time as well. Thus out of the 141,896 people estimated to be living in Monduli district in 1995, the Maasai and WaArusha are said to represent 40% and 20% of the district's population respectively (Meindertsma and Kessler 1997).

Using figures provided by Meindertsma and Kessler (1997) who estimated that in the Kisongo and Manyara zones of Monduli district, the population density was 8.3 people/km^2. This is lower than the Monduli district average as a whole (10 people/km^2), because of not

including Monduli town. This figure is higher than what the population is for all of Tanzania's Maasailand (noted above as 2 people/km^2) because agriculture is being rapidly adopted, as a way to cope with a rapidly rising human population. This figure is also lower than the Arusha region's figure of 21 people/km^2, as well as the national average on the mainland of 26 people/km^2 (Bagachwa et al. 1995). Meindertsma and Kessler (1997) also estimated the population density is in my research area to be increasing at almost 3% annually, suggesting a growth rate higher than the nation's since 1978 (Bagachwa et al. 1995).

3.4 - The Maasai Today

The Maasai culture has, on its surface, resisted cultivation and growing crops for hundreds of years (Jacobs 1965 and 1980). However, there is ample evidence that a transition to and from agriculture is not completely new (Campbell 1993, Spear 1993). Many Maasai still take pride in resisting cultivation, and many books and articles for the popular press continue to portray this Maasai ideal. It is this transition today that has become the central issue in my study.

Rigby (1992:165) eloquently stated ,

> *"Maasai still adhere to the elements of the pastoral praxis that have enabled them to change and yet survive for the past 300 years or so. In this adherence they challenge the forms of "development" designed for them by outsiders, together with all the ideological baggage that comes with these forms."*

This short statement sums up many of the problems the Maasai in Monduli are now facing. There is a strong cultural tradition and survival strategy that surrounds their ideological need to constantly expand their herds.

The Maasai are not and have not been a static culture. They have changed and evolved for centuries (Waller 1993, Spear 1997). While they are considered to be the epitome

of the East African *"cattle culture"* (Sperling and Galaty 1990), this has not always been the case. They came from the North most likely from what is now Sudan. According to linguistic evidence they are related to other Nilo-Saharan speakers of Africa. They are considered to belong to the Nilotic branch of others such as the Nuer, Dinka, Turkana, and Karamojong, who are also great cattle people (Galaty 1993, Bodley 1994). The Maasai basically abandoned agriculture during what Spear (1993) calls the pastoral revolution of the 18th and 19th century. But their roots in agriculture go back thousands of years to the Eastern Nilotic ancestors in what is now Sudan.

Many tourists fail to realize that the Maasai (much like native Americans) have been excluded from many of their traditional lands. In Southern Monduli district, where I conducted my research, this is especially true. Both directly and indirectly the Maasai here have been forced to lead a more sedentary way of life or move to the more marginal lands of Northern Monduli District, for reasons which will be discussed in chapter 6 (Jacobs 1965, Goldschmidt 1981, Ndagala 1994). However, the Maasai have been slow to change. This change is now picking up its pace as more and more people (many non-Maasai) are relocating in this area. The Maasai see the adoption of agriculture as one way to protect what has always been their land (Ndagala 1992c & 1996).

Waller (1993:291) calls Maasainess *"a slippery concept"*, because Maasai are constantly changing. He points out that while they are *"People of Cattle"*, the modern Maasai can also be *"a wheat farmer"*, and I would add a shopkeeper, a maize and bean farmer or a tour guide. While the Maasai have a strong sense of culture and what it is to be Maasai, there has always been, according to Waller (1993:291), *"a fluid pattern of exchange and assimilation among small scale communities of pastoralists, farmers and hunter gatherers that gives coherence to the regional system as a whole and supports the identities of its constituent parts."*

Spear (1993:9) says,

> *"Our view of the Maasai has thus moved beyond a simple opposition between pure pastoralists and others to embrace a view in which Maasai society is seen as encompassing a triangle of economic forces – pastoralism, hunting-gathering, and agriculture – within complex cultural structures which were both highly differentiated and complimentary."*

Spear (1993) also points out, that the complex reality of life in the Rift Valley area, among frequent droughts, disease, movements of people and innovations did not neatly divide the populations into pastoralists, farmers and hunter-gatherers. Ethnic boundaries were constantly blurred, especially as Maasai readily assimilated other tribes like the WaArusha and Meru into their own, through marriage."

This continues today as many Maasai marry outside the Maasai tribe. The most frequent of such marriages are with WaArusha, often seen as a way for a Maasai man to easily acquire the skills and labor to improve agricultural production (Ndagala 1996).

Galaty (1993) sees pastoralists, hunters and farmers as symbolically opposed within a single mode of production. In a process that he labels "*synthesis through exclusion*", there exists this triangle of productive alternatives (pastoralism, hunting and agriculture). Each group views itself and others in a way that often deflates the values of others while at the same time reinforcing its own lifestyle. Pastoralists have protected access to animals and grazing lands, by viewing hunters who destroyed animals or farmers who monopolized potential grazing land as the indifferent consumers of valuable resources.

Spear and Waller (1993:4) conclude that the Maasai have always been in transition, and to define them as "purely" pastoral is an inaccurate statement. Spear adds,

> *" Jacobs (1965) while calling other Maasai pretenders or cultural scavengers, reflects his Maasai informants contempt for poor people, those without cattle and for farmers that worked the soil, is a distinction that is too sharp and neat to be viewed as reality today."*

However, such contempt continues today both with regard to WaArusha (living in Maasailand) opinions of Maasai and Maasai opinions of those who have no cattle or are "pretenders" to this day. Even during my interviews my assistant would point out that a Maasai without livestock is reduced to poverty, begging and selling trinkets to the tourists. These he would say are "*fake Maasai*". The simple fact that this attitude perseveres is evidence that the Maasai as a culture do view themselves as different, even when they adopt agricultural practices (Sakita 2000).

Yet times are changing. The Maasai of Monduli district are changing. There is often an anthropological debate of what makes a pastoralist, and whether or not the Maasai are purely pastoral, yet Ndagala (1992c, 1996) makes a strong argument that there is definitely a change among the Maasai in the Monduli District.

Spear (1993:20) describes this change as,

> *"The definition of Maasai has now tipped from purely pastoral to include various forms of mixed pastoralism and even cash cropping. With tragic irony the true "traditional" Maasai* (like those described by Jacobs 1965) *are now those who are being marginalized as the pastoral proletariat, and the future would appear to belong to those agricultural Maasai, who were once looked down upon."*

This is not only a study about oxen and the changing landscape, it is also about a changing and dynamic people.

3.5 - Maasai and Their Livestock

The Maasai are very proud of their herds and flocks. Sheep, goats, and cattle are everywhere. They represent not only what is considered a good life to the Maasai, but they are an investment that is more secure than money in the bank (especially Tanzanian banks).

One man in my study boldly stated,

"The Maasai don't keep money in the bank. The bank is their livestock"[1]

This statement represents what livestock are to the Maasai. They are more than animals to be sold annually to profit from their herding activities. They are an investment for the future. Livestock are kept as insurance for the times when the crops don't grow, when a family member dies or becomes ill. They are an asset to be used in times of plenty to celebrate life and all that is good about it. For men livestock are the primary means used to acquire a wife, and they are essential to provide the animal protein, especially milk. That is considered essential to the Maasai.

Livestock are like family. Cattle are all given names, and are well known by their owners. They are branded with a unique design of their owner. Young calves, goats and sheep live in the house, until they are old enough and large enough to reside in the main corral. All livestock are assigned each morning to boys starting at about age four and up, or young men to take to pasture. The smallest boys take the young sheep and goats to pastures close to the *boma*[2]. Older boys take the larger calves and sick animals to pastures and special grazing areas a little farther away. The *morani* and some of the young elders take the main herd further away. In times of drought they are also the ones to set up remote *bomas* in areas where there is more ample grass and water. They may remain at these temporary *bomas* until rainfall allows the herds to return closer to the main *boma*. Each evening, no matter where they are, all stock are returned to the corral where the cows are milked and the young cattle, sheep and goats were put back together with their mothers for nursing.

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[1] Interviewee #114, a WaArusha man from Mswakini, he was referring to himself as a Maasai here.

[2] *Boma* is a Swahili term for the residence of a herder. It is translated into English as a fort. This is because livestock herders have not typically had farms, but rather homes and corrals built within a circular thorn fence for protection against predatory wild animals. The Maa equivalent would be *enkang*. The term *kraal* is sometimes used, as there is sometimes a corral around the homes and smaller livestock corrals within the homestead. See the figures in Chapter 5, which display many of the Maasai boma arrangements in the research area.

Livestock represent a more secure investment compared to crops. The mobility of the herds is in both the physical and sociological sense (used as liquid capital and capital for emergencies) are a way to allow their owners to confront natural disasters (frequent droughts and disease) with some form of resilience and flexibility. In other words, the animals can move to an area with rainfall, the crops cannot (Schneider 1981, Ciss`e 1981).

According to Hopcraft (1981:226),

> *"A defining feature of pastoral lands is that they do not reliably produce food. The primary products of the ecosystem are ones that humans cannot digest, thus livestock become an important capital investment and means of capturing this non-digestible product and converting it to a product that is usable by humans. Forage is the primary raw material, and the productivity of the forage is what dictates the output of the capital invested in livestock. Like all capital goods, livestock are reproducible products of investment and savings. When they appropriately handled by the human agent they are transformed through labor to consumable and saleable goods and services, namely meat, milk, hides, live offspring, and work animals,"*

Thus, for the Maasai and WaArusha in Monduli, livestock are worth accumulating, if their value is expected to rise by more than the cost of retaining it. This means that they try to maximize their herd size and benefit from whatever grazing is available (Jonsson 1993, Potkanski 1997). The inevitable result of this unbridled accumulation of livestock is the characteristic cycle of pastoral life, where livestock numbers are built up, followed by a crash in the population, when the forage is exhausted, water is no longer available or disease strikes down the herds (Hopcraft 1981). This classic pastoral dilemma is one of the "tragedy of the commons" (Hardin 1998). In essence, the users who share the common grazing areas have no incentive to conserve it or care for it in such a way to ensure its ecological and productive capacity over time, especially if it limits their own capital investment (Hopcraft 1981). For the Maasai grazing their herds on common lands has been a way of life, but recent social, ecological, and political challenges related to development have added additional pressure to this system. These factors will be described in chapters 7,8, and 9.

3.5.1 - Maasai Cattle

East African Zebu (*Bos indicus*) are well adapted to their environment, with their relatively small body size, a large surface of area of skin, which is held loosely on the body with a shorter but more dense hair coat than Bos taurus or European breeds. They have a comfort zone in temperatures of 15-30 degrees Celsius, which is much higher than Bos taurus breeds that have a comfort zone between 4 and 15 degrees Celsius (Webster and Wilson 1980). They also have an ability to survive with less water and trek farther than imported breeds and their crosses (Western and Finch 1986). Homewood and Rodgers (1987b) compare East African Zebu to wildebeest in average body weight (180 kg.) and their ability to forage, as estimated by their foraging radius of 16 km.

The Maasai recognize the difference between their native Maasai cattle, which are a strain of the East African Zebu and other local and exotic breeds. They envy the Ankole cattle of Rwanda, Burundi and Southern Uganda. They critique the cattle of nearby tribes and quickly point them out in cattle markets. Maasai cattle are very numerous, increasing in number, and very well adapted to traveling great distances for water. In the dry season they are sometimes only allowed to drink three times a week (Jacobs 1980, Homewood and Rodgers 1987b). Indeed says Jacobs (1980:278), "*the animals are purposely watered only once every two days, even in the wet season to ensure grazing mobility in the dry season.*" He has seen cattle in several herds only watered once in 3 days, and one herd that went without water for four and a half days with only 10% mortality. In addition, they survive with very little veterinary care and produce milk enough for a calf and human consumption.

Jacobs (1980) points out that the principle characteristics of Maasai cattle are their low milk yields, low calving rates, slow weight gains, low weight at maturity.[3] In fact the

[3] Although from what I saw these are not as low as the nearby mountain farmers such as the Pare, Chagga, and WaArusha using native cattle.

first time I saw Maasai cattle after spending months among the people of the mountains, I was surprised at their larger body size, their high tolerance of heat and aridity, and their great endurance.

Genetic diversity in agriculture has allowed animals to adapt to the ever-changing conditions of the environment (Alderson 1990, FAO 1996). Maasai cattle are no different. For hundreds of years the Maasai cattle have adapted to local conditions. This has shaped the gene pool of their animals and created animals that are adapted to the difficult conditions on the Kisongo Plains (Western and Finch 1986). Agricultural biological diversity is said to form the foundation for sustainable agricultural development. Among breeds of cattle, the Maasai animals are incredibly resilient animals, producing both meat and milk, where many other breeds quickly perish. In East Africa, among the Maasai, cattle are the source for economic security and like other genetic resources, this is important for future generations.

Some sedentary Maasai and WaArusha people are adopting exotic or introduced breeds such as, Jersey and Holstein cattle (called exotics). These breeds are not very well adapted to local conditions, require a great deal of care, and have been traditionally limited to highland areas and better-watered areas (Jonsson et al. 1993).[4] Even so, as the Maasai farms spread into the drier areas these cattle and their crosses seem to be moving slowly into those areas as well. Most Maasai and WaArusha living away from towns or villages recognize the great disease and survival risks associated with these European breeds, and also recognize that the crosses with their native cattle are also of a weaker constitution for survival in the dry plains.

[4] My original intention was to conduct research on the adoption of these more modern breeds, and evaluate how oxen may have impacted their adoption. However, in drier lands, away from Mt. Meru and Mt. Kilimanjaro and the Pare Mountain range it was obvious that these breeds were ill suited to the climate on the Kisongo Plains. The local indigenous breeds are in no immediate danger of being replaced by European breeds in the near future, simply because of the native cattle are so much better adapted to the environment. However, there continue to be International NGO's that believe that the more productive European breeds and their crosses ought to be adopted in Maasailand.

Maasai cattle are often at the heart of debates about overgrazing and environmental damage. Homewood and Rodgers (1987b) point out some of the environmental impacts of pastoralists and their cattle. These changes come about mainly by overgrazing, illicit burning of the grasslands, and ultimately soil erosion (Jonsson 1993). The erosion in the NCA (Ngorongoro Conservation Area) is much lower than in adjacent parts of the Arusha region, such as Monduli where Maasai and WaArusha have combined cattle keeping and agriculture (Homewood and Rodgers 1987a). This would indicate that cattle are not by themselves destructive to the environment, unless they are poorly managed

Even used as oxen they themselves are not destructive, as stated by one Maasai in my interviews,

> *"They did not destroy the environment. Oxen as such, did not do anything. We are to blame for not using ridges. Plowing with oxen is beautiful, the farmers are to blame for doing a poor job."* [5]

In fact, cattle as a production unit meet many of the principles of sustainability. My discussions with Maasai about the use of cattle always involved natural resources, and an element of resource planning. The Maasai know the land and how to get what they needed from it. Cattle use the natural energy flows from the sun, earth and water to produce what the people need. The Maasai have had little need for fossil fuel, fertilizers, or imported grain. Cattle seemed as much a part of the land as the grass growing on it. The Maasai sleep on beds made of cowhide, use their horns for tools, even recycled the animal's waste to build homes and fertilize fields, all emphasizing the principles of sustainability. Unlike commercial ranchers to the Maasai even dead cattle are valued. I often observed them retrieving dead or dying cattle from grazing areas to consume them and sell their hides (Scoones 1995).

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[5] Interviewee #78

3.5.2 - Maasai Sheep

Maasai sheep (*Ovis aries*) are sometimes called the Red Maasai or Tanzanian Short Tailed Sheep (FAO 2000). They are multicolored, often reddish brown, sometimes pied. They have a short fat tail and a fat rump. The hair is wooly, but is shed naturally by the animal. They are very well suited to local conditions, and often receive little veterinary care from their owners. Similar sheep are seen throughout much of Northern Tanzania. There does not seem to be any influence of other breeds in the area, and nothing that would indicate that the use of oxen and increasing cropland was affecting sheep genetics or animal numbers. Sheep are kept primarily as an investment. They are not seen as competitive with goats and cattle, as their grazing habits are different. They are least likely to be eaten by Maasai, as the Maasai's meat of choice is beef, followed by goat.

3.5.3 - Maasai Goats

The Maasai goats (*Capra hircus*) were very numerous. Even the poorest Maasai or WaArusha agriculturists had goats. Young men without cattle would often have goats, with the goal of working their way up to cattle as their financial position allowed. Goats across the region are very similar. The FAO calls them small East African goats, generally weighing about 15-30 kg. at maturity (Webster and Wilson 1980). They are larger than a North American pygmy goat, but smaller than a North American Dairy Goat. Goats are kept primarily for meat or as a farm asset. Goat meat is the preferred meat by most Tanzanians. Goat meat brings the highest price per pound in the markets, and is readily available at all restaurants and markets. Even though Maasai men proclaim that beef is their favorite, goat meat is eaten more frequently than beef by Maasai, as their size and the amount of meat in a carcass is easily consumed by a large Maasai family group or a gathering with guests in a single sitting. Small stock, such as goats and sheep are also the first to be consumed during droughts and bad years (Rigby 1992).

The Maasai sheep and goats were not recognized as their own unique breeds. Asking questions about breeds of goats and sheep seemed futile, as most people had never seen or heard of other breeds or types. Color and horn shape and size didn't seem to matter much, but the size of the animal certainly dictated its value. The value of a large ram or buck goat was often compared to that of a calf, which for Maasai was an important way of viewing the small ruminant. Many young men would begin their herds by keeping a few goats and sheep, gradually trading up to cattle as they accumulated wealth. One female goat was also frequently the price for plowing one acre of land in Maasai areas such as Selela and Engaruka.

Jacobs (1980) also points out that sheep and goats numbers within Maasai households varies tremendously, and wealthier families may have few or none. This would disagree with my observations of wealthy Maasai, as all had both sheep and goats. Most Maasai had adopted a more sedentary lifestyle in my study, which may have been different than the Maasai to whom Maasai Jacobs refers. The WaArusha I interviewed also owned sheep and goats, but were more likely to have few or no cattle at all.

Jacobs (1980) describes how sheep and goats are seldom milked by Maasai. While I agree that this is not the preferred animal to be used for milk, there were several instances where I saw sheep and goats being milked. Many times this was when there was a shortage of cow's milk, or maybe because I as the guest became an additional burden on the milk supply, and they knew there would be no objection by me of drinking this milk. In Hopcraft (1981) one Maasai discussant points out that goats and sheep play an important role in times of drought, as they require little water, and "when goats milk is used it is time for famine relief to begin."

3.5.4 - Maasai Donkeys

Most Maasai own donkeys (*Equus assinus*). Women most commonly use donkeys to transport water, crops and other goods. This is usually done with a local saddle or pack made from cow skins. Donkeys hold a lower social value, as they cannot be used for food. Their relatively low price reflects their value. They are sometimes yoked for plowing, but usually only in cases of desperation, when fields must be plowed and oxen are unavailable due to death or poor health. Although a few WaArusha in my study specifically said they preferred donkeys due to their intelligence, longer life, and fewer health problems. Donkeys were also the preferred animals for use on carts, as they can be more easily trained and controlled even by women and children. They are also considered hardier than most of the other farm animals, as they seem to be less affected by ticks, can browse on poor vegetation, and require less water than cattle.

3.5.5 - Maasai Poultry

Poultry, specifically chickens (*Gallus gallus*) are also raised by a large number of agropastoral Maasai. There is a tendency for Maasai men to say they do not have poultry, when there are chickens running all around the *boma*. This is because poultry are largely owned by the women, and not considered livestock by the men. Some poultry in Maasai *bomas* were even provided with small coops to roost in and lay their eggs, as a way to protect them from the many predators that frequently visit the *bomas*.

3.6 - Maasai Foods

A discussion of the food consumption as seen in my study, with reference to what has been seen by other researchers, is important, as Maasai and WaArusha farmers grow grains and beans for their own consumption, before selling any crops for cash (Meindertsma

and Kessler 1997). This farming for sustenance first is a strategy based on food security. Food security is particularly important for Maasai women. Men often place a cash value on the crops and will eagerly invest the cash received for crops in livestock, when immediate needs are met at home. This investment option was frequently discussed in my interviews as a benefit of growing crops.

Milk is one of the most highly valued foods and the most important staple in the Maasai diet (Jacobs 1965, Jacobs 1980, Talle 1990). It has also provided the Maasai with a readily available protein source. Compared to other ethnic groups and cultures in Tanzania, the Maasai do not lack for protein, largely due to their heavy reliance on milk. Milk is consumed fresh or sour, as well as in other forms such as mixed with blood, added to gruel or taken with maize meal, and with tea. (Talle 1990, Homewood et al. 1987)

Its importance is foremost in Maasai protein intake and according to Homewood et al. (1987), is second in importance in energy intake (providing 30% of the daily calories). It is taken numerous times each day, and its function is one of sustenance and symbolism. The need to have numerous cows in milk daily is of the utmost importance, and it is considered a great hardship if there is no milk, which often occurs, in the dry season.

In my own study, among the agropastoral Maasai and WaArusha whose herds were smaller, they frequently complained if they had to drink *Chai ya rangi* (colored, rather than white tea, due to a lack of milk). There is some sense in the literature that the value of milk to the Maasai is changing, as they and other tribes become more sedentary (Kjaerby 1989). It is often unavailable in households with no lactating animals, and its value is higher as it becomes scarce, causing some women to sell their precious milk to buy other consumer goods (Von Mitzlaff 1996).

Jacobs (1980) estimated milk forms 80% of the Maasai diet. While this may still be true of the Maasai in more pastoral areas, such as Longido in the Monduli district, it was

certainly not the case of the Maasai in much of my research area. Vegetarian foods, such as berries, fruits, plants and roots are collected by and primarily consumed by women and children. I asked to have these pointed out to me, and I tried some of these local plant foods. Crops, on the other hand, primarily maize, are consumed and eaten by everyone in the family. Jacobs (1980) pointed out that this was the case, with the exception of the moran age group whose diet is strictly prescribed. However, I did not meet any *morani* who refused to eat *loshoro* (a mix of whole corn cooked in sour milk) or other maize products. This is not to say that they don't adhere to these cultural ideals during and shortly after ceremonies of moranhood, but their reliance solely on animal products is more of an ideal scenario, than the reality today in the lower Monduli district.

The dietary energy provided by grains was estimated at 64% of the dietary energy by Homewood et al. (1987). The consumption of maize and beans appeared to be a year round staple in my study as well. Maize meal porridge (*ugali*) is as important as *loshoro*. Maize is also cooked as roasted or boiled on the cob. After milk, maize provides the second most important source of calories for the Maasai. This has been the case for at least 50 years according to Talle (1990). The diet is also commonly supplemented with purchased foodstuffs such as tea and sugar. I would also concur with Talle (1990) that foods such as rice, potatoes, vegetables, spices and beverages like soda and bottled beer are served to guests or on special occasions in households that can afford such luxuries.

Blood continues to be consumed, as I was offered this numerous times, but not on a regular basis. Historically it was consumed during times of hardship as a means of survival. Sometimes blood was used to replace milk in the dry periods. Non-lactating animals were bled once a season (Jacobs 1965, Talle 1990). According to Talle (1990) Maasai have virtually stopped bleeding their animals for subsistence purposes. Bleeding animals is usually only used for ceremonies such as circumcision and childbirth. Blood from slaughtered

animals is drunk directly by men at slaughter places or mixed with milk and soup. Animals are slaughtered by suffocation. Once the animal is unconscious, the blood is captured in a pouch of skin when the chest cavity or jugular vein is cut. It was during the slaughter of goats that I was most often offered the fresh blood.

A morning meal is most often milk, usually fresh, milk boiled with tea leaves and sugar, or mixed with maize meal in a light gruel. Meat is not eaten as a regular component of the diet. It is a highly valued foodstuff, but usually only eaten at feasts, ceremonies, for special occasions, or when an animal dies. I saw a number of cattle that had died and been dragged back to the boma, to be consumed by friends and neighbors[6]. This was the only time I saw Maasai consuming beef at their boma. Most beef consumption took place in villages and towns during weekly markets or during special ceremonies.

Hjort (1981) points out that it would take a herd of 28 cattle or 40 goats and 16 cattle to meet the protein needs of a household. It takes a considerably larger number to meet caloric needs, thus this fact suggests the need for the contribution of grain in the diet, especially among households with fewer livestock. Many of the households, particularly WaArusha *bomas* did not appear to have 16 cattle per boma. Grain therefore is an important supplement in these agropastoral households. Even in more purely pastoral households, grain is a necessary seasonal replacement for milk. It is also a cash crop and a food reserve for bad years. If the grain is properly stored and not sold for cash, it will be there when the dry season returns, particularly if there is a shortage of forage and the condition of the cattle is poor. Unfortunately successful harvests of grain in pastoral areas are most likely in years of good rainfall when there is also adequate milk, thus the frequent reliance on imported grain products during years with less than optimal rainfall (Meindertsma and Kessler 1997).

[6] This practice was also noted in Behnke and Scoones (1993:7).

3.7 - Maasai Agriculture

Near Maasai and WaArusha homes in the Southern section of Monduli District, there are many beautifully kept bean and cornfields. Oxen were used to plant most crops. However, many crops were not the native drought resistant beans and millet that had been grown in much smaller plots decades before. The Maasai and WaArusha fascinated me because they were masters of ox driving. Compared to the Pare, Meru and other tribes in the Arusha region they really knew their cattle and how to train them. This had a great influence on their cropland. It was obvious that the cropland base is expanding. The greatest challenge is using the land to grow crops that can endure the droughts that frequent the area (Meindertsma and Kessler 1997).

Sperling and Galaty (1990) claimed that while Maasai supplement their diets with grains, their direct involvement in actual cultivation is limited. This statement is not entirely accurate today, as every Maasai I met in the Kisongo and Manyara divisions of Monduli district, as well as the Kilimanjaro district was growing crops. Their crop fields varied tremendously in size, but they were all engaged in farming to some degree. In Monduli district there is and has been a widespread adoption of agriculture by the Maasai (Ndagala 1992a & 1996, Meindertsma and Kessler 1997) and this is certainly the case in nearby Simanjiro district (Lama 1997, Igoe 2000) as well as, Kajaido district in Kenya (Campbell 1984 and AWF 1999). The adoption of agriculture is often viewed as a necessity, and not one of the Maasai I met would have chosen had their not been increased pressure to do so.

One man interviewed stated boldly,

> *"You cannot find a Maasai who is not doing agricultural activities."*[7]

[7] Interviewee #121, a WaArusha from Lolkisale

During my 1998 initial research with the Maasai, I would ask each head of the household, how the farming system changed in your lifetime? The Maasai were usually eager to answer. Many replied by saying that they had been forced to settle and had lost much of their traditional grazing lands. Thus, they had been forced by economics and reality to reduce the size of their herds. Although many still said their goal was to have huge herds of cattle.

In the Ngorongoro Conservation Area, the Maasai have been forced to abandon agriculture, and there have been great outcries and distress due to this policy (Homewood and Rodgers 1987 & 1991, McCabe et al. 1992, Taylor et al. 1996). Thus the adoption of agriculture by many Maasai has now become as much a part of their survival and life as raising livestock (Taylor et al. 1996, Lama 1998).

As one Maasai man in Lendikenya said in one of my interviews,

> *"When crop farming is intensive it brings about erosion, resulting in gullies. We are not happy about farming, we would rather be pastoralists. However, we realize the economic opportunities...Farming is not our priority, but it is reality."* [8]

According to Jacobs (1980), most of Maasailand has been classified as essentially marginal to agricultural development. The Maasai free-range philosophy is becoming increasingly problematic as cultivators challenge pastoralists for access to the land. Competition is usually minimal in the rainy season, but as grass becomes scarce, with most permanent water in the traditionally wetter areas, the competition can become great (Ole Saitoti 1978, McCown et al. 1979, Lama 1998). This has not stopped agricultural development or encroachment in the local areas that enjoy a higher rainfall, which in the past constituted dry season pastures. This according to Campbell (1984) and Western (1997) has also occurred in Kajiado District just across the border in Kenya, and has lead to serious hardship for the Maasai that have stuck to a more traditional pastoral lifestyle.

It is only in the last few decades, that the pastoral Maasai have become increasingly sedentarized (Spencer 1990, Von Mitzlaff 1996, Western 1997). This process combined with market exchange, cash transactions and the consumption of non-pastoral foods and other goods are growing in importance (Jacobs 1980, Homewood and Rodgers 1991). The Maasai continue to rely largely upon subsistence strategies to survive, growing much of their own food, as well as continuing to raise livestock, most often cattle, sheep and goats. However, the Maasai in my study used growing crops as a way to expand their herds. They use cash crops such as excess beans and maize as a source of capital as have other societies (Boserup 1990, Lama 1998). Among some *morani*, cattle rustling is still practiced. It is a way of expanding one's herd, but the law takes this very seriously and many cattle thieves are caught and sent to jail.[9] So with increased population pressure, and an ever shrinking land-base, crops provide a way to generate cash with little more than one's own labor. For unmarried *morani*, growing crops can provide a jump start on one's independence, and allow them to take a wife at a younger age than their fathers or grandfathers did (as cattle in the form of a dowry or bride-price are still critical to acquiring a wife).

Yet, it is the Maasai preoccupation with livestock, most notably cattle, that make Maasai people "Maasai" (Ole Saitoti 1978). According to Talle (1990:76), for the Maasai people, "*cattle are the representation of the "good life"; they are pleasant to look at, touch, smell, and taste. Maasai personhood is symbolically constructed on the control of and association with animals.*" According to these Maasai, (Ole Saitoti 1978, Sakita 2000), you cannot separate Maasai from their cattle, for without cattle there would be no Maasai.

[8] Interviewee #65
[9] I met a number of men who had stolen cattle, some had served jail time, others had not.

3.8 - Maasai Gender Issues

Maasai women are normally expected to prepare all food for both men and children. This includes not only cooking the food, but also milking the cattle. They are expected to gather firewood and water. Both take a substantial amount of time, as firewood and water are scarce on the Kisongo Plains. They are expected to clean the house (removing manure from calf and goats pens), as well as maintaining the home. In addition, they are expected to assist with the daily handling and separating of all adult livestock from young animals, as they are sent to different pastures. They are expected to clean all utensils, which includes cooking pots and callabashes[10] that hold milk. They may also have some poultry to care for, have to make jewelry or tan hides from cattle, sheep and goats (Morindat 1997).

As the Maasai become more sedentary there has been a substantial increase in the burden of women (Von Mitzlaff 1996, Ndagala 1998). Maasai women in households growing agricultural crops are expected to help with all planting, do all weeding, as well as the harvesting. All of this is done manually, with little assistance from her husband or sons old enough to tend livestock. This includes the shelling of beans, husking of maize and sun drying of both. Once dried they must be put into containers or sacks. This is also largely the job of women.

Practicing agriculture in marginal areas means investing labor with an uncertain harvest as a return and putting the environment under severe stress and risking environmental degradation. The negative impacts of agriculture affect women more than men (Von Mitzlaff 1996, Morindat 1997). Men rely on their cattle in times of need. Women do not often have

[10] These are gourds, which are locally grown and used to carry water and milk the cows. They are beautifully decorated, and normally have a leather strap for carrying, as well as, a lid attached by a leather thong. These are also used for souring milk, which is usually offered to guests. I must admit that Maasai women were always eager to share their milk, this was not the case with the WaArusha women. It may have been because they did not have the milk to share, or possibly because there was a bit of animosity toward my Maasai research assistant and me. Lobulu frequently jokingly commented, that when we visit five Maasai bomas, we get offered milk five

livestock to sell. Likely a more important issue for the woman is the degradation of the environment. This makes it more difficult for the woman to fetch water, collect firewood and build a home. In addition their children lack the fruits, tubers, and honey from the wild, which supplement their diet and act as a famine food reserve in times of drought (Von Mitzlaff- 1996).

Maasai women are also expected to grow all of the food for their own household, in order to feed their own children (Von Mitzlaff 1996, Morindat 1997). Growing food for herself and her children is separate from the labor she must provide in her husband's fields. His fields are for family reserves, but the primary use is for cash. His crops are sold. If a woman has a surplus from her fields she can sell the crop, but this can be difficult, as the care of her husbands fields almost always comes first. If one wife ends up without enough grain or beans for the year, she has to beg for food from her husband stocks, which is something they prefer not to do (Von Mitzlaff- 1996).

Similarly stated by Boserup (1990:26),

> *"Even though women provide the primary and often sole economic support of their children, yet they cannot decide on many important issues, such as the marriage of their children, the disposal of income, and the cropping areas they will use. Yet they can produce food for their own children's consumption, and sell surplus crops."*

In addition to bearing the brunt of the labor on the farm and around the household, Maasai women bear a high number of children. Maasai bomas tend to be polygamous, which allows the sharing of some labor, but the care of children lies primarily on the mother, the older sisters or a female relative who might be staying in the same home. In any case, most women carry the youngest child with them, and often have other youngsters under the age of 5 or 6 to care for. Older male children take care of young livestock, and older female children

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times, and sometimes even meat. We visit the WaArusha and we must bring our own food, because we are

assist with the household chores. When children go to school this can place an additional burden on the mother.

Goldschmidt (1965:404) stated with regard to Maasai,

> *"While the onerous work of hoe farming may be done by a pregnant woman, the handling off stock requires the masculine freedom from child bearing, and probably the masculine kind of musculature. The male control of animals creates a predilection for patri-orientation – in residence, filiation, and heritage. It also tends to reduce the social role of women, though not their value as females."*

While Boserup's (1990:260) statement below is rather shocking in a Western sense, there has been little or no improvement among Maasai women with the adoption of agriculture. I must agree that, while Boserup was not talking about Maasai specifically, her statement about pastoralists is right on target, with what I saw among the Kisongo Maasai and WaArusha women in agropastoral households.

> *"The young age at marriage, the large difference between the age of the spouses, the frequency of polygyny, the unequal work burden between the sexes, and the high bride price and low educational status of women, all perpetuate the low status of women. Traditionally in Africa the status of women is that of non-adults."*

3.9 - WaArusha Culture and Identity

It was evident in my research area, that despite living largely like Maasai, the WaArusha in Monduli District were different. Their herds, their strategies, and their approach to agricultural development were different. According to the IUCN (2000),

> *"A constant tension exists between the needs of people and the ecosystem and between different groups of people. These tensions must be addressed if we are to develop combinations of human and ecosystem wellbeing that will eventually prove to be sustainable."*

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offered nothing. It was quite a striking difference.

I decided that if I was going to do research on the sustainability of animal traction and the agricultural systems in Monduli, the WaArusha should also become part of my study. Therefore in 1999, I decided to include WaArusha in my field surveys.

Despite my interest in Maasai I realized early on that it would be interesting to compare the Maasai in Monduli district to the WaArusha who live side by side throughout much of the central and southern parts of the district. They are directly related to the Maasai (Spear 1993 and 1997). They speak the same language and dress in a similar fashion. In fact, to the casual observer they can be difficult to distinguish from the Maasai. Other than their agricultural practices they live largely like the Maasai (Morindat 1997, Meindertsma and Kessler 1997). The difference is that they, for a variety of reasons, decided about a century ago to maintain a more sedentary lifestyle in the better-watered and cool foothills of Tanzania's second largest mountain, Mt. Meru.

According to Spear (1993:23), after the Parakuyo wars, the "Arusha Maasai" or WaArusha sought refuge on the fertile slopes of Mt. Meru.

> *"Their dramatic success as farmers reveals a number of important characteristics not normally associated with Maasai, including suppressed traditions of Maasai farming, the complimentary nature of Maasai pastoralism and agriculture, and the ability of the Maasai to adapt pastoral institutions and values to agricultural practice. Continued WaArusha participation in Maasai age sets and rituals with their Kisongo neighbors was not simply a cultural relic. Their successful fusion of "being Maasai" with being farmers was in fact crucial to their success. Their success at assimilating both Meru and Kisongo Maasai is a dramatic testimony to the openness of Maasai societies and the degree to which ethnicity itself was as much a function of economic form as it is birthright."*

According to Spear (1993 & 1997), in the 1930's and 1940's the WaArusha spread out to Monduli, despite being drier and lacking water supplies for irrigation (compared to Mt. Meru), it was nonetheless high (1500-1800 m) and cool ideal for raising cattle, maize and wheat. They had for some time been temporarily herding their cattle, after the rains, in the

Monduli highlands and Kisongo plains, but later in the 1950's and 1960's they spread their agricultural operations onto the Kisongo Plain (Spear 1997).

He goes on to explain that most plains households of WaArusha were simply extensions of their mountain homes, but over time they combined herding and raising beans and maize on rain fed fields. The fact that they were "*Maasai*" and were often directly related to Kisongo Maasai by marriage, made this movement to the plains easier than it would have been if they were another tribe such as the Chagga, Pare or Meru.

They used oxen to clear and plow their fields and pastured their cattle on the crop residues and spread manure from their "*kraals*"[11] on their fields. Wheat growers emerged, in the highlands of Monduli, as this crop proved lucrative in the 1940's. Many WaArusha sold cattle and invested in ox plows, tractors and even combine harvesters. The wealthy cattle owners then became wealthy farmers. However, by the early 1950's there was a switch to maize, which was more profitable. Yet, it was this movement of the WaArusha onto the plains that had a real impact on the adoption of more commercial farming by Maasai. Given their common language, willingness to interact and intermarry, some Maasai men pointed out in my interviews that they even sought out a WaArusha wife, so they could more easily adopt agricultural practices (Spear & Nurse 1992, Spear 1997). The WaArusha were certainly a group that were almost universally cited in my interviews as having brought the technology of animal traction or ox plowing onto the Kisongo plains.

The WaArusha today are still an ethnic group which lives largely on the well watered west side of Mt. Meru in the adjacent Arumeru district. They diversified into coffee, raising fruits and vegetables, as well as commercial dairy production on their mountain farms, sometimes with the profits from their farms on the plains (Spear 1997). These crops continue to be grown by many WaArusha in the highlands of Arumeru to this day, and they supply

much of the local Arusha market with their produce. There was a slow migration of the WaArusha onto the Kisongo plains and into the Monduli highlands, about 30 years ago. The WaArusha were faced with tremendous population pressure near Mt. Meru. Many WaArusha were offered land by the government in the strictly Maasai areas of Kisongo, in what is now Mbuyuni, Lolkisale, Makuyuni, and Mswakini. Many of these settlers, now in their 50's, comprised the men whom I interviewed in those villages.

The WaArusha, in villages such as Makuyuni, Mbuyuni, and Mswakini, today make up almost exclusively the entire rural population (see Table 3.1). They recognized themselves as different from Maasai, and spoke of themselves as the introducers of agriculture and oxen to the Maasai. Yet, they would also sometimes proudly speak Maa, and many of the WaArusha *morani* proudly took on many Maasai traditions such as circumcision and their carefree time as *morani.* While it was more common to see WaArusha men dressed in Western Style clothes, the *morani* proudly wore the more traditional Maasai robes and attire.

An interesting perspective that Jacobs (1980) pointed out is that often the Maasai and WaArusha are grouped together as Maasai by the Tanzanian government and others. He said this would be like saying that Irish, Canadians, Australians, and citizens of the United States are all the same, because they dress similarly and speak the same language. While there may have been some common heritage and certainly intermingling of the tribes over the centuries, they are culturally different, and I would agree with Jacobs, they are different. My experience showed that they certainly recognize the difference between themselves and Maasai and vice versa.

My research assistant was a Maasai, yet his family lived in a part of Lendikenya that had many WaArusha as neighbors. I often asked how he could so easily tell that someone

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Ths term is used instead of corrals, by Swahili speakers.

was WaArusha. His reply was that you just know, their language, their way of acting, and even their interaction with others will tell you whether or not they are Maasai. The WaArusha also always knew that Lobulu was a Maasai and not a WaArusha, despite being well educated and dressing in western clothes. [12]

Table 3.1

WaArusha Population Estimates Percent of Total Population

Village	*1.	*2.
Arkatan	30%	40%
Engaruka Chini	10%	10%
Engrauka Juu	20%	40%
Lashaine	99%	80%
Lashaine – Orkeeswa	96%	50%
Lendikenya	20%	40%
Lolkisale	80%	30%
Makuyuni –	70%	50%
Mbuyuni	95%	
Mswakini Chini	98%	50%
Mswakini Juu	100%	50%
Selela –	10%	10%

*1. Conroy/Sakita (2000) *2. Ole Kuney (1994) [13]

When I first traveled into Maasailand, I thought the style of the home might be an indicator of ethnic background, yet every single Maasai I interviewed lived in dome shaped thatched roof homes, which are considered a traditional WaArusha style (Lama 1998). The WaArusha likely developed this style to protect them from the frequent rains near Mt. Meru, but their roof style spread out into the plains with them. Only on the flat dry plains of

[12] This I must agree with Jacobs is not hard to understand when you put it in context. I would often ask Lobulu if he could tell where some English speaking white person was from by the way they spoke. He said he could not, only that some were harder to understand than others. My informal sample included Dutch, Scottish, Irish, , English and other Americans who had distinguishing accents.

[13] For the District as a whole, Ole Kuney (1994) estimated the WaArusha Population to be 40% Meindertsma and Kessler (1997) estimated that only 20% of the population to be WaArusha.

Engaruka did I see any Maasai who lived in the igloo style, entirely cow dung and sod flat roofed homes, which is more typical of Maasai in other areas of Tanzania and Kenya.

According to Goldschmidt (1981:117),

> *"The fact that the pastoralists are willing and able to change their ways and that they have been adapting for centuries is easily demonstrated. Those quintessential African pastoralists, the Maasai, repeatedly became mixed farmers or predominantly farmers, as exemplified by the WaArusha tribe."*

There is and has been a cultural mixing of the Maasai and WaArusha for centuries. Yet, there are still cultural differences. These differences have made an impact on the environment, the people and the agricultural system.

3.10 - Ethnic Conflict

Amazingly in Monduli, and throughout Tanzania, there has been little evidence of major physical conflicts over changing land-use.[14] Given the many villagization schemes, which involved mass migrations of people, and in Monduli and Ngorongoro Districts, the movement of Warusha into traditional Maasai lands by government order, the historically aggressive Maasai have been amazingly passive. There have also been numerous times that Maasai have been told to leave their traditional lands, which were made into wildlife parks (Homewood and Rodgers 1991, Brockington 1998, Igoe 2000). While these were not easy issues for the Maasai to deal with, they more or less peacefully moved on.

In the past the Maasai have been repressed, when they arose to defend their land. The Maasai realize that they are now governed by a nation, with police power over most of their activities, particularly when these might threaten the security and peace of the nation. Their

[14] While writing this dissertation, there was an uprising among the Maasai of the Morogoro Region, Kilosa District, in retaliation for the killing of two of their tribesman and 35 cows. The clash was over grazing areas that had been taken over by agriculturists. The social conflict had been ongoing for a number of years, as there is no clear demarcation between agricultural and pastoral land. The fighting left 29 dead and another 24 seriously wounded. Other than this incident there have been few violent conflicts, but Mfugale (2000) says this type of conflict is frequently seen between Maasai and agriculturists in other areas of Tanzania.

tolerance in part may have been due to the work of Tanzania's first president Julius Nyerere. They are still feared by the Pare and other tribes who say they continue to raid their cattle, but they are not feared as they were in the past. Despite Nyerere's many economic and political mistakes, his legacy of peaceful coexistence continues to this day.

Having worked with the Karamojong, in Uganda, I have seen what pastoralists can do when motivated by violence and threats. They are pastoral people who are truly feared by others. They carry guns in the field when grazing cattle or goats. They maintain their strong presence in Northern Uganda, which even Idi Amin found nearly impossible to rule in the 1970's. To this day, other ethnic groups often steer clear of Karamoja. When tribes like the Karamojong or their rivals are out of their traditional areas, the racial conflict escalates easily and quickly. It goes well beyond racial jokes and quiet antagonism seen when Maasai and *Mswahili* (Non-Maasai Swahili speakers) gather in Tanzania. The Maasai have a much more low key conflict over land, with the WaArusha and other tribes, yet there is conflict (UN 2000a, Mufgale 2000).

The WaArusha have moved into Maasai traditional grazing areas like Mswakini Makuyuni, Mbuyuni, Mswakini, Lashaine, Monduli Juu, and Lolkisale (see Figure 3.1). In most cases the more pastoral Maasai were not living there, but only using these areas for grazing. It was easy land for the government to grab and allocate to others like the WaArusha, because under Tanzania's customary land tenure, you have to be physically using land to claim it as your own.[15] Thus under Maasai customs of grazing and communal land use, the loss of land was something they had little control over legally. In places where overgrazing is now severe, pastoralists have simply migrated to less populated areas as a solution. The danger is that land degradation is simply exported to other areas. (Bagacwha et

[15] This issue we will explore in great depth later, as it has become key to the land loss among the Maasai, and continues to be a major problem.

al. 1995). In the case of my study this meant the Maasai have left areas like Mbuyuni, Mswakini, and Lolkisale, leaving these areas to the WaArusha, rather than trying to coexist with them. Many Maasai have moved to other areas like Simanjiro, where Maasai agriculture is expanding rapidly (Lama 1998, Igoe 2000).

The relationship between the Maasai and WaArusha in the lower Monduli district is one that frequently involves antagonism, ethnic jokes, and animated discussions about each other. The Maasai, in general, do not readily cooperate with the WaArusha. They are relatively cordial in markets, towns and on public transportation, but the Maasai are still often seen as backward and too conservative by the WaArusha (Ole Kuney 1994), even though the WaArusha often dress the same and live the same lifestyle. However, the Maasai see themselves as superior to the WaArusha, based on perceived physical and behavioral characteristics, attitudes, competencies especially when it comes to livestock, as well as interests and customs (Ole Kuney 1994, Sakita 2000). For example, in the weekly cattle markets, the Maasai would make jokes about the WaArusha, and their small cattle, because they did not know how to find good grass for them.

There is now a trend for Maasai to educate at least some of their sons. This is being done in part to try to overcome the problems they have had in the past with little government representation, due to a lack of education. While visiting numerous Maasai bomas, the well-educated son would frequently come out to talk. Sometimes depending on the age of the *Mwenye Boma* (The Senior Man or Father) this might be a teenage boy, in other cases it turned out to be a well dressed professional, who happened to be at home.

The WaArusha have always been more keen on politics and getting representation in local and national government (Ole Kuney 1994). Today there are NGO's like *Inyuuat-e-Maa*, a Maasai development organization based in Arusha, that is trying to educate Maasai and other pastoralists, about the importance of land use plans, and legalizing their claims to

grazing lands. One of Inyuat-e-Maa's goals is to help Maasai try to take care of their land, that is still under their control (Igoe 2000, Sakita 2000). Through representation and zonal coordinators they try to encourage land-use planning, by designating places for grazing and agricultural activities, and having land use plans officially documented. The hope of groups like Inyuaat-e-Maa is to maintain the cultural values and land of the Maasai, while at the same time having them become true participants in their own governance.

3.11 – Summary

The Kisongo Maasai were the primary focus of my research, within the confines of my research area. Understanding the Maasai is important in the context of this study. I have highlighted only a small portion of the cultural practices and ideas, but these are important as the Maasai are different (and often misunderstood) compared to other nearby ethnic groups. The WaArusha have moved to traditional Maasai areas in Monduli over the last 40 years. They brought with them many of their agricultural practices, but at the same time integrated easily into the area, as they are related to the Maasai, dressing in a similar fashion, and speaking the same language. The Maasai have changed in this same time period, adopting many of the WaArusha agricultural practices, including growing crops with the use of oxen. To the casual observer, the WaArusha appear to be Maasai. However, to the Maasai, this expansion of the WaArusha people has brought many changes, including some radical changes to their landscape. This cultural phenomenon, the adoption of foreign technology (oxen in this case), and expansion of agriculture, is in many ways the basis for land use change and conflict in this area of Tanzania. It has many ramifications within the confines of this case study.

CHAPTER 4

RESEARCH METHODS

4.1 - Introduction

In order to answer the original questions presented in Chapter 1 (page 18), I chose a case study approach. This work was a case study of the Maasai and WaArusha of the Southern part of the Monduli district, traditionally known among the Maasai as *"Kisongo"*(see Figure 4.1). My intention was to document, at one period in time, the people (specifically the agropastoral Maasai and WaArusha), their agriculture, their use and adoption of oxen, and also the environmental impact of their adoption of agriculture in an area that may be largely ill suited to such endeavors.[1] The case study developed largely into a study of the sustainability of the agricultural system most common in Southern Monduli district. This chapter will describe how the concepts of sustainability were put together into a list of indicators of farm system sustainabiliy (see Figure 4.3 and Table 4.1). These indicators were used to develop the questions asked in the field.

This chapter also describes the development of my research methodology, and how this methodology was put to work in the field gathering data. I describe sampling in 27 sub-villages, how interviewees were selected, and how the interviews were conducted.

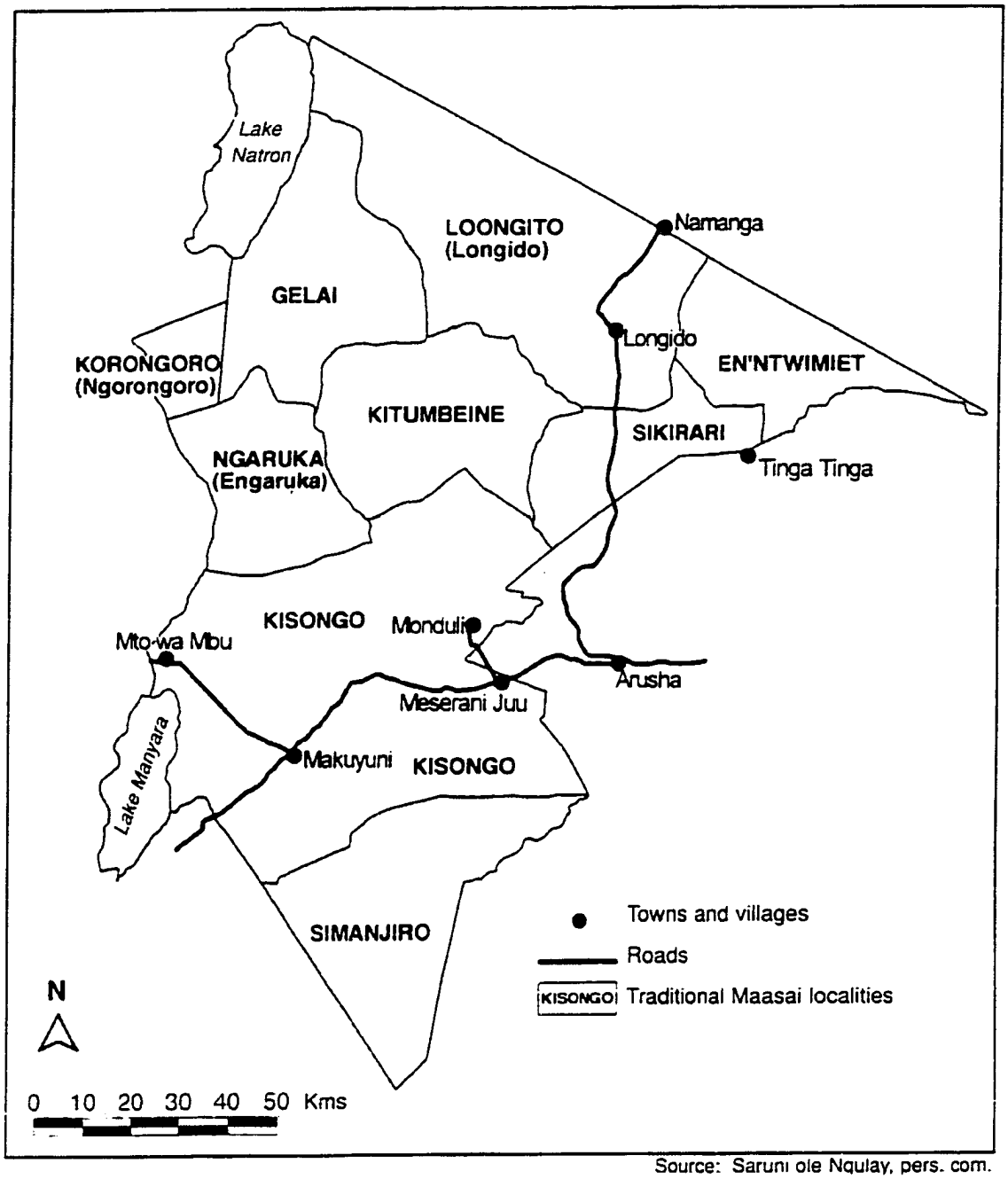
Most of the rural inhabitants of this research area are now agro-pastoralists. This has not always been the case. In the past this was the home of the largely pastoral Maasai. As

stated in Chapter 2 and Chapter 3, this traditional Maasai land base has long been a common resource to all Maasai residents in the region. The land has had the dual function of acting as a buffer zone between agriculturists, as well as, providing for the wildlife and pastoralists, both in their pursuit of adequate grass and water. Agricultural encroachment and Maasai adoption of agriculture, is now (and according to Saitoti (1978) has been) an area of conflict and concern for both the native people and the many tourists that frequent the area.

Times have changed. There have been many changes to the environment. As crop growing has expanded, it has led to environmental degradation. Therefore, this also developed into a study of the conflicts that have arisen from this adoption of agriculture in an area that has been communally controlled and largely used as grazing areas for the Maasai. The semi-structured intereview format described in this chapter, was an appropriate research technique to assist in documenting how agriculture has led to conflicts between people, their livestock and the wildlife that compete for an ever-shrinking land base.

Finally, this chapter describes how the data were evaluated and used to present this case study. Each of the subsequent chapters in this dissertation, help answer the questions put forth in both Chapter 1, and in Table 4.1, with regard to the sustainability of this agricultural system.

[1] Barrow (1997:84) calls this an Integrated Regional Environmental Assessment.



Source: Saruni ole Ngulay, pers. com.

Figure 4.1 – Traditional Maasai Localities

From Meindertsma and Kessler (1997)

4.2 - Developing My Research Methodology

My development of a methodology and techniques to carry out an assessment on the use of animal traction by the Maasai could not follow any one path of previous researchers. This project, on its surface, was similar to the work of many other non-Tanzanian researchers that have conducted surveys in Tanzanian agricultural development settings (Kjaerby 1979 & 1983, Mothander et al. 1989, Birch-Thomsen 1993). This project also required combinations of techniques due to the unique nature of this project, the region, and the people involved. This is typical in designing impact assessments (Branch et al. 1984, Barrow 1997). I was not trying to gather, as Scoones (1995) said "*complete information*". I knew my understanding of the people, the region and pastoral development was limited at the onset of my research. Instead, I was trying to lay the groundwork for "*a learning process*" that might offer some feedback to others for Maasai development in the future, particularly in the Monduli District with regard to their agro-pastoral development challenges.

As an example, Barrow (1997:17) made the statement,

> *"If two case studies of similar conceptual approach were selected at random, it is highly unlikely that they would share more than general similarities in method."*

I searched the literature for a clear and well-defined way to do the research. There was no one method that I could simply adopt and put to work. I had no one in the field to guide me by the hand. I could not find anyone who had done exactly what I was attempting to do. Furthermore, like Barrow's statement above, given the differences in budgets, political climates, and geographic challenges, anyone doing field work in developing nations has to be willing to adapt the ideal methods to those that will work in the field.

The method I initially chose for my work, in 1996 and 1998 was a Rapid Rural Appraisal (RRA)[2]. This part of my research I refer to as Phase 1, as it was a period of learning about the region, the people and examining the possibilities for research. The RRA method has its shortcomings, namely limited time with each respondent (Lindberg 1996), and the lack of detail that might be gathered with more ethnographic methods. It is based largely on interviews and informal observation, involving usually only one visit per household (Upton 1986). However, without this component, it would have been nearly impossible to plan the second stage of my research, where I gathered the bulk of the information for this work. It was in part a training exercise for me, but did yield a great deal of informal data, which allowed me to refine my questions and ideas for further study.

4.2.1 - Research Overview

My sequence of field research techniques or methodology was as follows, In 1996, I conducted a scoping study, meeting the people and traveling to the region. My objectives were to meet my research contacts, set the stage for getting the necessary research clearance in Tanzania, and visit some farmers using oxen. Returning to the University of New Hampshire, I followed this with some background research on the people, the region, and the policies that impact them. I narrowed down where I wanted to work and with what people. The 1996 research scoping was integrated into the 1998 field exercise, in order to come up with objectives and boundaries for the study. I also needed this time to refine my approach, determine the need for additional assistance and come up with a budget. This did not really involve any formal data collection, but rather observations and development of my ideas the remainder of my study.

[2] The Rapid Rural Appraisal is a form of field investigation common to many development projects and research in third world agricultural settings. Compared to the Participatory Rural Appraisal, it is said to be more "extractive" (Lindblade 1997). This method is largely based on interviews and informal observation, its costs are low, as it often involves only one visit to a household (Upton 1986).

4.2.2 - Scoping/Pilot Study – Beginning of Phase 1

In order to develop a methodology that would work in evaluating the impact of animal traction technology, a pilot study or scoping study was the logical first step. As mentioned earlier, the RRA was employed to explore ecological and socio-economic concepts of draft animal use in Tanzania in 1996. My objectives were to find an area where I could conduct research on the use and impact of oxen, with people that were relatively new adopters of this technology. This was largely qualitative in nature, whereby the background issues, local perspectives and the local environment were examined with key informants, such as NGO leaders, leading Tanzanian scientists, extension officers and small farmers. I tried to consider not only the farming system, but also the household, regional, national, and even global factors that were likely to affect the communities and the people that had adopted oxen.

After my initial scoping study in 1996, I decided that Northeast Tanzania was where I would conduct my research. I spent much of 1997 trying to learn the language and to understand the context within which the people lived and had lived in the study area. This became largely an analysis of historical changes related to agriculture and the environment in the region. The majority of this historical analysis was done outside my fieldwork in Tanzania. However, this was critical to the project and giving me an understanding of how I might proceed, when I returned to the field in 1998.

4.2.3 - Initial Field Research

The second part of Phase 1 of the project was again largely qualitative in nature, following the RRA technique. My goal was to refine my ideas, my research area, and understand the more complex background issues, local perspectives and the local environment. In 1998 this occurred through visits with local extension agents, agricultural

leaders, NGO leaders and village representatives once appropriate villages had been selected in both Arumeru and Monduli Districts. [3] This was done largely through the help of a local research assistant, as described in Chapter 1. The qualitative portion began with the initial visits with key informants and village leaders. Open-ended informal questions, as well as, rural village walks helped me evaluate village farming systems, examine rural priorities and trends, including the challenges and aspirations of farmers and agriculturists. I kept a notebook detailing both the informal interviews and my observations. Like Heyer (1993), I found these notes to be very helpful, but very tedious to pull together, in order to see trends. This initial field research utilized techniques similar to studies done in Tanzania by Mothander et al. (1989)[4], Starkey and Mutagubya (1992)[5] and those outlined by the Ghirotti (1993)[6] in conducting exploratory agricultural research (rapid appraisals) in African nations.

However, given the fluid nature of the field research in early 1998, my research objectives began to change. I decided the study of the impact of oxen on agricultural biodiversity alone (which had been proposed as my original study topic) was likely not relevant, at least in the way I was approaching it.[7] Thus in the midst of the 1998 research, I decided the Maasai adoption of oxen and its impact on the farm and local land-use patterns would be the focus of the rest of my study.

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[3] My scoping study in 1996 included regions, which I ended up not choosing as potential research sites, including the Tanga and Dodoma regions.

[4] These authors conducted rapid rural appraisals with farmers to evaluate and get a sense of the use and availability of animal drawn farm implements. They recognized the shortfalls of their methodology, but their study would not have been conducted as a large scale survey.

[5] These authors interviewed 65 people, in many of the same regions I visited in 1996, including Tanga, Kilimanjaro, Morogoro, Dodoma, and Arusha regions, in the same time frame of a few weeks. This was done in order to interview key informants and get a sense of the issues facing animal traction based agriculture in Tanzania.

[6] Ghirotti discusses the Rapid Appraisal technique as a cost effective research method to compliment veterinary science in order to explore, monitor and frame the problems of livestock development with pastoralists in Ethiopia.

[7] I had hoped to study the loss of biodiversity with regard to breeds of livestock and crops, but with the agropastoralists, they fully recognized the value of their local breeds and there was no danger of them being replaced by more modern genetics. The same largely held true for crops, as most farmers simply kept their own seeds, and essentially had their own selection process.

Early in 1998, I had identified numerous intervening variables that seemed to be intertwined with the adoption and use of oxen. These included politics, land tenure, economics, population growth, weather, geography, and culture, all of which seemed to be impacting both the adoption and use of oxen and the sustainability of the agricultural system in general. All of these have had a large impact on what is happening on the ground in Monduli, as will be explained later. Many researchers have previously pointed out in Tanzania, that land degradation is less due to over population, than it is due to economics and socio-politics (Kjaerby 1983, Turner 1997, Graaf 1999, Igoe 2000), and in part I had to agree. Some of these components were added to the research conducted outside my time in Tanzania, between the field research in 1998 and 1999. This was due to limited time to conduct field research. [8]

Also in 1998, I learned where Maasai live in Monduli District. I wanted to know whether or not the environment in Monduli district is conducive to sedentary agriculture and to what degree the Maasai had adopted these sedentary practices. I also wanted to explore what the level of animal traction use was in the area. In the past, there has been a great deal of emphasis on controlling pastoralists and integrating them into agricultural systems that utilize a system of mixed livestock and crop farming (Rigby 1981, Ndagala 1990, Spear 1997). Current thinking, with regard to sustainable development, goes contrary to the previous plans to get Maasai to settle in one area (Okigbo 1990, Biggs and Farrington 1991, Sitarz 1994, Western 1997). Thus, from a standpoint of sustainability, I saw this evaluation was a very important one.

[8] As I had a full time teaching appointment, a farm and a family back in the United States.

Regardless of what planners and development specialists may want the pastoralists to do, it was obvious that the Maasai had their own agenda. I wanted to hear what their objectives were. I wanted to understand their opinions on agriculture and sedentarization.

Based on my own research, and later hunting down many new references, I learned that the Maasai in my research area are not really true pastoralists. They in fact practice a combination of pastoralism and crop farming (Spencer 1990, Spear 1993, Spear and Waller 1993, Spear 1997). This is not something completely new (as was explained in Chapter 3). The presence of the WaArusha people is a historical example that demonstrates that the Maasai have never been totally opposed to crop farming, when presented with reduced access to land, as well as, economic and population pressure (Spear & Nurse 1992, Spear 1997).

The presence of agro-pastoralism, as well as, the possible physical and climatic conditions making it sustainable, were good starting points for my research. These factors helped establish the basic requirements to evaluate whether draft animal technology will flourish at all. Once this point was established in the 1998 scoping survey, additional information about the economy, the physical geography of the region, and the relevant polices and previous experiences were gathered, in order to further refine the methodology. My work in 1998 was largely a test of possible questions to be used in the survey put forth to target audiences in 1999. To see a sample of both the questions and the general answers to these questions posed in 1998, see Appendix 2. In the field I was able to make adjustments as necessary, based on observations and what the obvious questions were or were not.

4.3 - Assessing Animal Traction's Impact on Maasai Culture and Agriculture

In early 1999, before the final stage of my research, I began searching for an appropriate design for evaluating the impact of the adoption of DAP on agriculture and the environment among the Maasai in Tanzania, I reflected on the indicators, of agricultural sustainability described later in this section. They are directly related to sustainability and are also important in trying to predict the impact of the introduction and use of a new technology. The environment in my study area, the Maasai people and their economies are not static. The people, the natural resources, the government policies, and even the climate can and will change. This change will impact the long term sustainability and use of the technology. It was important to incorporate as many potential factors impacted by the adoption of the technology. The impact of the technology cannot be viewed like a snapshot, as technological innovation can relate to virtually any aspect of life (Barrow 1997). My hope was that my study would document what is happening on the ground at this time, and help identify how the more unsustainable practices might be improved in the near future.

Ikerd et al. (1996:25) made the point,

> *" One cannot prove empirically that one agricultural system is sustainable and another is not. Such a conclusion requires certainty concerning the future, but the future is inherently uncertain. One can only conclude that according to current knowledge, a system is likely or unlikely to be sustainable."*

These ideas were central to my dissertation, as I was not trying to document without question whether or not the adoption of oxen and the related agricultural practices were sustainable. Instead, I was trying to examine the agricultural system, with a keen interest in the impact of oxen on how they might be impacting the sustainability of the agricultural system.

An assessment of technology examines whether or not equipment and techniques can work, including the assessment of the risks and impacts of using the technology. Assessments are necessary in order to inform decision-makers, clarify problems and identify opportunities. This can also perform an alerting function. Technology impacts can be a function of a number of factors – technology failure, operator failure, poor maintenance, poor design or training, inappropriate or unwanted social and economic consequences.

Technology assessment can help identify appropriate technology that may play a part in the quest for sustainable development, by identifying threats and promising development paths (Barrow 1997). In looking for an appropriate methodology a sort of integrated impact assessment seemed to be the best choice in this case. Barrow (1997) defines an integrated impact assessment as, "the study of the full range of ecological and socioeconomic consequences of an action". From his work it seemed that the best description of my proposed work was a case study, as an integrated regional environmental assessment. Barrow's (1997:84) integrated regional environmental assessment had the following objectives:

- *to provide a broad integrated perspective of a region about to undergo development*
- *to identify cumulative impacts from multiple developments in the region*
- *to help establish priorities for environmental protection*
- *to assess policy options*
- *to identify information gaps and research needs*

I wanted to learn all I could about this system to both inform me as a teacher of draft animal power, but also as a change agent in the environment. What lessons had the Maasai already learned? What were the impacts and needs of the people and the environment?

4.4 - Indicators of Sustainability

When the agricultural practices employed by the Maasai and WaArusha are compared to the many indicators of sustainability below, which put forth by Holmberg et al.

(1991) below, it was obvious to me through both my observations and research that most of these indicators have been violated.

Holmberg et al. (1991:14-15) Indicators of Sustainable Development:

1) *Replenishment of Soil Nutrients removed by crops.*
2) *Maintenance of soil physical structure*
3) *Constant or increasing levels of organic matter*
4) *No increase in acidity or toxicity*
5) *Constant or increasing soil depth*
6) *Minimal off-farm environmental contamination*
7) *Maintenance of habitat for pollinators, pest control agents and wildlife*
8) *Conservation of Genetic resources of crop and animal species farmed, and farmers having equitable access to genetic material.*
9) *Diversity of Species farmed on a given site and maximum nutrient transfer between the species.*
10) *Continual cover of soil by vegetation*
11) *High efficiency of water use, minimum from open water and sprays*

Social/Cultural Indicators of Sustainable Agriculture:

1) *Farmer plays a leading role in designing the farm system and choosing technologies, and these designs and technologies build carefully on the site characteristics and traditional husbandry techniques.*
2) *Farming and pastoral communities thrive, but not at the expense of the other communities*
3) *Non-agricultural employment is also available in agricultural areas.*

Output Indicators :

1) *Yields are reliably constant or increasing*
2) *Agriculture is profitable enough to secure adequate subsistence and income*
3) *Farmers are trying to optimize long term production*

Economic, Policy, and Institutional Indicators:

1) *Prices, grants, and subsidies encourage farmers to maximize long term productivity and resource conservation.*
2) *Extension, Research, Policies and Procedures emphasize the farm system and not just the individual commodities or enterprises. Integrated advice is offered to farmers.*
3) *Policies, plans and targets do not just emphasize output/unit area. Net economic benefit and sustainability should also be goals.*
4) *Regulations are in force that ensures farming causes little off farm contamination.*
5) *Land of the highest production potential is allocated to agriculture.*

6) *Where agriculture regularly produces surpluses, land is usefully retired to other productive uses and marginal land used for environmental conservation.*
7) *Financial assistance to farmers is not linked to specific commodities in a manner that discourages the best use of a region's ecological suitabilities. Rather than the price of chemicals being subsidized, the opposite is the case, their price incorporates environmental costs, "The polluter pays principle".*

This is not to say that there is no hope for agriculture or the people feeding themselves. However, the current situation in Monduli district indicates more of the same, as according to Meindertsma and Kessler (1997) the district is a net importer of food, especially in drought years. Therefore, there had to be a way to explore what the key problem areas were, and how oxen were impacting this change.

I found Holmberg's (1991) indicators could be directly applied to the Maasai agricultural system. The trend at this time is to increase the extensification of agriculture, at the cost of traditional pastoral areas (Meindertsma and Kessler 1997). This is not unlike what has been seen by others (Kjaerby 1983, Rugumamu 1995, Lama 1998, Turner 1997). Due to the apparent lack of rainfall in much of the region (National Environment Management Council 1993, Hatibu et al. 1995, Meindertsma and Kessler 1997), there seemed to be little hope for widespread adoption of more intensive methods, like those adopted by the nearby WaArusha, Meru and Chagga living on nearby Mt. Meru and Mt. Kilimanjaro respectively (Maro, 1975, Spear 1993 & 1997). The adoption of these well-known methods in theory might alleviate the conflicts and environmental degradation, which seem to be the norm at this time. However, the drylands that the Maasai occupy are not like the more mountainous areas and higher rainfall areas (Ole Saitoti 1978, Galaty 1994b). Yet, it would not be impossible to intensify the agricultural system, for there are numerous examples from other dry regions in Sub-Saharan Africa (Tiffen et al. 1994, Adams and Mortimore 1997, Balcet 1998) that have overcome such challenges. However, in Monduli district there will likely be

much suffering before such change is initiated. The suffering will likely be due to more overgrazing, more conflict over agricultural land, more erosion, and lower agricultural yields, before more intensive systems are adopted. Figure 4.2 below outlines how this process has often occurred in other cultures and areas in Africa.

For these reasons I decided to explore concepts of sustainability, in the context of a case study. I developed some simple indicators of agricultural sustainability that point to the challenges that are facing the Maasai and WaArusha of Monduli District. Indicators that may be helpful in the future in paving the way to more intensive and environmentally friendly methods of agricultural production. Both the concepts of sustainability and developing indicators of sustainability are important to a more sustainable agriculture among the Maasai and WaArusha of Monduli.

Developing indicators is likely the most controversial part of my research, as many institutions and individuals have done a great deal of research on indicators of sustainability. I did find a great deal of literature on indicators of sustainability (Hart 1998-1999, UN-DPCSD 1996-1997, IUCN 2000, IISD 2000).

Hart (1998-1999) wrote,

> *"An indicator is something that helps you understand where you are, which way you are going, and how far you are from where you want to be."*
> *"Indicators... point to areas where the links between the economy, environment and society are weak. They allow you to see where the problems areas are and help show a way to fix those problems."*

Similarly the IISD (2000) pointed out that, "*an indicator quantifies and simplifies phenomena and helps us understand complex realities.*" They also stated that a careful selection process is required, and that during this process, "*indicators are selected on the basis of context-specific conditions and general selection criteria.*"

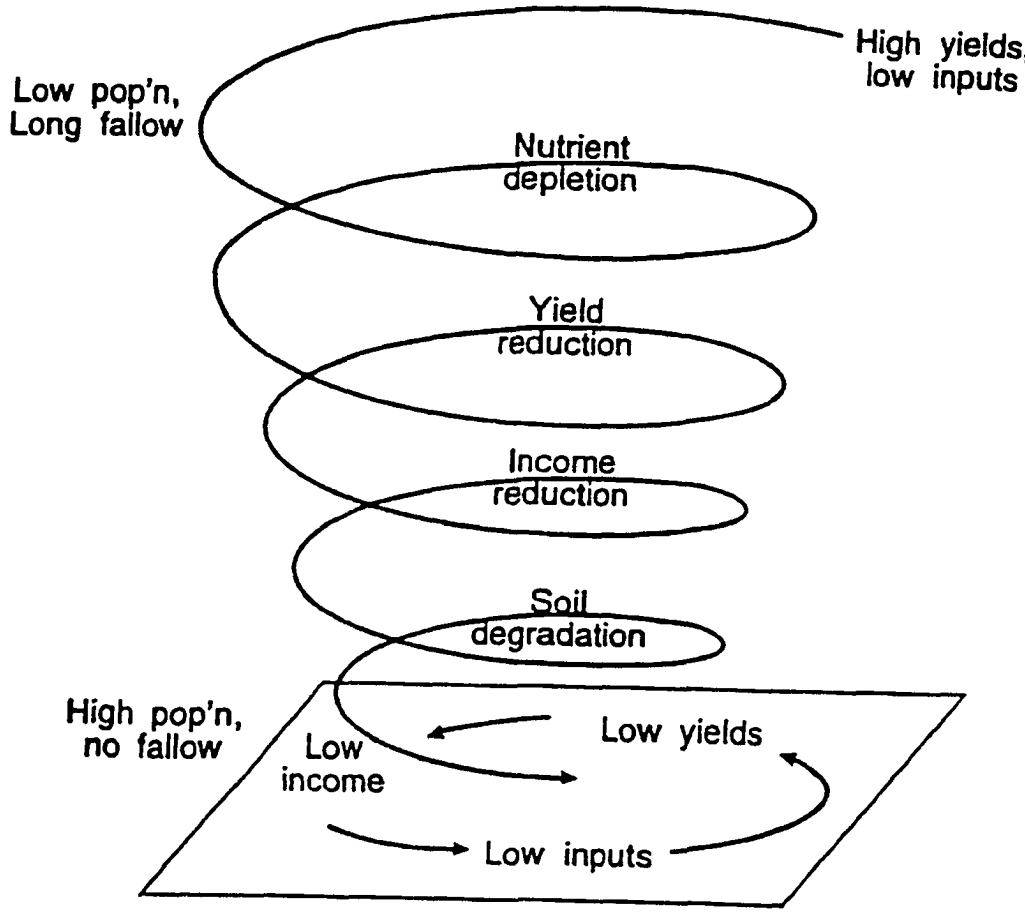

Figure 4.2 –The Poverty Trap or Spiral of Environmental Degradation
From: McCown et al. (1994)

The selection of indicators must therefore be established in such a way that they are the "best" indicators given the needs, circumstances and background of the people using them. For example, an indicator frequently used is the percent of arable land. This indicator has little relevance in indicating the biodiversity in a forest, or the condition of the soil, especially if the local people are going to use this to monitor their own behavior. Thus, the

use of indicators is of little consequence, if they are totally inappropriate for the system being evaluated. I wanted to evaluate Maasai agriculture and the use of oxen. There were no indicators of sustainability that could be found to evaluate this culture or this technology.

The ideas from Hart (1998-1999) and Holmberg et al. (1991), as well as, my own personal experience with draft animals in Africa were used in developing a list of "indicators" for evaluating the sustainability of animal traction technology in Sub-Saharan Africa. This list differs from indicators that might be used to measure sustainable development at a macro-level, with statistics such as the quality of life based on percents of the population that are literate or the percent that have access to health care. The 40 possible indicators listed below. These were generated as a way to determine the sustainability of the agricultural practices adopted by the Maasai and WaArusha agro-pastoralists. These indicators became my research questions.

While the challenges in acquiring data for each could be a huge undertaking, in a field research setting, answers to these indicator questions are easily incorporated into a semi-structured interview. These indicators could be used in any similar setting. The people, the natural resource base, the policies that impact their agricultural system, as well as the farm, crops and livestock will all impact animal traction adoption and use in a systems perspective.

As I began to think of possible indicators of the sustainability of an animal traction based agricultural system, I drew an ox, a plow, a field, and a farm on a piece of paper. Over the course of a number of days I jotted down many things that would impact this system, with arrows, boxes and notes (see Figure 4.3). The systems diagram idea I adapted from Vahaye et al. (1988 - p. 464), which used a causal diagram of the household subsystem and agricultural

production constraints of the Sukuma people[9]. This simple diagram outlined many of the issues I discussed with farmers in 1998 and it also contained many of the indicators of agricultural sustainability outlined in Holmberg et al. (1991) above. This became the basis for my survey and much of my research into the sustainability of the Maasai and WaArusha agro-pastoral system in my research area.

Developing a list of indicators of agricultural sustainability, could be considered the most controversial part of this research, as sustainability can be measured at different levels. I wanted to measure sustainability at the farming system level. I was not trying to determine sustainability of the people, or the nation. Therefore, according to Lynam and Herdt (1992:222),

> *"Sustainability is a relevant criterion for evaluating agricultural technologies only when a system using a technology has been well specified; and therefore the criterion cannot be applied above the farming system level."*

Many indicators of sustainability have been developed in the past. Mikkelsen (1995) description on using indicators compliment semi- structured interviews was particularly helpful. I have used a theoretical base to develop the list below (as described earlier in this chapter), but according to the IISD (2000), *"it is usually not the lack of possible measures hindering the evaluation of sustainability, but the overwhelming abundance of possible indicators."* This I certainly found to be true. As I examined my systems diagram (see Figure 4.3), in comparison to the Holmberg's (1991) indicators of sustainable agriculture, I came up with my own list of indicators (below) for use in this study.

[9] The Sukuma are an agropastoral tribe and Tanzania's largest ethnic group. The Maasai frequently commented on Sukuma that brought their cattle into the Arusha region for sale, and told me stories about their long-standing clash over cattle.

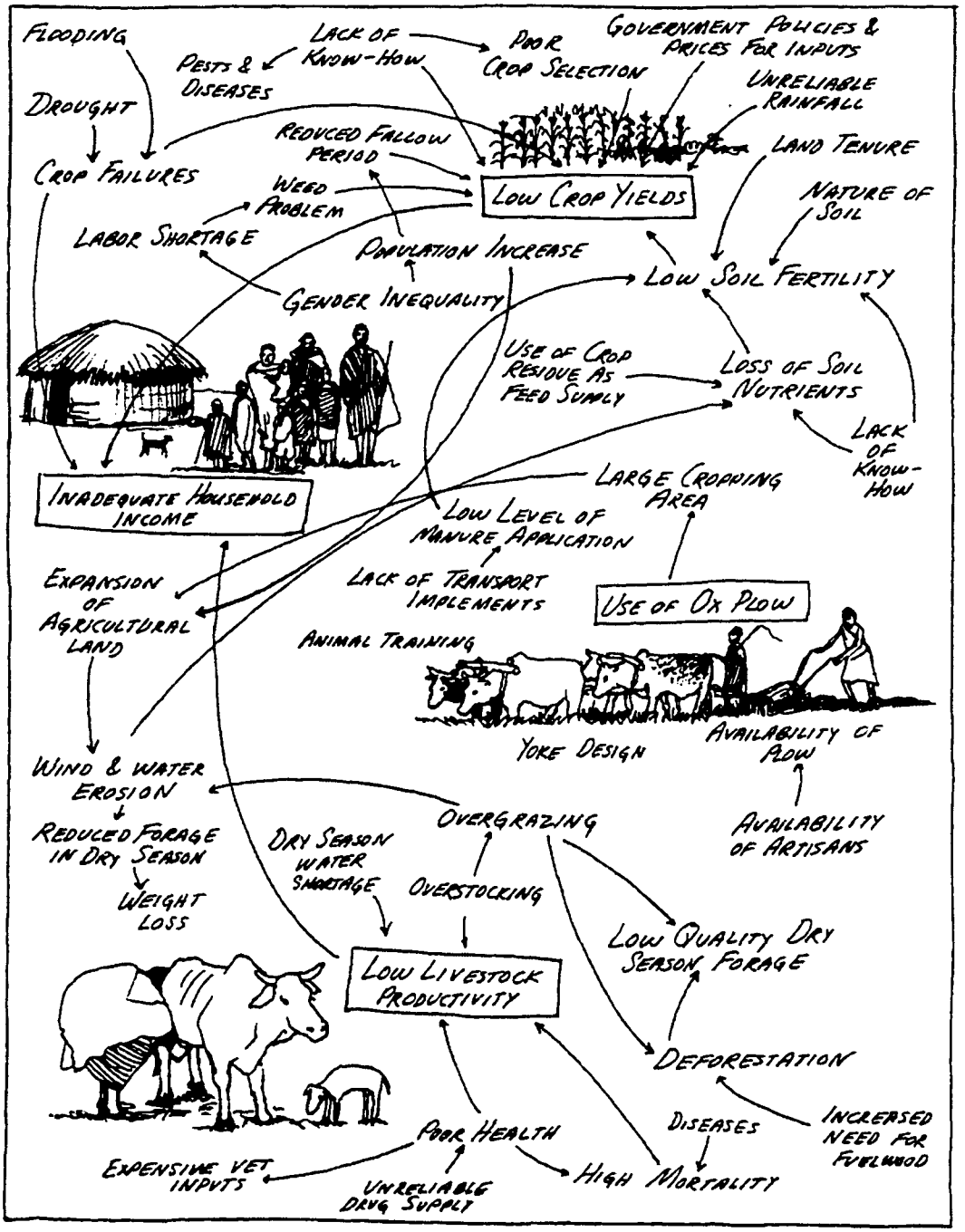

Figure 4.3 – Monduli Maasai Agricultural Systems Diagram

4.4.1 - Indicators of Maasai Agricultural Sustainability

Indicators for evaluating the sustainability of animal traction

People

- Local perception toward animal traction
- Indigenous knowledge
- Access to tools/artisans/equipment/spare parts
- Population pressure
- Access to economic opportunities off the farm
- Labor situation
- Relative wealth of the farmers
- Land Tenure situation
- History and Culture
- Access by women to capital, property or agricultural resources, including oxen

Institutions

- Current official policies toward animal traction
- Pricing and Marketing policies for agricultural products and inputs
- Basic transportation infrastructure
- Education – informal, extension, agricultural training for youth, rural networks
- Research – participatory, small farmer oriented, understands or recognizes
- cultural, economic or engineering constraints

Geography

- Rainfall – average annual rainfall
- Climate – growing season, temperature
- Land capability/potential – mountains (steep rocky slopes), midlands, lowlands
- Water – access to readily available water source
- Soil Types – limitations, fertility
- Proportion of ground cover
- Visible Soil erosion and gully formation

Farming System

- Presence of mixed crop and livestock
- Intensive systems –what crops are being grown, diversity
- Extensive systems – methods of clearing land, fallow periods
- Cropping system – monoculture, diversified, intercropping, rotations
- Presence of cattle
- Access to grazing areas, crop aftermath, local pasture
- Land-use/crop changes over time
- Average farm size

- Adoption of conservation tillage or other soil saving measures*
- Farming marginal areas
- Crop storage facilities/arrangements
- Fertilizer Use
- Pesticide Use
- Seed Selection – hybrid or local varieties
- Use of Manure and Organic Crops
- Adequate and Improving Agricultural Yields

Livestock

- Feed Availability (grazing, by-products, stored or harvested feed)
- Local disease challenges
- Access to veterinary care or supplies
- How long have draft animal been used
- How were draft animals introduced
- How are the animals used – just plowing or numerous activities

Given this list of possible indicators, I wanted to compare them to standards or criteria used for developing other indicators. According to Hart (1998-1999) and IISD (2000) the following criteria should be applied to determining whether the indicators proposed are appropriate to evaluate the agricultural system in question

- ***Policy Relevance*** – the indicator should be linked to some action component or policy that might be impacted by its adoption.
- ***Simplicity*** – the indicator must be easily understood by all interested parties and audiences.
- ***Validity*** – the indicator is believable and defensible using scientific measurement techniques.
- ***Availability of Affordable Data*** – expensive indicators are less likely to be used than cheaper indicators.
- ***Reliability*** – How reliable is the indicator if measured by others or only measured a few times

Using the list above, as criteria for the selection of "the best" indicators, I found eighteen of my originally proposed indicators easily meet all of the criteria. These included:

1) Local perception toward animal traction
2) Access to tools, artisans, equipment and spare parts
3) Land Tenure
4) Current policies toward animal traction

5) Pricing and marketing policies for agricultural products and inputs
6) Geography
7) Land capability and potential for agriculture
8) Presence of mixed crop and livestock systems of agriculture
9) Presence of cattle in the agricultural system
10) Prevalence of farming in marginal areas
11) By whom the draft animals were introduced
12) How the animals are currently being used.
13) Adequate and improving agricultural yields
14) Access by women to capital, property or agricultural resources, including oxen*
15) Access to labor and off farm income
16) Visible Soil erosion and gully formation
17) Adoption of pesticides and commercial fertilizer
18) Seed Selection – hybrid or local varieties*

The most sensitive indicators of the sustainability of the animal traction based agricultural system seemed to be; the local perception toward animal traction, access to tools etc., the geography, the presence of cattle, and the prevalence of farming in marginal areas, soil erosion and gully formation and adequate and improving yields (Okigbo 1993, Rempel 1993, Mwalyosi1993, Kessaba 1993). The other indicators would be less likely to indicate small changes in the sustainability of the system, but their use would nevertheless be important to determining its sustainability in the planning or implementation stages of this technology.

The selection of this short list includes indicators that could be easily measured and understood by others. However, it does not provide the detail and background that the more comprehensive list could provide. Therefore, in conducting my interviews in 1999, which provided the bulk of my data for this case study, I actually used the majority of the items in

the larger list for making my data collection and final comparison and analysis, presented in Chapters 7, 8 & 9.

4.4.2 – Indicators of Maasai Agricultural Sustainability in the Framework of Agenda 21

The list of indicators above is not a random list of indicators developed by a researcher in isolation. As described throughout this chapter, I developed this list after much thought, reading, and discussion. As another way of evaluating the indicators I developed, I compared them to the indicators of sustainability developed by the men and women involved in the Earth Summit, in Rio de Janeiro, in 1992, who presented their work as the document known as AGENDA 21[10] (Sitarz 1994). Many indicators they proposed directly related to my work and gave me the confidence that my use of indicators was an appropriate way to evaluate an agricultural system.

For example, the United Nations Commission on Sustainable Development (UN-DPCSD) has worked on generating numerous indicators of sustainability. This list includes economic indicators, social indicators, environmental indicators, and policy or institutional indicators. Their specific indicators are listed under these categories. In their methodology sheets the UN-DPCSD has provided ample information on the use of specific indicators, their relation to other indicators, and their limitations (UN-DPCSD 1997-1998). I found their list particularly interesting, as a number of indicators mentioned in my proposed list above were also found on the UN list of "best" indicators for determining the sustainability of land use and agricultural practices. This is not a result of me using their idea, as these ideas were found after I began my research in 1998. In fact, the use of pesticides, the use of fertilizers,

[10] This document was adopted by nations representing 98% of the Earth's population, and was developed as a plan to confront and hopefully overcome the ecological and economic problems facing much of the world. It highlights many of the areas in my own research, as critical areas for research and action.

the use of manure, changes in land use, changes in the condition of the land, and education were all items I initially included in my own 1998 survey of farmers in Tanzania.

Indicators, as mentioned previously, are numerous and must be adapted to the population using them and the system being evaluated. The UN committees that worked on developing the indicators for Agenda 21, certainly put more time and evaluation into their work than I have in this research. Finding indicators I have already used, was encouraging, as the indicators I initially chose in Tanzania were commonly used to evaluate other agricultural systems. According to the UN-DPCSD (1997-1998), information about land use relates directly to Chapter 10, in Agenda 21, requiring a more integrated approach to planning and management of land resources. The use of pesticides and fertilizer directly addresses the issue of promoting sustainable agriculture and rural development in Chapter 14, Agenda 21, where it calls for a reduction of pesticide use and more judicious use of agricultural fertilizers. The education of farmers and their children by formal or informal methods is also directly addressed in Agenda 21, in the chapter on improving the quality of life. Education at all levels and in sustainable agriculture is especially important in rural areas.

Included on my list was the need to understand and recognize indigenous knowledge. Through direct participation in the research and participant observation I was beginning to understand indigenous knowledge. With the UN-DPCSD describing the need for more documentation of indigenous knowledge, this adds credence to my description of the Maasai people in my research area in Chapter 3, and my data presented in later chapters will add more to this body of knowledge. Although, authors like Western (1997), certainly have far more experience in this regard, his work outside Amboseli National Park in Kenya, mentions only agriculture, not the oxen that allow agriculture to rapidly expand. Thus cultural knowledge and understanding is often limited to what the particular researcher is interested in, so taking a new perspective only adds to what we think we already know.

In my study the presence of oxen, has become in part an indicator that something was wrong with the pastoral system in the lower part of Monduli District. The traditional pastoral model of agricultural development has changed in my research area. The adoption of draft animal power is not inherently bad, as will be described in Chapter 7. Beyond indicating that the pastoral system is failing, it does recognize some important agricultural development changes are taking place. For example, animal traction use is a both a locally available and renewable energy source. It can be a key to reducing the drudgery of women and improving their social status. It also allows people more time to develop their skills and local industries. As a new source of power, it can offer a more equitable distribution of the workload.

This important aspect of animal traction, was not directly addressed in my list of indicators. Yet it offers insight into the evaluation of achievements toward sustainability. Both alleviating the drudgery of women and allowing more people to develop alternative skills and industries are also addressed in Agenda 21, in Chapter 7 on improving the quality of life in more sustainable human development. Also with regard to Chapter 12 is the call for the establishment of mechanisms to ensure that land users particularly women, pastoral and nomadic groups maintain or improve their access to property rights are the main actors in implementing land use change. Thus my list was short on recognizing pastoral and nomadic groups (but my field research in Tanzania with the Maasai was not).

In Agenda 21, there is a call for more efficient use of the Earth's natural resources. In this area there are a number of items that are related to animal traction that I also included in my list of indicators. Land tenure is likely one of the most important issues. People have to be given secure land tenure before they more they will invest for the long term in their resource base (Raikes 1986, Galaty 1994, Sinclair and Arcese 1995, Dejene et al. 1997, Ndagala 1998). Other important items are the cropping system employed and the transfer of

successful and appropriate technology. Agenda 21 also calls for the need for more efficient agricultural production and the need for more intensification. The use of animal traction can certainly be used in this charge. I tried to explore these concepts and ideas in my interviews with Maasai and WaArusha farmers.

During Phase I of my research in 1998, my list lacked Agenda 21 items such as the importance of adequate agricultural production and food security. These are appropriate indicators that are a basic necessity of any agricultural system. In 1999, rather than try to quantify yields over time, which would be difficult in any ethnic situation given my time constraints, I chose instead to ask whether yields were increasing or decreasing. Data on national production levels, could be used as an indicator of yields for the nation. However, those found at the national and local level would be difficult to apply to a specific ethnic group. I found that most farmers easily provided evidence about the increasing or decreasing yields they were experiencing. I chose this path of exploring yields, rather than trying to decipher exact yields from scanty data or poor recollection. The farmers interviewed had a excellent recollection of good and bad crop years, based on food security and the increase in their herds and flocks due to good cash flow from crop sales. They also had a good sense of how crops production was decreasing, which will be explained in Chapter 8.

Finally, the sustainability of animal traction largely depends on using local animals that are adapted to the local conditions. Not only does this provide additional security in terms of animal health and well being, with minimum inputs, it also aids in the protection of indigenous breeds of cattle. Thus the use of indigenous breeds of cattle and livestock, and the presence of imported breeds became an indicator of sustainability as well.

The sustainability of animal traction seems possible for people that have access to land, cattle and adequate resources to capitalize on the technology. Animal traction can help them meet many of the activities recommended by Agenda 21. However, Animal traction is

not a benign technology. It like any other resource must be managed in ways that are consistent with the idea of sustainability. It seems to be human nature to push all systems they manage to the extreme. The indicators of sustainability of agriculture and animal traction are simply gauges to try to determine the path that has been followed and the impacts it is having on the farming system.

4.5 - Methods of Measuring Indicators Agricultural Sustainability

My choice of methods to measure the indicators was based on experience and an understanding of the people and governmental institutions in Tanzania. My case study was largely qualitative in nature and relied on the answers to questions I posed to the people. The indicators could be categorized by the system component, and the location of this data where indicators were measured (see Table 4.1). This was especially true with regard to the farming system , the environment and livestock. I chose not to research available data in government and regional offices on agriculture and livestock because these reflect only regional trends (which are not always entirely accurate), not the ethnic groups I was studying or their agricultural system. The indicators in the category of Institutions I could find easily in published sources. The same was true for most of the indicators in the category of Geography. The only exceptions were visible soil and gully erosion, as well as, proportion of ground cover. These categories I did not try to quantify, as it was outside the realm of time and expertise I had to devote to this. My qualitative sense of the situation is in my descriptions of villages and my land use cross section in Chapter 5. To quantify this data would likely take the time and effort of another major project.

Table 4.1

Table of Indicators Developed for Assessing the Sustainability Maasai Agriculture

Location	System Component Measured	Indicator	Variables Measured
Village	People	Local Perception of DAP	Good or Bad
Village	People	Indigenous Knowledge	Special Skills
Village	People	Access to Tools etc.	Yes or No
District	People	Population Pressure	High or Low
District/Region	People	Access to Jobs/Labor	Yes/No
Household	People	Relative Wealth	High, Medium, Low
Village/District	People	Land Tenure	Secure/Insecure/Unknown
Household/Village	People	History/Culture	Pastoralism vs Agriculture
Household/Village	People	Women opportunities	Yes/No/Some
National	Institutions	Animal Traction Policies	Pro/Con
National	Institutions	Prices/Marketing	Controlled/Free Market
National	Institutions	Transport Infrastructure	Good, Poor, Nonexistent
National	Institutions	Education	Schools, extension, NGO's
National	Institutions	Research	Participatory or Not
District	Geography	Rainfall	Millimeters/year – drought
District	Geography	Climate	Temp,
District/Village	Geography	Land Capability/Potential	Physical Geography/Elev.
District/Village	Geography	Water Availability	Irrigation, Ponds, Seasonal
Village	Geography	Soil Types	General Soil Characteristic
Village	Geography	Proportion Ground Cover	Bare soil vs. Grass cover
Village	Geography	Soil/Gully Erosion	Visible Erosion
Village/Household	Farming System	Cropping System	Intensive vs. Extensive
Village/Household	Farming System	Mixed Crop/Livestock	Yes/No – livestock types
Village/Household	Farming System	Intensive Agriculture	Crops, Rotation, Inputs
Village/Household	Farming System	Extensive Agriculture	Land Clearing, Fallow sys.
Village/Household	Farming System	Cattle & Other Livestock	Ownership vs. Use
Village/Household	Farming System	Grazing Area(s)	Common, Reserve, Crops
Village/ Household	Farming System	Land Use Change	Pasture vs. Crop Type
Household	Farming System	Farm size	Hectares
Household	Farming System	Soil Conservation	Adoption or Not
Village/Household	Farming System	Farming Marginal Areas	Semi-Arid vs. Subhumid
Village/Household	Farming System	Crop Storage	Type or Arrangement
Household	Farming System	Commercial Fertilizer Use	Yes or No
Household	Farming System	Pesticide Use	Yes (on what?) or No
Household	Farming System	Seed Selection	Hybrid or Local Varieties
Household	Farming System	Manure/Organic Crops	Adoption or Not
Household	Farming System	Yields	Increasing or Decreasing
Household	Livestock	Forage/Feed	Availability/Type
Village/Household	Livestock	Disease problems	Type and Severity
Village/Household	Livestock	Access to Vet. Supplies	Medication Availability
Household	Livestock	Oxen	How Long Used
Household	Livestock	Oxen	Who Introduced Oxen?
Household	Livestock	Oxen	How Are Oxen Used?
Village/Household	Environment	Perception Local Environ.	Problems/Solutions?
Village/Household	Environment	Biodiversity	How has it changed?
Village/Household	Environment	Drought	How to deal with it?

Many African farmers are already using the practices that Goldman (1995:303) claims to be the "*prescription for sustainable agriculture*". These include: crop rotations, crop and livestock diversification, nutrient cycling, natural pest control, soil conservation, low input use (fertilizer, pesticides, and fossil fuel) and little irrigation.

In my own study I saw some sustainable practices, but most of these were not the norm, and would not have been included in government sources. Therefore, the use and adoption of animal traction should be done in a way that monitors how well indicators of sustainability are being followed. It requires looking closely at the agricultural system and the actions of the people. It is at the regional, district and village level that my proposed indicators might be most helpful. They can point to goals and indicators of local sustainability. To ignore such indicators that shed light on the long-term sustainability, in the hope of narrowing down a list of indicators is not what systems thinking should accomplish.

With regard to understanding pastoral development and change, Scoones (1995:6) said,

> *"No matter how much information is collected in a sensitive and differentiated manner, there is no way that all possible outcomes can be predicted or planned for. Rather than aim for complete information (elaborate, multi-variate surveys) prior to intervention, it is better to incrementally initiate a learning process that monitors experience and feeds back lessons."*

This case study is presented as part of a learning continuum. I have gathered data from the people that are living proof that what I describe is happening. I have used their own words, backed up with examples from other researchers and my own observations. I like Scoones above do not believe that all possible outcomes can be predicted. However, the only way to make improvements and offer suggestions in the future is to know what is going on now, and work toward improvement. The indicators I have developed could be used in the

future to again evaluate the Maasai agricultural system, in this area, in order to monitor its progress to or away from a more sustainable model.

4.6 Phase II - Gathering Data - 1999

My final step in the field was to gather data. This phase II stage involved two primary methods to gather data. Both participatory observation and semi-structured interviews using questionnaires (SEE APPENDIX 1) were used. The questionnaires were essential to make sure that each question related to my objectives outlined in the table above was answered [11] During this portion of the study the identification of impacts of draft animals and a field assessment took place. There were ample opportunities for the conversation to wander, but I always tried to have all my initial questions answered. This questionnaire included some demographic information, questions about the farming system and questions about the use of inputs such as manure, fertilizer, improved seeds, and the choice of primary and secondary cultivation techniques. There were also numerous open ended questions, these pertained mainly to the adoption of oxen, their perceived impact, and the general state of the farm and nearby environment.

This second phase was supposed to be the quantitative component of my research. I planned on using a non-experimental stratified sampling method in the Southern portion of Monduli district, with random sampling of farmers using draft animal power. Despite the original intention that this would provide largely quantitative data for this final component of the study, the qualitative answers and subjective nature of the interviews became the key components to the study. The challenges associated with trying to come up with a random sample in the field (described below), and the very nature of many of the interviews changed the second phase of the study. This I am sure is for the best, as the information gathered is

what the people are doing and thinking, rather than me objectively trying to figure out from a distance what is going on.

Because of local interest in this work, I will be eventually reporting back to many of those interviewed, as well as, the local leaders, with an outline of the outcome of this study and the potential impacts for their feedback. Not only do I want to do this out of courtesy to those interviewed, but this is also a suggested research technique for someone hoping to return to the area to do research (Branch 1984, Barrow 1997).

4.6.1 - Sampling

My sample of Maasai and WaArusha farmers, was selected from 10 villages. These included Arkatan, Esilalei, Engaruka, Lashaine, Lendikenya, Lolkisale, Losirwa, Mbuyuni, Mswakini, and Selela. I further divided the sample by making sure I sampled 4-5 bomas in each of the sub-villages, if there were sub-villages, with the exception of Lolkisale.[12] Thus I conducted interviews at *bomas* in a total of 27 sub-villages (see Table 4.2 below).

I had planned on getting a list of all the *Bomas*[13] in a main village and randomly choosing from that list. However, some sampling problems arose in 1999 while I was in the field. Villages (*kijiji* singular, *vijiji* plural in Swahili) in Tanzania are divided into sub-villages (*kitongoji* singular, *vitongoji* plural in Swahili), these are further divided into ten-cell groups (*kumi-kumi* in Swahili). This was largely a result of the villagization scheme in the 1970's. I thought this would make sampling villages and sub-villages, relatively easy. Prior to my 1999 field research this division of villages into sub-villages, was proposed as a way to stratify my sample.

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[11] In 1998 I learned an important lesson, totally informal interviews often end up far from the original questions, and both the people being interviewed and research assistants lose interest and focus, without some questions to keep the interview moving forward.

[12] Due to the severe rains in 1998, I was unable to get to Lolkisale despite many attempts. In 1999, Lolkisale was the last village I visited, and with deep regret I ran out of time to visit each of Lolkisale's numerous sub-villages.

[13] According to Lama (1998) the Swahili word boma, means compound or corral. The Maa word for the typical homestead is enkang, but outside strict Maasai areas, the word Boma is commonly used.

Table 4.2

Villages and Sub-villages Where Interviews Were Conducted

Village	Sub-village	Sub-village	Sub-village	Sub-village	Sub-village
1. Arkatan	Mti Moja	Nadosoito			
2. Engaruka	Eng. Chini	Engaruka Juu			
3. Esilalei	No formal sub-village divisions recognized in interviews				
4. Lashaine	Lashaine – *kitongoji*	Orkeswa	Orgoswa	Lordungiro	
5. Lendikenya	Arkaria	Oloodo Lakaria	Lendikenya *kitongoji*	Murandawa	Emuruguru Nanyokie
6. Lolkisale	Interviews in only Main Village – due to time constraints				
7. Losirwa	No formal sub-village divisions recognized in interviews				
8. Mbuyuni	Barabarani	Lambo	Lolerae	Naiti	Orkisimai
9. Mswakini	Mswakini Chini	Mswakini Juu	Mswakini Kati		
10. Selela	Nadosoito	Shuleni	Ranchii	Selela *kitongoji*	

Each of the villages has a leader called *mwenye kiti*. There are also other village administrators, such as the village treasurer, village executive officer, village council members. The *mwenye kiti* was always my first point of contact in each of the 10 villages. These meetings usually went very well, with regard to allowing me to interview residents. Sometimes it meant taking someone out for a beer later, but for the most part these meetings were helpful, enjoyable and presented no problems. The randomization of samples however, became somewhat troublesome, as many of the *mwenye kiti*, had no formal lists of all Maasai bomas, or were reluctant to openly share them.

In each of the *vitongoji* or sub-villages, the sub-village leaders were also called *mwenye kiti*. I had hoped that these sub-village leaders could provide me with a complete list of *bomas* in their *kitongoji*. However, these men usually had no written lists of the *bomas* in their subvillages, and would simply verbally tell me who they were. This sometimes became

an exercise in trying to drag out a sample, which I believe was impacted by the perception of who they thought I should visit. Since most of the agropastoralists I interviewed lived separately from the rest of the village in their own *vitongoji*, that was often some distance from the center of the village or even center of the sub-village, thus, proceeding without a name was always challenge. There were no roads or addresses to use to find them or choose them in a Western sense.

Finally, my last points of contact in the sub-villages were the *balozi* (ten cell leaders in Swahili). Most of the *balozi* were helpful in assisting me in finding *bomas* of people we chose at the village or sub-village level. They were also helpful in identifying whether the *bomas* represented different wealth categories based roughly on the number of livestock and the size of the cropping area. Yet, they had too few households under their leadership to help me randomize samples. Therefore, the greatest challenge became trying to generate a large enough list to randomly select people to interview. Due to these randomization constraints, the quantitative data generated using the villages and sub-villages as strata for use in a parametric test became extremely difficult given my time and financial constraints.

Despite these sampling challenges, I was able to get a representative sample, as the answers to questions posed in the interviews provided information, which could be backed up with other data from work done by researchers in the area (Meindertsma and Kessler 1997, Ndagala 1992a, 1992b, 1994, & 1996). My sample represents a broad range of farmers in each of the villages, and as pointed out by (Weiss 1994:23), this can be more important in qualitative studies than a random sample, by ensuring *"that our sample includes instances displaying significant variation"*.

Weiss (1994) also points out that you need to know in advance what the variation is that you are exploring and where the people are who display it. My work in 1998, helped pave the way for this understanding. My selection of farms in villages of various altitudes,

soil types, including farmers that use both tractors and oxen, displays the variation I saw throughout the district among the local agro-pastoralists. A review of Figures 5.1 and 5.5 shows the variation in both location and geography of the villages used in this study. Interviewing only Maasai and WaArusha farmers, I do not believe complete randomization would have yielded data any different from what I present later. Using 27 sub-villages, and the selection of a similar number of interviewees in each, also ensured that I covered as wide a geographic area within the villages as possible. Finally, the permission and assistance of the *Mwenye Kiti* was not only required in many villages, I do not believe I would have found the range or variation in farm size, crops grown and techniques employed, without their assistance.

The data from the interviews in 130 *bomas,* represent what is happening in those bomas. When I did not believe something, I asked to see it. When someone told me something far-fetched, I would try to determine if this was the truth. My research assistant and I would carefully observe the men and their family, sometimes revisiting them. We would also ask to see the fields. During interviews, humor, blatant dishonesty or anger was often plain to see. If this did not satisfy my curiosity in human nature, I or my research assistants would do some background work to check the facts. For example, one Maasai farmer who spoke fluent English told us he learned to speak English by reading newspapers. Of course we did not believe him. The driver of my vehicle took it upon himself to find out what the real story was. It turned out he had a university degree, and had been sent to jail for misusing project funds. It was something of which he was not very proud.

At every step I was checking and double checking anything that seemed remotely odd, distinctly different or questionable. I am not sure I would have trusted field workers or enumerators to do the same. Of course I cannot be sure every statement is entirely accurate, but there were very few answers to questions that were far-fetched or outside the norm of

what other men had told us. I believe I was successful in getting honest answers, because I was not asking difficult questions. I was straightforward in describing who I was and why I was interested in this topic. Finally, I was not asking personal questions that might put the men in uncomfortable situations if I failed to keep the interviewee's names anonymous. For example, I did not ask about livestock numbers (which can influence how they are taxed), I also did not ask about personal income or wealth. I was not prying in order to get information about yields, which would have likely been based on recollection, which by its very nature is always questionable. In the next section I will expand on the interview process, and how I worked to get answers that were believable.

4.6.2 - Interviews

The selection of people to interview seemed to work best at the village level, where a larger list could be generated. This allowed me to send a message out to the sub-villages, where I had planned on interviewing people we selected from this list. Most of the time this worked well, especially if my research assistants and I could forewarn the *balozi* of our intentions. Thus on certain days and at approximate times of the day, we would find the individual *boma* and interview the men who were often waiting for us. In a number of cases, the message was not delivered and the men were not at home. In these cases, which numbered about 20% of my sample, we simply went to the nearest *boma,* and asked if we might interview the residents of that *boma.* This portion of my study was more like the "opportunistic" strategy employed by McCabe et al. (1992), with their work near the Ngorongoro Conservation Area. This strategy usually worked, only in a very few instances were we turned down completely. This was most often due to the men having other plans, such as attending nearby livestock markets or male and female circumcision ceremonies that were common in the months we visited. Among those that initially turned us down, most apologized and told us to return another day.

I had originally proposed randomly sampling the farmers, this proved difficult as I will explain later. I had specifically set my objective to conduct interviews at 120 twenty *bomas* in 3 months. This estimate was based on what was accomplished in other studies done by non-Tanzanian graduate students conducting similar surveys in Tanzania (Birch-Thomsen 1993, Masawe 1992, and Kjaerby 1983), as well my own experience in the scoping studies in 1996 and 1998 in the region. Early on I thought this number of farms was quite optimistic, but I ended up conducting interviews at a total of 130 *bomas*. This sample represented 395 men at the 130 *bomas* visited. In almost all cases I interviewed the *mwenye boma* (head of the household). Interviewing the head of the household was culturally most acceptable, and it also meant that other adult men in the household usually joined in the interview. This accounts for the large number of men actually present at the interviews. However, realistically my sample was n=130, as the information provided by all of the men in any one interview were for that one particular *boma*. See Figure 4.4 (below) for an example of one of the larger interviews.

Group interviews were not what I had initially planned on, as I thought this might create problems. However, there were very few interruptions, and the expressions on the faces of the brothers and sons of the *mwenye boma* provided a great way to informally verify the answers. Sly smirks, a burst of laughter, or very serious and concerned faces, I jotted down next to the answers in my questionnaire. Lobulu and I discussed these later. Some of these smirks were due to illegal activities such as cattle rustling, killing wildlife in the crop fields or growing crops outside the village's prescribed crop growing areas. There were also comments about the need for better seeds, a water system, or medications for the cattle. These were specifically intended to steer me into writing this down, so that the men might benefit from what they considered *maendeleo* or development on their behalf. Sons sometimes corrected the size of the cropping area, because they often did the land

preparation, especially if the *mwenye boma* was old or ill. I genuinely considered the family group interview as an asset, not a liability. The only challenge was when non-family members were present. In a few cases, I had to ask to have a private interview, when the discussion would drift to ideas and information about someone else's farm.

Figure 4.4 – Interviewing Maasai men in One Boma in Lendikenya

Reviewing the data, this sampling technique provided a broad sample of large, medium and small farms. The cropping areas varied from 0.4 ha to 162 ha. The average size of the potential crop area for a *boma* was about 12 ha. I use the term potential area, because many of the farmers with greater than 8 ha, either left some of the land fallow, used it for grazing, or planted excess areas with some expected crop loss due to inadequate rains, wildlife damage or insect damage. [14] I also estimated size of livestock herd, as large or small, using the size of the corral as an indicator of type and number of livestock owned.[15]

[14] All interviewees used the term acres rather than hectares. So these figures have been converted to hectares.

The size of the farm was determined by asking each farmer how much land they had for growing crops. On many farms the fields were both viewed and examined. Measurements were taken using a both a hand held Global Positioning System (GPS) and by pacing the perimeters of the fields. In no cases were the estimates by the farmers far from my own measurements of the total cropping areas mentioned in the interviews.

The farmers had a good sense of how much seed they required to plant their fields and how many acres they had prepared, as they often hired tractors to initially break the sod, and this was done by paying per acre. This combined with hiring people to weed per acre and sometimes hiring people to plow with oxen on a per acre basis, were also a way to keep track of the size of fields growing crops. Finally, most of the villages allocated specific amounts of land for agriculture, usually only 2-5 acres. While most of the farmers admitted to expanding their cropping areas, the discussion about field size included fields, which were given to the man through customary land tenure, as well as, purchases and village allocation. While the acreage cited may have been an estimate, I do not think these estimates were far off.

This interview portion of my research was much more time consuming than the initial rural appraisal, yet tremendously rich in detail and first hand information. I required an interpreter throughout this component of the field research, as most of the farmers preferred to be interviewed in Maa, their native language. For the most part Lobulu Sakita was my interpreter and did an outstanding job of conducting the interviews, sometimes in three languages. The interviews were tape recorded, which allowed me to check on particularly

[15] Every boma be it WaArusha or Maasai had a corral (*kraal* in Swahili). The size of the corral at the primary home was an indicator of the type and number of livestock owned, because of the diameter and construction techniques. Very small corrals, in the vicinity of 2-3 meters generally found among WaArusha indicated smaller herds of sheep and goats and a minimum number of cattle. However, some Maasai corrals were 60 meters in diameter, with huge accumulations of dung, and very sturdy and high walls. These indicated much larger herds of cattle. Some of these large bomas also had separate corrals for sheep and goats. These were constructed with much lower walls. Arriving in the morning at some bomas, observation and informal counts verified my ideas. When inquiring about livestock, the Maasai with large herds were also more likely to have animals that had been

long answers or those that seemed to drift away from the main question. Each evening after conducting up to 5 interviews, Lobulu and I would review the interviews and the tapes.

One week that Lobulu was unavailable and I hired a local extension officer, Ngaai Suyaan. He was Maasai and originally from the Monduli district. He spent a day with Lobulu and I observing our interviews and the way the questions were posed and translated. His assistance in no way slowed down the work. His assistance, in fact, proved to be a great way to check Lobulu's translations and learn a few new things about the local flora, agricultural practices, as well as, crop and livestock diseases that Lobulu had difficulty translating.

Farmers were easily identified as users of oxen, as almost every farm in the research area was using oxen (as discussed in Chapter 7). Even those without oxen either hired or borrowed them and those with large tracts of land employed both tractors and oxen. These and other current agricultural trends will be discussed later in Chapters 7 and 8. The semi-structured interviews, posing open ended questions specifically addressed the size of the cropping area, and the agricultural inputs. These included the use of fertilizers, adoption of hybrid maize and other crops on the farm, as well as, problems and perceived changes in the environment and agricultural biodiversity over time (see Appendix 1 to review the questionnaire).

The location of each *boma* was documented using a hand held GPS [16]. This allowed the altitude to be measured. It also documented the position of each village and sub-village, and provided a record of the location of each *boma* and the crop fields they were using. This information will not be presented, in order to protect the identity of my respondents, however it is on file with the author for possible future collaborative study or reference.

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taken away by morani to distant pastures. This strategy was less commonly used by WaArusha with significantly smaller corrals.

[16] The location of the bomas will not be revealed in this dissertation, but the author has both an electronic record and a written record of the location of each boma.

Initially targeting 120 farmers, I hoped to interview 60 from each of the two major tribes (WaArusha and Maasai) in the in the Monduli district. I ended up interviewing 65 WaArusha bomas, and 62 Maasai bomas. The other three bomas could be considered outliers, but were extremely interesting from the perspective of the introduction of technology and gender issues. The first of these three outliers, was a Somalian farmer who had emigrated nearly 45 years earlier to Engaruka from Kenya. He and his family certainly looked different with much lighter skin, and their travels had impacted their early adoption of draft animal technology. The second was a Msonjo farmer who had moved to Engaruka 33 years earlier. He was also an early user of animal traction. The final outlier was one Maasai *boma* where we interviewed two women. One wife was a WaArusha and the other a Maasai. Their husband was not at home when we arrived, despite having received the message of our expected arrival. My interpreter that week was the local extension officer, who happened to be related to the husband. Two of the wives apologized for his not being available. Upon Ngaai's suggestion, they willingly allowed us to interview them. It was the most fascinating and revealing of all the interviews conducted in 1999.

In studying land-use change, ideally aerial surveys and satellite images to document change over time, would have been an additional tool to add possibly a more objective approach to my research. However, given my training and my limited funding, I will have to leave this to others or maybe a future project in collaboration with someone with these skills. I explored with people what they have seen as land use change. The WaArusha and Maasai in the research area live in almost identical *bomas*. Their ethnicity, their use of oxen, their perception of environmental change, land tenure issues, the perception of less rain over time, and poorer crop yields would not have been easily documented by any source other than interviews on the ground.

4.7 – Evaluating the Data

All interviews were conducted using a semi-structured interview sheet (see Appendix 1), where the questions I was interested in were outlined. Both the research assistant and I had a copy of this document throughout the interview. Questions were posed to the interviewees, then the answers were translated from Maa or Swahili to English. These answers were written down in English, although sometimes it was easier to write in Swahili if that was the language being spoken. As time in the field went along, I could translate most of the Swahili answers. The interviews were audio taped. These tapes were checked against the written answers at the end of each day, with the help of my research assistant. My hand written notes, included not only what the men said, but also observations about the boma, the farm, and/or the comments of the other men (which were few). As noted earlier, I also noted any particular circumstances that might question the answer, and/or particularly long answers, where the man being interviewed wandered to other subjects. These notes helped me focus on issues that I had possibly ignored in developing my interview questions.

Many interviewees were photographed in their boma, sometimes with family.[17] This was done both as a gift to the family, but also as a way to document the images for both research and presentation purposes. These were also critical in developing the village and boma drawings displayed in Chapter 5.

The data was later entered into a computer software program designed for evaluating qualitative interviews, called NVivo.[18] This program allowed the interviews and all additional comments to be put into a database, that could later be searched, coded,

[17] These photographs were quickly developed in Arusha, and a copy returned to the man interviewed. In all cases they were greatly appreciated. These also allowed a visual record of the interview, which was a great reminder when transcribing the notes, of the interview, the village and the particular boma. They are an invaluable record of the farms, the oxen, and the general state of the environment near the boma.

[18] Nvivo is an abbreviation for NUD*IST Vivo, a software program written by Donald Fraser. I used the second edition, 1999. The copyright is held by Qualitative Solutions and Research Pty. Ltd. Melbourne, Austrailia.

and organized around themes. In this way, answers to questions in one section of the interview that might apply or answer other questions could be reviewed together in single nodes (folders). This program was helpful in organizing both my notes and the answers to the questions posed in the field. The coded data was essential in the assembly of data into categories directly related to the indicators I used as a basis for developing the case study.

4.8 - Objective versus Subjective Research – Doing Both

When I went to Tanzania in 1998, my initial objective was to develop and have historical, qualitative, and quantitative components in this project. Through readings and traditional review of the literature, I hoped to gather the majority of my historic information. The Maasai have been the subject of a great deal of research, finding information about them was not difficult. Finding historic data about land-use change was a greater challenge. I knew through the observation and close contact I had with the Maasai that ethnographic data, my qualitative component, would be possible as well. I hoped through the use of sampling techniques and interviews I could get quantitative data. My goal was to use these three forms of research to develop a systems approach (Upton 1986, Fitzhugh et al. 1992) to evaluate the connection between the technology adoption and use of draft animal power, the farming system, the people and the environment.

During my initial research planning, I imagined being able to be fairly objective in my evaluation of the farming system, the environment and use of draft animal power. I was warned that this would be difficult, especially given my outgoing nature and willingness to engage people of all backgrounds. To some degree once in the field, I found this to be the case. My personal observations of the villages and people may be biased by the subjective nature of my research and my short periods in the field. However, I do not believe that my research is entirely subjective. In 1999, during what I call phase two of my project, at every

step I tried to cross check what I was seeing and what I was told by the men in my interviews. Measuring fields, viewing the crops, or simply inquiring about the diseases that I was told frequent the area, with local extension officers and expatriate veterinarians working for NGO's allowed the answers brought up in interviews to be called into question. At every step I was "triangulating the data."

My technique was similar to what Lindberg (1996) used in nearby Babati district. Sometimes, like Lindberg (1996), my observations and the interviewee's behavior contradicted what I was being told. Lockwood (1993:176) said, *"...all data obtained by asking questions are 'qualitative', in the sense that they cannot be treated simply as objectively true."* Devereux and Hoddinott (1993:34), point out that "*getting at the truth*", can be a challenge, but understanding the culture, and cross-checking using other means is always important. While my research was not a true ethnographic study, the ethnographic nature of my research allowed me to dig into these issues and try to find the "truth". Yin (1994), portrays this process as a way of getting to the facts. The process of using many sources and techniques permits the researcher to effectively triangulate the data. This process not only worked, but the following example shows how it had advantages over a sample relying solely on a survey, that might have been implemented by enumerators that gathered the data.

As an example, some research shows that women in Tanzania do not use or have access to draft animal power (Sylwander 1994, Marshall and Sizya 1994, Rwelamira and Sylwander 1999). I assumed this was the case with the Maasai, who culturally are more male dominated than other Tanzanian ethnic groups. The men all initially said very bluntly, " women do not use oxen" (see Chapter 7). However, as the research will show, this was not really the case. Twenty-eight percent (28%) of the men I interviewed said women actually do use oxen. This answer was only evident after a little probing. Semi-structured interviews allowed

conversations deeper than a simple yes or no answer. This detail was possible through the use of the ethnographic methods. My methods were focused on trying to get as representative a sample as possible from both a geographic and ethnographic perspective. I did not want to interview only wealthy farmers or poor farmers using oxen in Monduli district. I wanted to interview all types of farmers. I wanted to see in each village and sub-village if there were differences impacting the adoption, use and sustainability of certain agricultural practices.

Returning from the field in 1999, I was filled with ideas, images, and the statements that were made to me by amazing people. Such statements, ideas and images have changed me forever. In the field I could not separate myself and maintain an objective distance in the field. I lived with Maasai, ate with them, drank with them, and worked oxen in the field with them. I assisted them when I could and followed them when allowed or invited to do so.

As pointed out by Yin (1993:61),

> *"Rather than trying to create this objective distance from the topic of inquiry (i.e. through the use of instruments), the investigator's goal* (with ethnography) *is to in fact experience directly the phenomenon being studied. Such direct experience arises from the conduct of fieldwork, with participant observation therefore being the preferred data collection technique."*

My hope is that by sharing my observations, and the words of the Maasai and WaArusha, I will help people understand the context of this research, the people, as well as, the places where the research took place. I have tried at every step to back this with citations and what others have found, but invariably there will be subjective statements and ideas that come forth. I do not apologize for them, but rather hope that sometime in the future, other researchers will benefit from my observations. This subjective part of my research was important to me personally. Therefore, I have to share some of the words, wisdom, and images from my work. These have become as much a part of my research, as any of the more objective answers to questions in my semi-structured interviews. My work is unique in

that I was studying the people and their agriculture. I was not simply gathering census data or measurements. I wanted to know what people thought was important with regard to the adoption of oxen and their impact on the farming system and the environment.

As my good friend Jim Igoe (2000:23) pointed out in his own dissertation,

> *"This combination of experience and ideas, whether acknowledged or not, is literally the stuff that ethnography is made of, and one of the distinguishing features of socio-cultural anthropology."*

Finally, I should comment on how I took a list of indicators and measured the variables of those indicators. Table 4.1 outlines the indicators of agricultural sustainability in my study, as well as, the system component they measured, and where I found answers to these questions. With the exception of institutions and possibly geography the men interviewed easily answered questions about the people, the farming system, their livestock and their immediate environment.

Another way to look at the variables measured is to explain it as how my questions were posed and the answers were interpreted. Most of the questions posed few problems with regard to soliciting answers. The only exception was one question about how the use of oxen has changed the biodiversity on the farm. This usually required some rewording, as there was not a Swahili or Maa translation for biodiversity. Most men simply interpreted this as a change in the flora or fauna. The answers revolved around new weeds in the fields and the disappearance of some species of animals and trees. Many of the answers to questions were quite straightforward, such as the presence of soil erosion or whether or not soil conservation practices were implemented. These variables were both measured by observation, but also the frequency of comments surrounding these issues by the men interviewed. These variables will be presented in the next four chapters. I explain the characteristics of the villages, the land tenure situation, the use of oxen by the farmers and the agricultural system. In the final

chapter I will pull these variables together in a discussion about land-use change and future challenges.

During the interviews, questions were posed in categories of Land Use (farming system), Livestock, Draft Animals and the Environment (see Appendix 1). These categories do not exactly represent the system components measured as they are presented in Table 4.1. The geography component is presented in Chapter 5, the human component is presented in earlier chapters and in Chapter 6, the draft animal and livestock component is presented in Chapter 7, and the farming system component is presented in Chapter 8. Chapter 9 will explore the impact to the environment and finally, I will integrate these indicators in Chapter 10, where I will discuss how they all address land use change and challenges for the future, with regard to the sustainability of the agricultural system.

4.9 - My Success with the Maasai and WaArusha

My graduate training was not in anthropology or sociology. Reflecting on the challenges of conducting fieldwork might not be worthy of mention in a dissertation in those disciplines. However, I feel they worth mentioning here. In my case I learned as much about conducting field research as I did anything else in this study. I do not consider myself an anthropologist, but over the course of this research and my Ph.D. program, I studied and used the methods of the anthropologist (Brim 1974, Johnson 1978, Branch et al. 1984, Devereux and Hoddinot 1993, Kumar 1993, Bunders 1994). During 1998, I learned how important it was to be in the field, rather than sending out some enumerators, to do the work for you. As my contact with the Maasai expanded and my knowledge of Swahili and Maa improved, I also realized that through participant observation, I was learning as much by being in the field as I was through my interviews. Conducting the interviews yourself also gives you a

real sense of people's answers and ideas, and allows you to follow unique answers up with additional questions.

I am also not an ecologist, but over the course of this study, the ecology of this unique region came into play constantly. Every animal, human and plant interaction I studied showed the impacts of changes that have been implemented over time. Uniquely this area has been settled for agricultural use in only the last 5-35 years. Given this time frame, and the adjacent areas that were still largely pastoral, it was obvious that this change was altering the landscape and changing the people. This was where my study of sustainability and my interest in examining its principles came into play almost constantly.

I had no graduate advisors to assist me as a beginning researcher in the field. It was no small feat to travel halfway across the globe, conduct qualitative research with a people that you never met before, in a language you were just learning, in an environment that was extremely challenging. This for me was especially true, because my training was largely in animal science under controlled environments in American University settings where the technology is often second to none. I hope my comments below offer ideas, inspiration or methods to researchers in the future, which by virtue of their training may not be fully prepared before entering into the realm of anthropologic or ethnographic research with a foreign culture in a distant land.

In gaining access to the Maasai, there were a number of things that worked in my favor. Probably most importantly was my Maasai research assistant. Had I hired a Chagga, or a Meru research assistant, the language of the Maasai would have proved a difficult obstacle. While the Maasai can speak Swahili, they were usually more comfortable with their own language. The WaArusha were an exception, as most speak Swahili fluently, and speak Maa as well. Having Lobulu work with me was a definite advantage. His training, personality and style were very conducive to gaining access to the people I needed to meet. A Meru or

Chagga may have also had the perception of cultural superiority, which I saw in my previous work in Ngulu (Pare Mountains). This would have severely limited my access to the Maasai.

Second, I was willing and able to engage the Maasai in their favorite topic of conversation, cattle. Although many of the Maasai and WaArusha I met were engaged in a more agro-pastoral lifestyle, they adhere to their cultural identity and their close association with their cattle. For the Maasai, cattle were more than a resource for acquiring things. Cattle were their life and their passion. Their homes, their few possessions, their favorite foods, and their security revolved around cattle. My research, my interests, and my own professional and personal experience have also revolved around cattle. Sharing my photographs, ideas, and interest in cattle helped me gain remarkable access to the Maasai. The Maasai were always turning my interviews around. They always asked me how they might do a better job with their animals or crops. There was the element of seeking to improve their own decision making capacity, and soliciting feedback which often made my research almost participatory in nature (Bunders 1994, Morindat 1997). It certainly added an interesting dimension to my interviews when the tables were turned. Yet such dialogue and interaction was critical to gaining an understanding of the limitations and challenges within the Maasai farming system.

One of my favorite ways to dispel any ideas that I might have some huge sponsor backing me, or any larger development project looming behind me, was to simply tell the men I was talking to that I sold my own oxen to come do this research. They too could come to my *boma*, if they sold some cattle. This would often bring great laughter, as this was likely not going to happen among Maasai. In discussing my success with Lobulu and the other researchers that employed him previously, my success was unique, given my time constraints. In part it was due to the topic, and in part due to my genuine interest in this as more than just a research project.

Third, I was willing to go to the Maasai. I visited Maasai at their homes, cattle markets, and places of conversation. Despite the challenges associated with traveling during the rainy season, I was willing to walk to the Maasai, sometimes across great distances. During our travels by foot, we met many Maasai. The Maasai use other modes of transportation where they are able. However, their *bomas* or "*enkang*" are often far from regularly traveled routes of local transportation. In our travels, Lobulu and I had to always stop and discuss our plans and destination with others on foot. Lobulu said this small talk was important, as the Maasai do not read the news or have access to many other forms of communication. This conversation often led to why a white man would be traveling by foot. One Maasai man speaking to Lobulu on one of our walks asked, "Why do you punish this white man by making him walk into the bush?"

Most Maasai found it peculiar that I would be willing to walk all over the Monduli district in order to discuss their use of oxen. I soon gained the title of "*Mzungu Maksai*" (white man with oxen). As we strolled into markets or villages this title usually preceded me. The gossip network was apparently quite effective in Monduli. Soon the Maasai leaders were asking me to visit them. This allowed me access to meetings and even ceremonies, seldom seen by white men. It also allowed me to explain and discuss my research with large groups of people (sixty at one ceremony).

Fourth, in 1998, I could speak some Swahili and had learned a few greetings and words in Maa (the Maasai language). The training I had at Boston University was a great help. I was far from fluent, but often fooled a number of people by speaking only words I knew, and nodding as they spoke to me. I think having at least a grasp of the language and a willingness to learn was appreciated, and it allowed me to follow conversations to some degree. I never felt at a loss for words without Lobulu.

By 1999, with some additional practice, and an intensive refresher course in Usa River, Tanzania, my Swahili had improved. I was able to follow most conversations in Swahili, and all conversations in Swahili related to my research. I would also speak much more confidently. However, my grasp of the Maa language was still minimal. Many Maasai in my study area could speak some Swahili, so we did have conversations. Yet these casual conversations were usually outside my research interviews which were primarily in Maa.[19]

I also accepted the limits to my understanding of Swahili and Maa. I knew my time in the field would be limited. I had to accept the consequences that not being fluent in some ways limited my effectiveness. This was where an interpreter's skills were critical. At the same time it helped me realize that there was a great interdependence of humans on each other that could largely exist without spoken language. Throughout my fieldwork, I realized that spoken language was not the only form of communication. There was much that I saw that did not need words to interpret what was going on. I recognized my language shortfall, and did my best to remedy the situation. However, I was amazed at how quickly I could recognize answers within the context of my questions in both Swahili and Maa. I deeply regret that I did not have the time nor the opportunity to learn more of both the Swahili and Maa language, yet what I did learn and the speed with which it came to me in the field was remarkable.

Finally, access to the Maasai seemed to fall into place once I stopped acting like a tourist (although I always looked like one). When I was willing to sit up all night and talk about cattle, drink sour milk, and eat cow stomach, intestines, and other body parts I couldn't identify in the dim light of a campfire, I felt like I was finally making progress. I know I was

[19] I found speaking Swahili to Maasai much easier than speaking to other Swahili speakers, as the Maasai that had not attended school, seemed to have a more limited vocabulary, much like me. Some Tanzanian friends in the Pare Mountains joked that of course I could speak Swahili to the Maasai, because we both spoke poor Swahili. This was not always the case, as many younger men could speak fluent Swahili, and a few I met in their bomas spoke fluent English.

a foreigner, but at the same time I saw many other "tourists" fail to even gain a glance from the Maasai. The white man has a reputation among the Maasai for being rude and unwilling to engage in what is considered essential greetings and conversation. I tried my best to fit in. At one point when I was given a red robe and an elder's club, then asked to join the men in conversation, I knew I was on the right track. I wondered if it might be sort of a joke, but I never saw anyone even so much as snicker or make a gesture of displeasure.

By the time I left Tanzania in 1998, I felt a great attachment to the Maasai, and a desire to stay and learn as much as I could. I was told to return by many elders. The greatest compliment of all was when a group of men insisted that somewhere in my family tree their must be some Maasai blood, for they had never seen a white man that understood cattle and oxen as I did.

4.10 - Summary

In this chapter I described the process of learning and development that led me to the research area, the people and the research questions. This process included not only the scoping exercises or preliminary research conducted in 1996 and 1998, but also the development of the list of indicators of agricultural sustainability used to evaluate Maasai and WaArusha agriculture. I have also described my methods used in the field, and in evaluating the data after returning home, to prepare this work for publication. I also outlined the process by which the indicators were discussed, and how the variables affecting the indicators were evaluated throughout this dissertation. Finally, I highlighted a few of the factors which added to my success in working with and conducting research among the Maasai and WaArusha people.

CHAPTER 5

MONDULI – THE CASE STUDY AREA

5.1 - Introduction

The geography and landscape of the research area are outlined in this chapter, including the soils and rainfall which are the major determinants of the agricultural potential of the region. Each village where interviews were conducted is also described in detail, with figures highlighting the unique characteristics of the village, as well as, some of the unique characteristics of the individual bomas visited. This level of detail was important for a case study, as the landscape is changing. In time, these village characteristics may change considerably, and my descriptions will provide a baseline from which to make comparisons in the future. I have included initial data about the farming system, such as grazing availability and the major crops grown in each village, as it is difficult to separate a description of the villages from what was seen and examined in each village. This chapter answers many of the sustainability questions posed in Table 4.1, specifically those related to the geography of the area and the general farming system (see also Table 10.1).

5.2 – The Research Area

Tanzania's mainland is divided into 20 regions (Ravnborg 1990). The Arusha region, located in North Central Tanzania, is divided into 8 districts. The Monduli district is in the

center of the Arusha region. Its present boundaries were established in 1979 (Meindertsma and Kessler 1997). Monduli district covers a total land area of 15,775 km^2. It is about 40 km West of Arusha town. Monduli district is adjacent to the Arumeru district in the East. It runs to the Rift Wall and the Ngorongoro District in the West. The district borders Simanjiro and Babati district in the South and it borders Kenya on the North. The district lies between longitudes 35° 30' and 37° 30' East and latitudes 2° to 4° 15' South (see Figure 5.1).

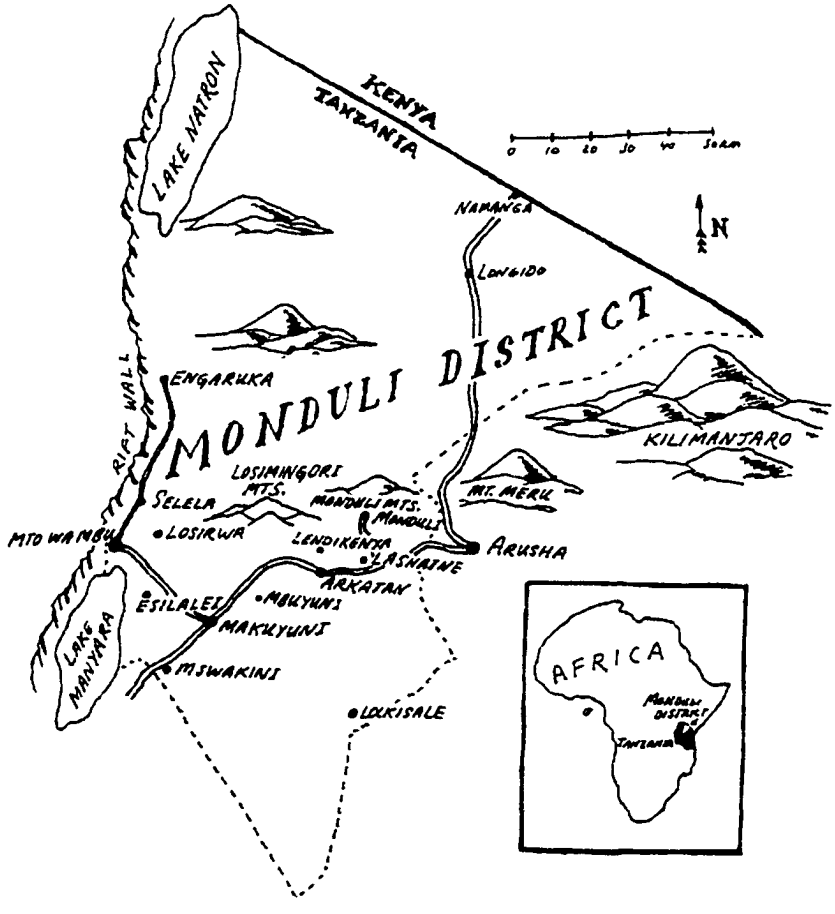

Figure 5.1 - The Research Area

Within Monduli district my research took place in the Southern half of the district. traditionally known among the Maasai as *"Kisongo"*(see Figure 4.1). While there is a village called Kisongo in the nearby Arumeru district, the *Kisongo* name reflects a much broader area of Tanzania's Maasailand[1]. The Kisongo locale, encompasses most of the more formal Kisongo and Manyara divisions, which are formal administrative boundaries.

My research area extends in the east from Monduli town (Latitude 3° 18' S and Longitude 36° 26'E) and Meserani (Latitude 3° 25' S and Longitude 36° 28'E) south to Lolkisale (Latitude 3° 46'S and Longitude 36° 25'E). It then extends west to the Great Rift Wall and Lake Manyara (Latitude 3° 26'S and Longitude 35° 48'E) and north to the edges of Ngorongoro Conservation Area, in Engaruka (Latitude 2° 59'S and Longitude 36° 28'E). My research area also bordered by the Tarangire National Park, in the southeast. Overall the research area fell between East of 36°30' longitude and South of 3° latitude (see Figure 5.2).

I chose this part of Monduli district because I wanted to select a population that was using oxen and had recently adopted them. Given my time and financial constraints, I knew from my research in 1998, that the villages in the semi-humid and semi arid lands in Monduli, just off the Great North Road were using oxen (see Figure 5.3). The northern part of the district is more arid and largely unsuitable for cultivation, although some farming with oxen does occur in the semi-arid part of the Longido area, just south of Namanaga, Kenya. But given the distance to this area and the limited number of farm villages, I focused my study on the area described above.

[1] Maasailand is a term used to describe the areas in Kenya and Tanzania that have traditionally been Maasai grazing and living places. It is frequently used in the literature, but it is not really a place that can be typically found in a geographer's map. However among Maasai and people that have studied them (Jacobs 1965, Talbot 1972, Jacobs 1980, Ndgala 1992a, Rigby 1981, Spear 1993, Spear and Waller 1993, Homewood and Rodgers 1987) the term Maasailand is used frequently.

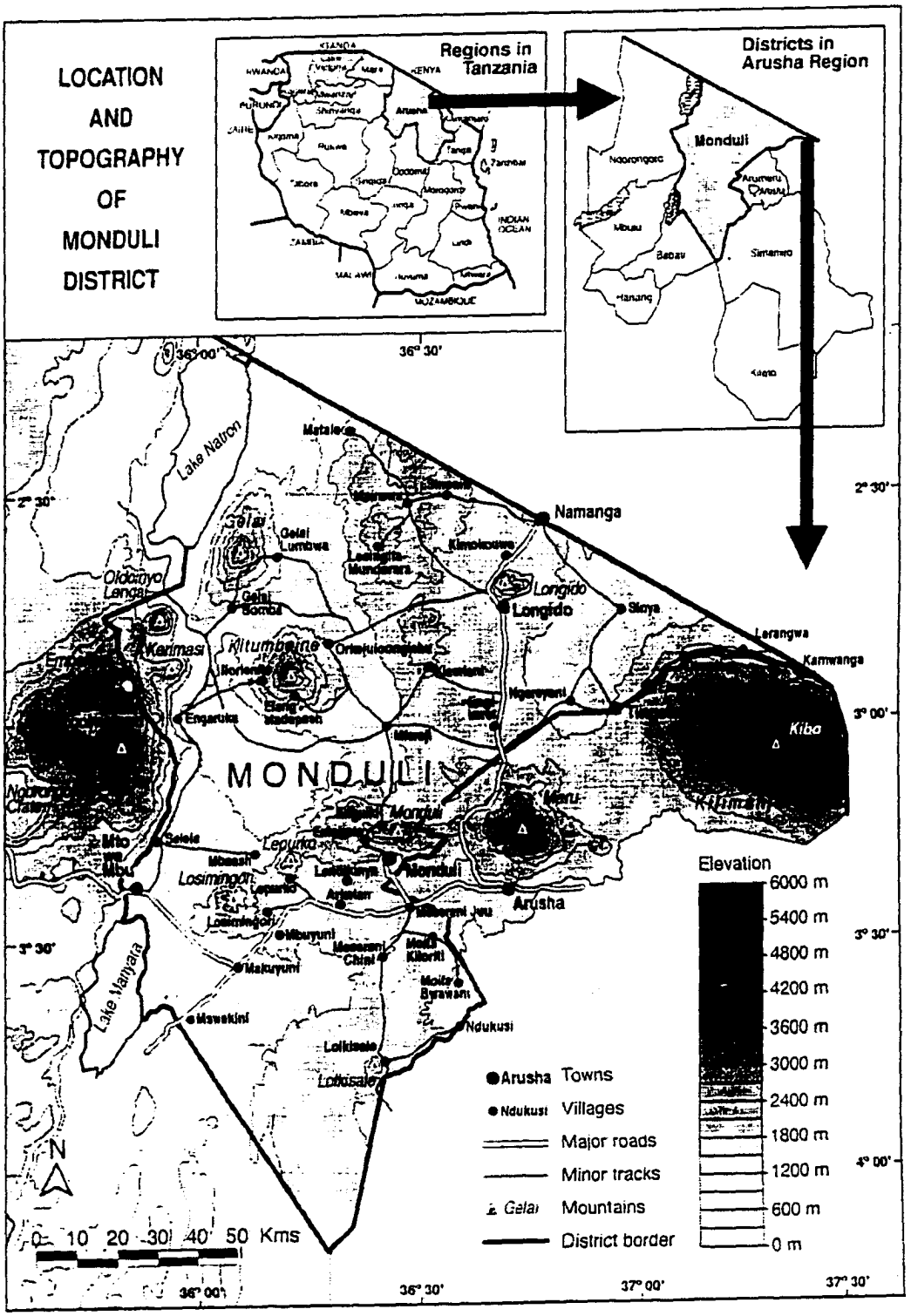

Figure 5.2 - Location and Topography of Monduli District
From Meindertsma and Kessler 1997

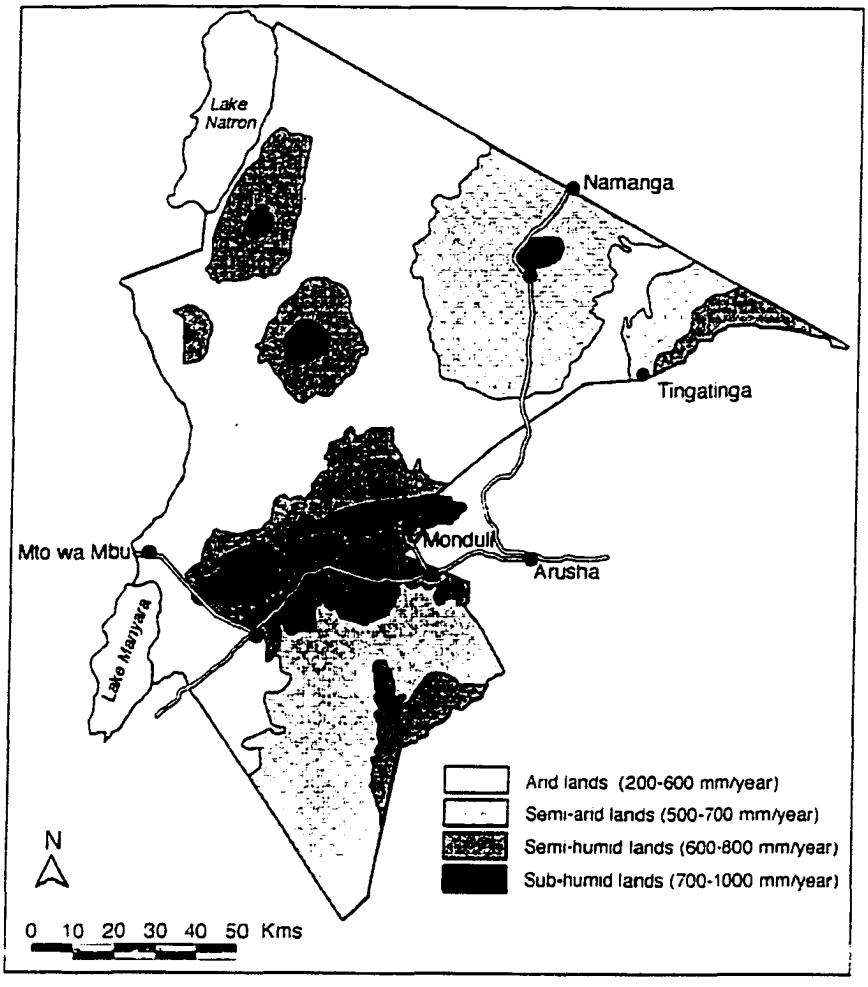

Figure 5.3 Climatological Zones of Monduli District
From Meindertsma and Kessler 1997

5.3 - The Landscape

There are numerous large volcanic mountains, both active and inactive, in the district. These dominate the flatter landscape, and often have higher rainfall on or near their slopes. There are also a number of lakes, a few permanent rivers near the Great Rift Wall, numerous seasonal ponds, both natural and man-made.

Other than the mountains, much of the land in the study area is considered savanna, with a few exceptions that I will describe below. It is primarily a low rainfall grassland zone, which also may have trees and shrubs. According to Meindertsma and Kessler (1997), 83% of the Monduli district is primarily grassland, with some scattered bushes and small trees. Savannas generally separate tropical rain forest zones from deserts. In this context, the lush forests of the Monduli Mountains and Forest Reserve, as well as, Mt. Meru, and Ngorongoro Conservation Area are nearby representing the rain forests. To the South of this savanna, are the drier more arid areas, such as Simanjiro district and the Dodoma Region.

DOS (1961) illustrated the lower elevations of my research area in a different way, displaying parts of the region as grassland (sections with 500-750 mm of annual rainfall) and other drier sections (250-500mm of annual rainfall) as savanna. In either case, rainfall is limited and the grasslands and/or savanna exist largely due to the climate, soil and topographic conditions (Ford 1971, Spear and Waller 1993).

Kikula et al. (1993) point out that the Maasai may have had some impact in maintaining and extending the savannas through grazing and the suppression of bushes and trees by using fire. To what degree this is this case is hard to determine. However, he also points out, *"The calcarious concretions at 30-50 mm below the surface, would seem likely to exclude plants with roots deeper than that of grasses."* Although many Maasai in my own study reported that places like the Ardai plains have been cleared for Wheat Farming schemes after the second world war, most of the area was listed on early maps as grassland/savanna before any crop growing was initiated (DOS 1961, O'Connor 1966). Therefore most of the region's vegetation is limited by the soil and rainfall (Kikula et al. 1993).

5.4 – Weather

"Only God can decide on the weather"[2]

Hatibu et al. (1995) refers to Monduli as part of the northern highlands. He classifies its Maasai steppe as having primarily semi-arid and arid land, with a bimodal rainfall. The semi-arid zone covers about 1/3 of the total land area of Tanzania (295,000 km^2). Semi-arid pastoral systems were defined by Ellis et al. (1993) as one that receives 400-800 mm of annual rainfall in a bimodal delivery, although McCown et al. (1979) defined a semi-arid climate as one with 250-800mm of annual rainfall. In any case, both certainly seem to be within the realm of the rainfall averages in much of the Monduli district (see Figure 5.4). The only exception in my study area was the village of Lendikenya, which due to its elevation and proximity to the Monduli Mountains has more of a sub-humid climate, with rainfall averaging something closer to Monduli town's 758 mm/year (Meindertsma and Kessler 1997).

The savanna typically has both a distinctly dry and a wet season (Bodley 1994). Rainfall in Monduli district certainly follows this trend. In Monduli rainfall is highly seasonal in nature, with primarily two rainy seasons in the areas east of the Rift Wall (Jacobs 1965, Hatibu et al. 1995, Morindat 1997, Meindertsma and Kessler 1997, Lama 1998). The bulk of these seasonal rains occur in April and May, although sometimes they begin earlier and possibly extending into June. There are also some "short" rains in November and December. The short or early rains in November and December are more typical nearer the mountains, but are less common out on the plains. Therefore rainfall limited the cropping period in most of my research area to only about 90-120 days.

[2] Interviewee #62

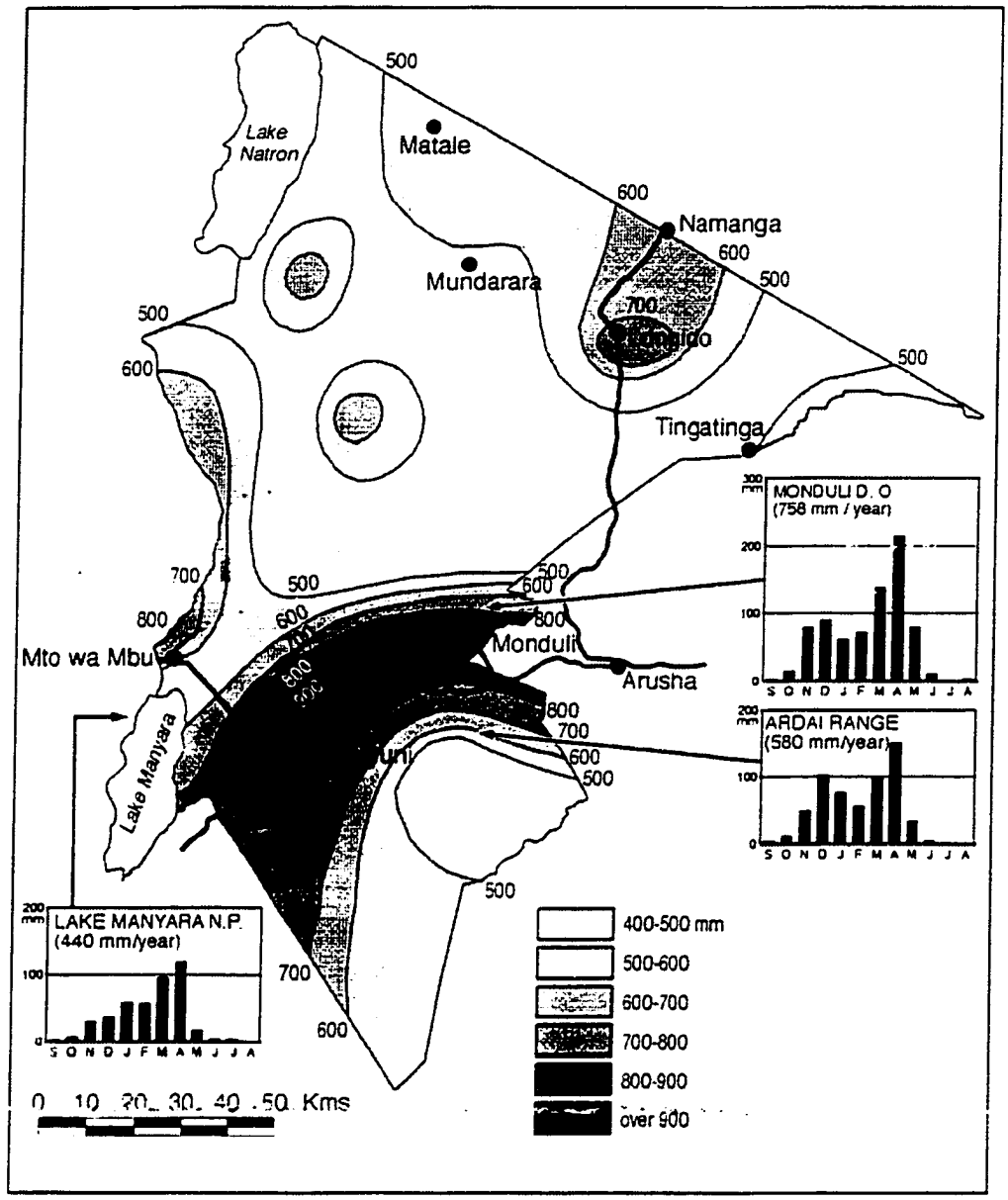

Figure 5.4 - Rainfall in Monduli District
From Meindertsma and Kessler 1997

In 1998, I experienced some of the most severe of the long rains, with one of the wettest years anyone could remember. So wet, that many crops failed due to flooding, erosion, or failed plantings.

Despite the "El Nino" rains in 1998, the greatest challenge in this the semi-arid zone is low and unreliable crop and livestock production due to both high temperatures and unreliable rainfall. The hottest months are January to March and the coolest months are July and August (Jacobs 1965, Hodd 2000). The average temperature is between 20-25°C. The range of temperature is from a minimum of 15°C in June, July and August to a maximum high temperature of 33°C in February and March (Meindertsma and Kessler 1997). The coming of the "early or short " rains in November and December, after the driest months of July, August and September, may mean life or death to humans and their livestock. The amount and timing of rain is of decisive importance for livestock and crop growing. Much of Tanzania's northern steppe has a low and erratic rainfall (Lama 1998), where only 22% of the land in Tanzania receives 570 mm of rainfall or more in 9/10 years (Hatibu et al. 1995).

5.5 - Soils and Soil Erosion

In Monduli, most of the soils have developed out of volcanic parent materials (Kikula et al. 1993, Meindertsma and Kessler 1997). On the slopes of the mountains extending from Monduli town, most of the soils are a deep dark reddish-brown silty clay loam, which are moderately well drained. On the lower slopes including the Ardai and Kisongo plains (which constituted much of my research area) the soils are a darker black silty clay or dark yellowish brown silty clay-loam. There were also some heavy black clay soils, that crack and open with hot weather and little vegetative cover in overgrazed areas (Kikula et al. 1993, Meindertsma and Kessler 1997).

Traditional practices of leaving land fallow followed by short periods of cultivation are no longer being practiced in Monduli, largely due to population pressure (Kikula et al. 1993, Meindertsma and Kessler 1997). Fallowing will be described in more detail in Chapter 8, but the rising number of both people and livestock both limit sustainable agricultural practices. This has forced people to extend agriculture into marginal lands and this population pressure on marginal land and overgrazing in semi-arid areas both have made significant contributions to soil degradation (Kikula et al. 1993, Assmo & Eriksson 1994).

Soil erosion is common in some of the agropastoral areas. In Monduli district, one of the greatest examples of soil erosion is readily seen on the lower slopes of the Monduli mountains where they meet the plains. The most severe erosion is in Lashaine and Lendikenya villages (see Figure 5.5). Due to the nearby mountains' higher rainfall, the topography and much of the lower forest having been removed, the water likely comes down the slopes at a faster rate than it has in the past. Added to this is the increased monoculture cropping without fallowing and the larger fields with exposed soil surfaces. There are also large bare patches of bare ground due to overgrazing, particularly during the dry season. Finally, the human paths and cattle tracks are found going to every boma. In the lower areas these are like livestock highways. The livestock travel these paths daily to the plains where grazing is allowed. Due to restricted grazing in the military areas and the Monduli Forest Reserve, the grazing pressure is high. The soils in this area, particularly the volcanic silty clay-loams, are easily eroded due to its readily detached soil particles (Kikula et al. 1993, Meindertsma and Kessler 1997).

Erosion is generally taken as a strong indication of adverse human impact on the environment (Homewood and Rodgers 1984). This research shows that Lashaine and Lendikenya are no exception. Using Aerial surveys published in 1980, Homewood and Rodgers (1980) found that there is a strong association between human land-use and erosion

in the Arusha region. The most severe erosion was found in Arumeru and Monduli districts. These authors found that erosion is primarily associated with agropastoral and farm settlements outside the Ngorongoro Conservation Area. They also found that there was no significant association with pastoral activities. They did note some erosion in the Salei plains (Esilalei and Losirwa) which was due mainly to cattle and wildlife tracks, on the Gol Mountains and Rift wall (Homewood and Rodgers 1984).

According to (Webster and Wilson 1980:111-116), there are numerous factors affecting soil erosion, these include:

1) *Amount, distribution and intensity of rainfall*
2) *The slope and the nature of the land surface*
3) *The vegetative cover – in the absence of cover crops or other soil conservation measures, the soil loss under cultivated crops such as maize can be substantial. In contrast broadcast finger millet or native grasses offer considerable protection from soil erosion.*
4) *The type and fertility of the soil – fine textured sandy soils will readily erode. As a rule soil erosion speeds up as the more absorptive, humic surface layer is washed away, exposing the more impermeable subsurface layers.*
   A decline in fertility is also a cause of soil erosion. In the absence of practices to maintain fertility and humus under cultivation strategies, both humus and structure, hence the ability to absorb rainfall are gradually reduced. It may also indirectly reduce the growth and density of cover crops and the amount of organic matter returned to the soil in crop residues.
5) *The land use and farming practices – such as the ill advised use of a plow up and down the hill, instead of on the contour results in this implement causing erosion.*

All of these factors (outlined by Webster and Wilson 1980) have affected the soils in this research area, although the slopes in villages that are closer to the Monduli Mountains are more severely affected. I will describe the farmer's perceptions of soil erosion in more detail, and soil erosion as an environmental problem, in Chapter 8 and in Chapter 9, respectively.

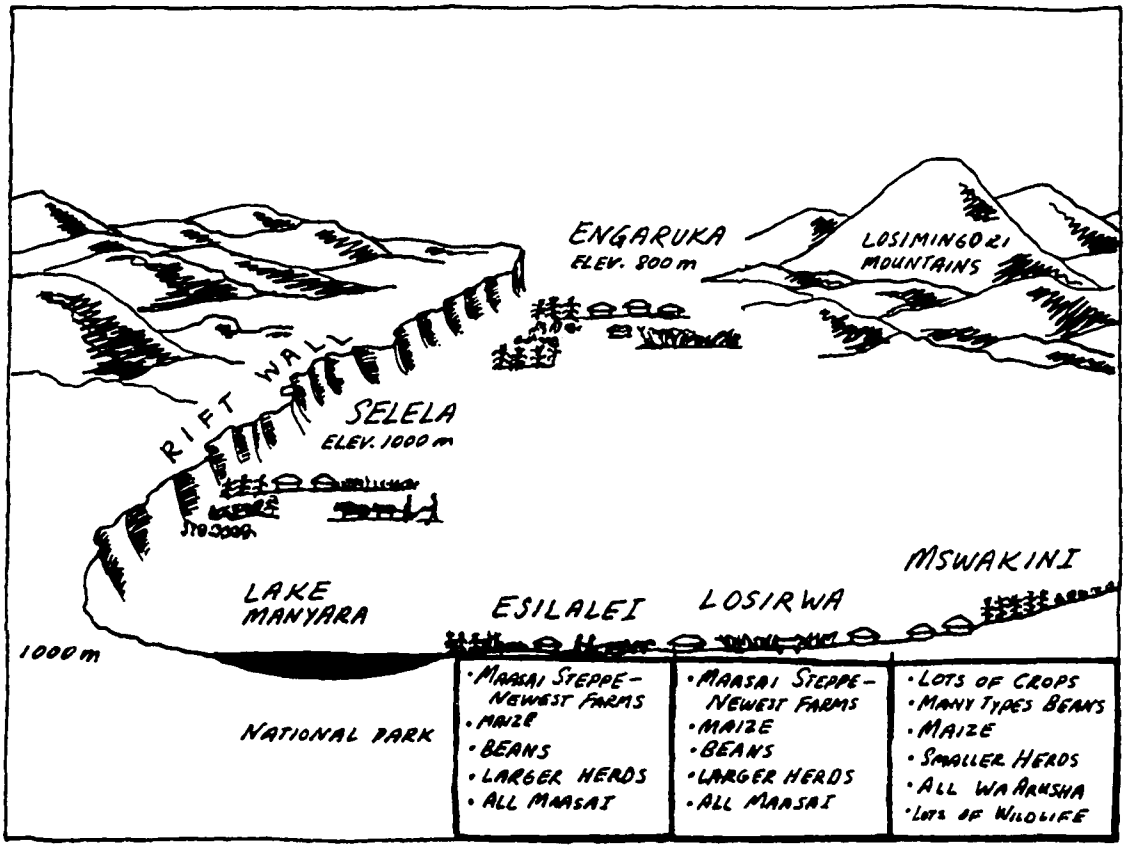

Figure 5.5 - Research Area Landscape Cross-Section (Part I)

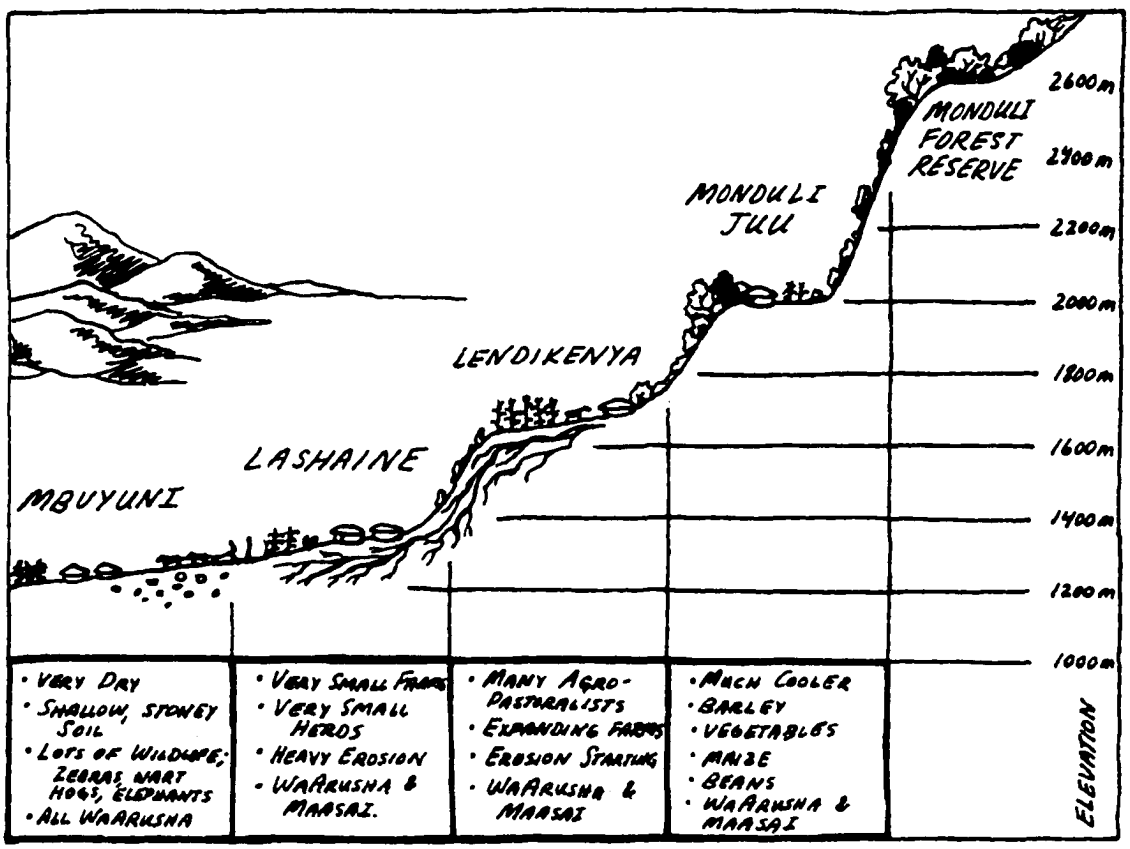

Figure 5.5 - Research Area Landscape Cross-Section (Part II)

5.6 - Village Characteristics

Ten villages were visited in the Phase II portion of this study. There were differences in their altitude, soil type, rainfall and native vegetation. These will be described in detail below. However to highlight their differences, I have prepared a landscape cross section of geographic and ecological differences (see Figure 5.5). The altitude of the individual *bomas* ranged in elevation from 796 m in Engaruka Chini to 1682 m in Lendikenya.[3] Engaruka Chini was the driest of all the research areas, with sparse and thorny vegetation within a few kilometers East of the rift wall. However given my research interests, Engaruka also had the highest concentration of oxen due to its remote nature and irrigated crop fields. Lendikenya was the highest rainfall area, as indicated by the trees and vegetation growing on the slopes throughout most of the village, as well as the documentation mentioned above. Much of Lendikenya was in more of the sub-humid zone, with more rainfall than the nearby savanna in lower elevations (Meindertsma and Kessler 1997).

The only villages where I did not conduct formal interviews, which lay within the research area described, were in Monduli Juu and Makuyuni. I describe my reasons below.

Monduli Juu (Enguiki and Emairete villages) is a mountainous, high altitude, cool, and even high rainfall area. This has become largely a barley growing area with the use of tractors. There were some oxen, but few in comparison to the other areas studied. Monduli Juu is also a dry season grazing area for Maasai and WaArusha from lower elevations. Enguiki and Emairete villages were both located near the main road. On some of their lowest slopes they had elevations of 1888m and 1926m respectively. Most of the farming operations were higher on the slopes. There prevalence of *Bos taurus* (European) breeds of cattle, also indicated that the environment and environmental conditions were considerably more favorable for both agriculture and livestock, than what was seen in the lower areas I studied.

Given my time constraints I chose not to focus any research in Makuyuni. Makuyuni was the only village I passed through regularly in the district where I did not conduct any formal interviews. In 1998, I did a number of informal interviews. The village leadership was certainly eager for me to return. However, this village lies directly on the northern tourist route, and as such there was a lot more economic activity than what I saw in all of my other villages. This seemed to make Makuyuni different and much more diverse in its population. The sub-villages in Mbuyuni and Mswakini surrounded Makuyuni. Given the ecological and geographic similarities to Makuyuni, these two villages made more sense given my time constraints and my interest in strictly Maasai and WaArusha agropastoralists.

5.6.1 - Arkatan

Arkatan was located on the North side of the Great North Road, south of Lendikenya and East of Mbuyuni. It is largely a grassy rolling section of the Ardai plains, with one small year round lake called Lake Eluanata Nanja, or simply *Nanja*. Much of the area was also called Sepeko, referring to the lowland common grazing area. The village had two schools, a few small shops, and a grain mill.

There were two sub-villages, where I conducted interviews these were Arkatan – Mti Moja (meaning single tree) and Arkatan - Nadosoito. Four interviews were conducted in each of sub-village. The population is almost entirely agropastoral, with 60-70% of the population being Maasai and the remainder WaArusha. These two groups coexist together, and it would be difficult to tell them apart from each other in any way, except by asking them, as their *bomas*, crop fields, corrals, and so forth appear identical. I interviewed 5 Maasai bomas and 3 WaArusha bomas.

[3] The altitude was measured using a hand held *Magellan GPS Tracker.*

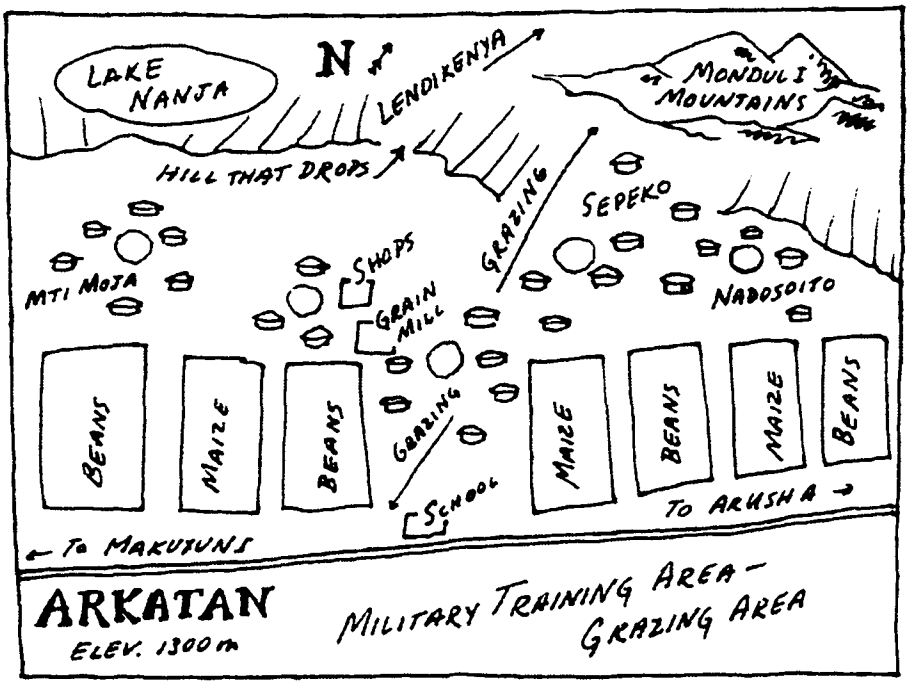

Figure 5.6 - Arkatan Village

The crop fields ranged from 4.7 ha to 11.3 ha, and averaged 7.7 ha in size. All of these were rainfed, and had easy access to the paved Great North Road for marketing. The crops were only maize and beans. The bean varieties in Arkatan were Canadian, soya, rosecoco, ngwara, maulazi, and red Masai beans. All of the bomas had corrals that appeared medium in size, indicating livestock numbers that were not in excess of a few dozen sheep and goats and a lower number of cattle. The elevation of the bomas ranged from 1276m to 1379m. The average elevation was 1325 m. See figure 5.6 for a typical layout in the bomas where interviews were conducted.

5.6.2 - Engaruka

Engaruka was the most highly developed agricultural area in my study villages. It was the village where Maasai were practicing the most intensive agriculture. They used a well-designed series of irrigation canals in the village to draw water from permanent rivers

descending from the Ngorongoro highlands. This water makes for a highly productive agricultural area just below the Rift Wall adjacent to the eastern edge of the Ngorongoro Conservation Area. It was the only village, other than Selela, that could reap two harvests of most crops every year. They not only grew maize and beans, but also bananas, melons, and vegetables. While this village is largely controlled by Maasai today, it's history dates back some 600 years, with the Sonjo people thought to be the earliest inhabitants of this area (Sutton 1993).[4] Sutton (1993:54) describes the lost civilization of Engaruka like this:

> *"In time it felt strains, as the population, having grown on the success of the system reached its maximum size which the fields could feed. With declining stream flows and soil fertility, it would have been a losing battle despite or perhaps because of, all the technical ingenuity and agricultural intensity. Engaruka and smaller agricultural communities to the south (Most likely what is now Selela) broke up in the seventeenth century, or at the latest the 18th century, very probably before the Kisongo Maasai established themselves in the adjacent plains."*

Sutton (1993) put forth this statement, at a time, when Engaruka was certainly a shining star in one of the drier parts of Tanzania's Maasailand. I am not a historian, nor can I dispute his history of the area, however, my personal observations differed significantly from his comments. The other possibility is that the Kisongo Maasai were so successful that they simply took over the irrigation-based agriculture and continue it to this day.

According to Sutton (1993) this area acted as a refuge and supplier of agricultural goods to Maasai who lived on the nearby dry plains. It continues to this day to be a major source water for Maasai herds in the drier seasons. The village itself also provides a trading post for selling livestock and buying household supplies. I thoroughly enjoyed watching herd after herd as they came to the river to water during the month of July in 1999.

[4] There was one Sonjo farmer I interviewed in Engaruka, but he had moved to this area more recently.

He also points out that there are the remains of a 2000 ha ancient field system, visible by aerial photograph, because of the stone lined canals. While I would concur with his estimation of the size of the field system. I must admit, this canal system today is visible because it is actively in use. According to local residents it has been in use as long as anyone could remember. While there may be stone linings to the canals, these are not visible, even when standing on the canals. A village council, with strict water rights and access actively manages these canals. Sutton also points out that the inhabitants raised some cattle, goats, and sheep. This certainly continues to this day with largely Maasai inhabitants.

Finally, Sutton (1993) discusses how the residents would have kept cattle in stalls or stone enclosures, and used manure to fertilize the fields. The Maasai do keep a few cattle, but most are sent out to stay with relatives on the plains. A few cattle were kept in the village for draft purposes and even some European breeds in stalls for milk production. Manure is a resource that is used and often sought after. Cattle graze in crop aftermath. For ox owners this becomes a payment in exchange for plowing the field. For the crop farmer, who most likely is a Maasai as well, this offers not only the advantage of manure to the fields, but also the removal and trampling in of crop residues, which interfere with crop plowing the next year and weeding. The grazing can also break up of ridges created by plowing.

Engaruka consists of two sub-villages, Engaruka Juu (high up) and Engaruka Chini (down low). I conducted interviews in 6 bomas from each sub-village. The elevation of these *bomas* ranged from 796m to 947m. The average elevation was 874 m. The size of the crop fields varied from 1.2 ha to 13 ha. The average size of the crop field belonging to one *boma* was 4.7 ha. The major difference between the two was the availability and flow of water. Farmers in Engaruka Juu tended to have a greater flow of water, even if they were allocated

the same number of days for their fields.[5] In Engaruka Chini, there were constant complaints that the water gets used up before it reaches the fields. The fields in the lower sub-village also tended to be only maize and ngwara (a drought resistant creeping bean like legume). Outside the irrigated areas, the vegetation was "desert like" in Engaruka Chini. See Figure 5.7 for a layout of the village, showing the river coming from the Ngorongoro highlands, with diagrams of the irrigation ditches.

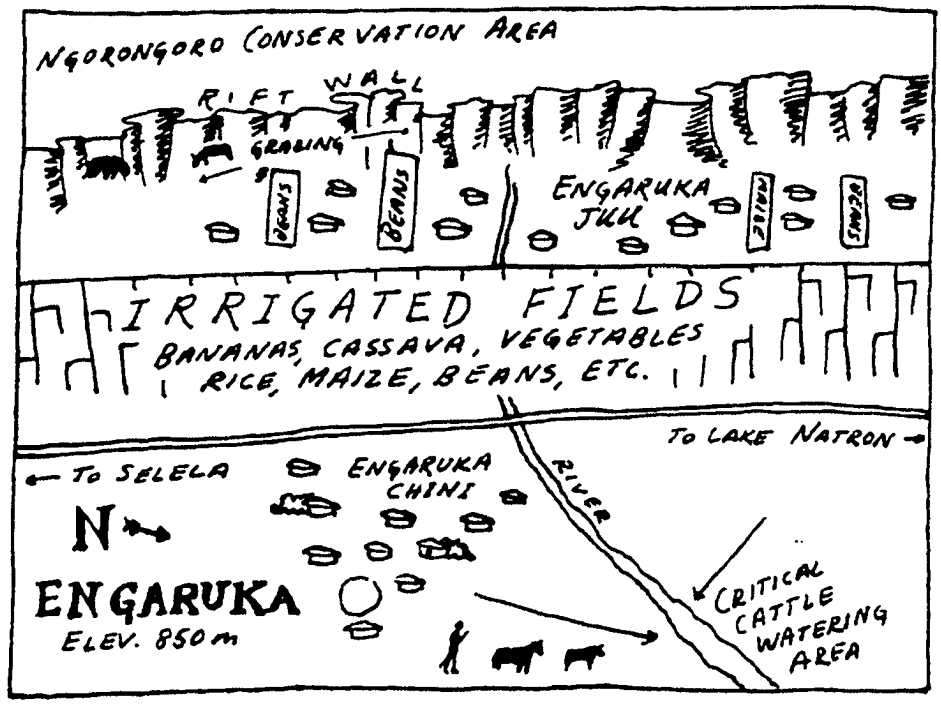

Figure 5.7 - Engaruka Village

Engaruka was a fairly remote village, in comparison to the other villages I visited. It is largely cut off from other areas in the wet season, due to the difficulty of motorized transport.[6] There are large numbers of giraffe (*Giraffa camelopardalis*) and zebra (*Equus*

[5] Schuskey (1980) points out that any elaborate irrigation system requires a highly centralized authority, with an elaborate bureaucracy to construct, maintain, and oversee all canals and dikes. There was no doubt in my mind that the village leadership in Engaruka was quite capable of being this highly centralized authority.
[6] The local *morani* on market days assured me it was just a day's walk to Mto wa Mbu. When I inquired about how they covered the 60 km in one day, they informed me that is was done by leaving early in the morning,

burchelli) between Selela and Engaruka, and elephants (*Loxodonta africana*) are said to frequent the area as well, coming down some passes on the rift wall. Zebras and giraffes usually present few problems as the area was so densely populated by humans. However, in drought years zebra, and giraffe will come and eat crops on the outskirts of the village. Porcupine (*Hystrix cristata*), Black Faced Vervet monkeys (*Ceropithecus aethiops*), wart hogs (*Phacochoerus aethiopicus*) were mentioned as problem in crops fields as well.[7]

5.6.3 - Esilalei

Esilalei was almost entirely a Maasai area. It consisted of the flat grassland that was north of Lake Manyara, but east of Mto wa Mbu and Losirwa. This village had a grain mill, a few churches, a school, and a few very small local *dukas*. The Maasai in this area had larger herds than were seen in any other village. Most were medium in size, with dozens of sheep and goats, and an equal number of cattle. However, a number of herds were larger. One herd in particular was huge, with hundreds of sheep and goats, and an equal number of cattle. It took what seemed like hours for these animals to be moved from the boma in an organized fashion, with each group assigned to a boy or young man for the day's grazing. The owner said there were over 200 people living in the boma, including children. Given the numerous homes and separate corrals, and crowds of kids running around I had no reason to doubt him.

Individual cropping areas tended to be large as well, with an average cropping area of 11.33 ha and a range from 2 ha to 40 ha. Of all the villages Esilalei had the newest crop fields and the fewest complaints about poor fertility. The nearby Manyara ranch, which had been a Government-run cattle ranch, had recently been abandoned and grazing was now permitted to Esilalei residents. This provided a new area that was open to grazing for

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making it to Selela (about halfway) by midday, and then continuing to Mto wa Mbu, arriving there in the early evening. They said a white man like me would not be able to make it in one day on foot. I would have to stay in Selela for one night, and continue the next day.

[7] I watched a group of dogs and *morani* strike out after one near the fields to kill it.

residents from Esilalei. It also seemed to take some of the pressure off the existing grazing lands and encourage Maasai expansion of crop fields. Residents included both small and large farmers, the newer farms tended to be on the North side of the main road. I conducted interviews in 12 bomas. Below is Figure 5.8 portraying the typical boma layout in Esilalei, the grazing in lower areas was often within the former Manyara Ranch.

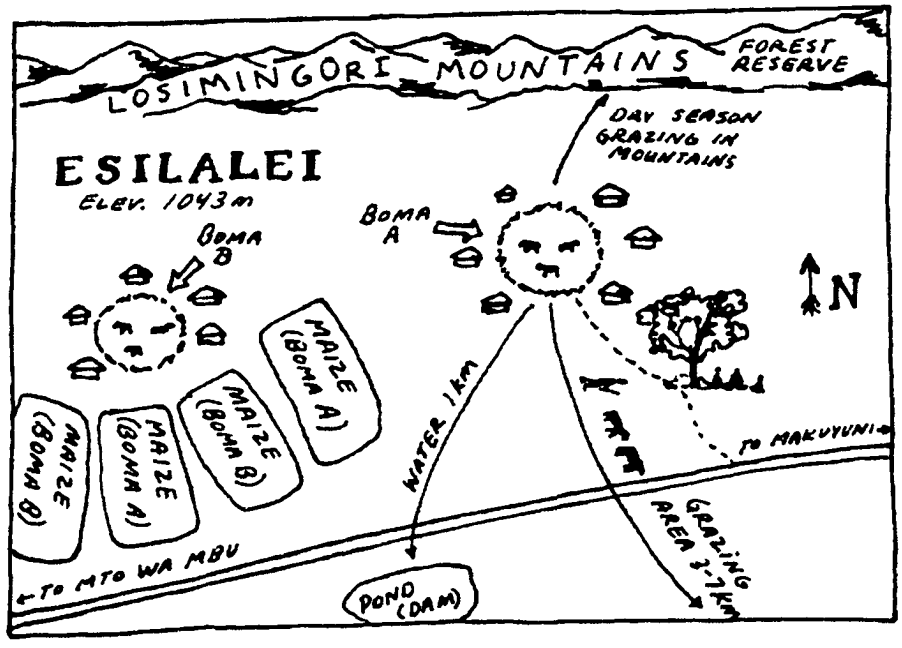

Figure 5.8 - Esilalei Village

The crop fields near Lake Manyara were often grouped together to from huge almost continuous fields. Some Maasai had even hired *Mswahili* farmers (Non-Maasai) who took care of many of the larger crop fields. This rapid expansion of cropping had some of the local wildlife tour operators worried, as the Manyara Ranch and adjacent Maasai grazing areas provide an important wildlife corridor called the Manyara-Jangwani corridor (Meindertsma and Kessler 1997) between Tarangire National Park and Lake Manyara National Park. The Maasai farmers took me to the fields and pointed out the damage and many problems they

had with Cape buffalo (*Syncerus caffer*), wart hogs (*Phacochoerus aethiopicus*) and zebra (*Equus burchelli*), although the wart hogs were said to come less often now, because they were being killed. Wildebeest (*Connochaetes taurinus*) were also considered troublesome, but not because they ate crops, because they carried Malignant Catarrhal Fever (MCF), and transmitted this to cattle.

One of the most intriguing ideas for improved yields in crop fields, seen in Esilalei, was to plant crops right outside the livestock corral (see Figure 5.9). Most Maasai and WaArusha spread very little manure, and in some of the larger *bomas* the accumulation of manure was substantial. Many of the fields suffered from poor fertility, while tons of manure composted in the corrals. Planting crops directly adjacent to the corral will capture much of the run-off, as the corrals are usually higher than the surrounding landscape due to years of accumulation. Run-off is nutrient rich, and the crops were appreciably better than those in nearby fields.

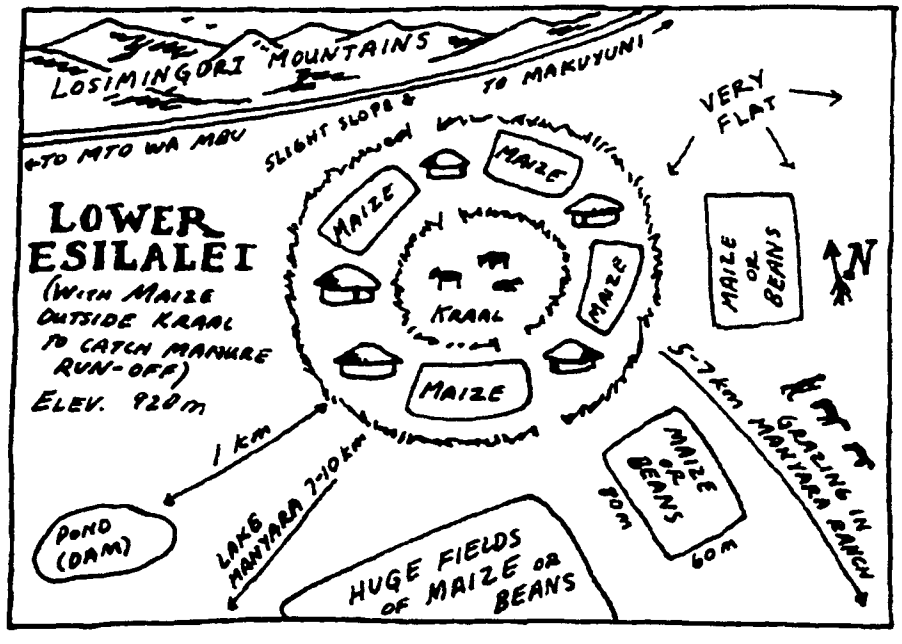

Figure 5.9 - Lower Esilalei Village

According to the men interviewed the area had more rainfall than Losirwa and Mbuyuni. I have no way to document their opinion, however the elevation ranged from 978m to 1117m. The average elevation was 1046m. Lake Manyara had an elevation of just over 1000m. Given the proximity to Lake Manyara, the relatively flat landscape and higher mountains surrounding Esilalei, the entire area flooded in 1998 during the El Nino rains. The crops were devastated, and my visit to the area was extremely difficult at that time. The local people in 1998 faced numerous hardships.

5.6.4 - Lashaine

Lashaine surrounds Monduli town on the south and west. Lashaine's sub-villages included Orngoswa, Orkeswa, Lordungiro, and Lashaine sub-village. The elevation varied from 1320m in Orngoswa to 1482m in Lordungiro. The average elevation was 1409 m. The lower sections were located near Lashaine Mountain, just off the road from Meserani to Monduli town. This area also bordered the Military Officers training grounds. It was located on the flatter section of the Ardai plains. This lower area was also suffering from the most severe erosion in my study (see Figure 5.10). This was largely due to factors explained above, including the most heavily used livestock paths. The sub-village of Orkeswa had farms on the higher elevations on the outskirts of the Monduli Mountain and part of the Forest Reserve. Many of the fields were on steep hillsides and erosion was common here as well, although not as severe as the lower areas. The sub-village of Lordungiro was near Lendikenya, with more ample grazing and larger plots for growing crops. The village had a number of primary schools, a few small shops, and was within a few kilometers of Monduli town, where many other services and a number of secondary schools were located.

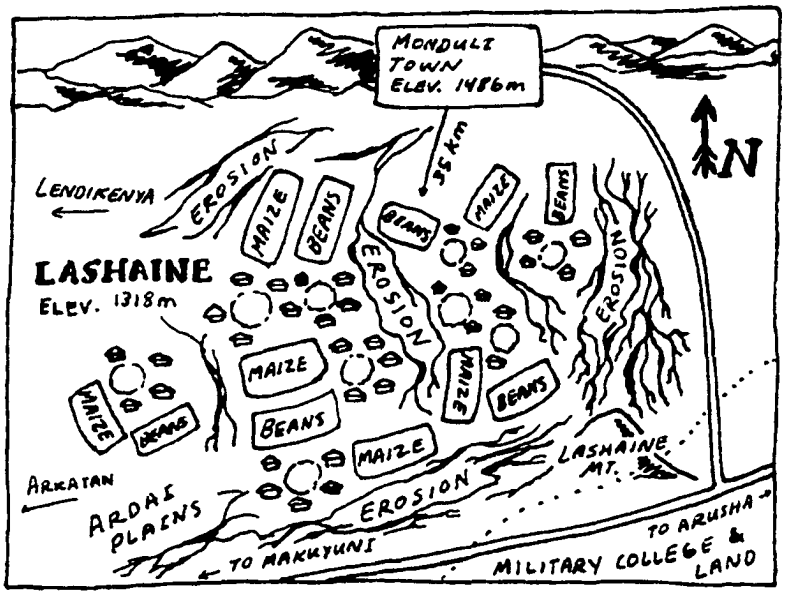

Figure 5.10 - Lashaine Village

The population is not entirely agropastoral, as some of the residents work in Monduli town or some had other small businesses. In the lower areas some residents are large growers of maize and beans, with the use of tractors. The majority of the residents are WaArusha. Most are practicing agriculture and livestock keeping, in much the same way all of my other villages were. I conducted interviews in 16 bomas, representing four from each sub-village. All of the men I interviewed were WaArusha. The livestock keeping is a real challenge with severely limited nearby grazing in Lashaine sub-village. This was largely due to the military post, expanding crop fields, and severe gully erosion. Orkeswa was one of the only villages where some of my respondents did not have any cattle, and borrowed or rented oxen to do their field preparation.

The crop fields ranged from 0.6 ha to 40 ha, and averaged 15 ha in size. My sample of 17 bomas may be skewed due to one farm with 40 ha and another with 12 ha. Both farmers admitted renting out much of their land to others for growing crops. They used only 6.4 ha

and 2.5 ha for their own use. Thus considering this admission by the large landowners, the average size of crop fields used by individual farmers was 3.5 ha. All of these were rainfed, and had relatively easy access to Monduli town for marketing. Despite easy access to supplies in Monduli such as pesticides, fertilizers and hybrid seeds, most were using no pesticides, no one was using fertilizer, and only about half of the farms were using hybrid seeds. The crops were primarily maize and beans, with the exception of some tobacco and vegetables grown at the higher elevations. The bean varieties grown included primarily Canadian, Soya, Rosecoco, and Red Masai beans.

There were complaints of wildlife in crop fields, despite the proximity to Monduli town and a fairly large population. In Lordungiro and Orkeswa animals from the forest such as bush pigs (*Potamochoerus porcus*), wart hogs (*Phacochoerus aethiopicus*), black faced vervet monkeys (*Ceropithecus aethiops*), porcupines (*Hystrix cristata*), and Dik Dik (*Madoqua kirkii*) were the major pests. In lower areas, near Lashaine Mountain, zebras (*Equus burchelli*) were the most common problem.

5.6.5 - Lendikenya

Lendikenya is West of Monduli town, adjacent to the Monduli Forest Reserve and Monduli Juu. Lendikenya's sub-villages included Arkaria, Oloodo Lakaria, Emuguru Nanyokie, Murandawa, and Lendikenya sub-village. The elevation at the *bomas* visited varied from 1328m in Murandawa to 1682m in Emuguru. The lower sections were located near both Arkatan and Lashaine. This lower area was located on the Ardai plains. Erosion was quite common in all but the highest elevations (see Figure 5.11). These higher elevations do not have the pressure on grazing resources, and many of the *boma* owners have located their crop fields at lower and flatter sections. The severity and distribution of erosion is not what it was like in Lashaine. However, as the population grows, combined with higher livestock numbers and more extensive crop growing, I would expect the gully erosion to

increase in severity. Many of the gullies in Lendikenya seem to be in grassland areas an along roads and footpaths, rather than in or near crop growing areas, like Lashaine.

The population is primarily agropastoral, with larger numbers of livestock compared to Lashaine. The majority of the residents are Maasai, but WaArusha make up between 20-40% of the population. Similar to Arkatan, these two ethnic groups coexist together, and it would be difficult to tell them apart from each other in any way, except by asking them, as their *bomas*, crop fields, corrals, and so forth appear identical. I interviewed men at 13 Maasai *bomas* and 9 WaArusha *bomas*.

The crop fields ranged from 1.2 ha to 24 ha, and averaged 6.6 ha in size. Most farms were not using pesticides, no one was using fertilizer, and 86% of the farms were using hybrid seeds. The high adoption of hybrid seeds seemed to be the result of both higher rainfall compared to other areas, and the introduction of hybrid maize through a loan program by the Arusha Diocese Development Organization (ADDO). The crop fields were entirely maize and beans, with the exception of some small plots of tobacco and vegetables grown at the higher elevations. The bean varieties grown included Ngwara, Canadian, Soya, Rosecoco, and Red Masai and Maulazi beans. One farmer was growing a small plot of sorghum.

The village had a number of primary schools, a couple of grain mills, and was within 8-10 kilometers of Monduli town, where many other services and a number of secondary schools were located.

Everyone in Lendikenya was complaining about wildlife in crop fields in late July, especially zebra. When I visited, it was the beginning of the harvest season. In the mornings many *morani* were resting outside the huts, after long nights chasing wildlife from the nearby crop fields.

As pointed out by the two women interviewed in Lendikenya,

"There is a problem, with the zebra being the most destructive. They sneak in even if you are in the field. If they hear nothing, they will sneak in. They are very smart animals." [8]

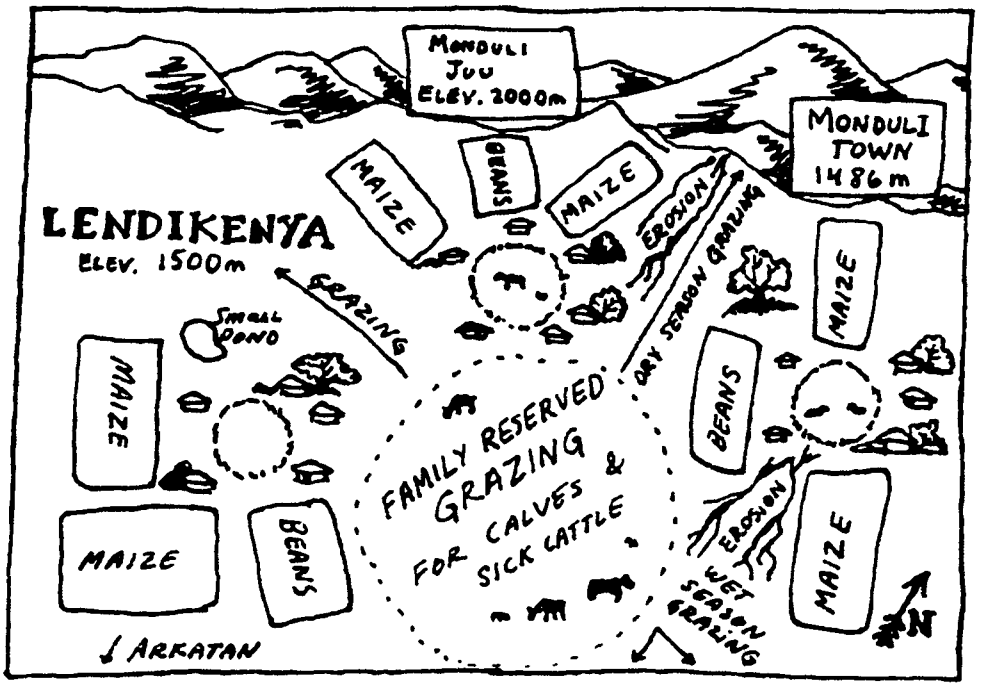

Figure 5.11 - Lendikenya Village

At another boma another man replied to a question about wildlife in crop fields,

"Yes, Zebra are the problem, there are so many around, that when the sun goes down you have to chase them. The cattle become afraid and want to run away. It is a real problem!"[9]

Other than zebra (*Equus burchelli*), the most troublesome animals were wart hogs (*Phacochoerus aethiopicus*), porcupines (*Hystrix cristata*) and bush pigs (*Potamochoerus porcus*).

[8] Interviewee #70
[9] Interviewee #75

Lendikenya, being largely in a sub-humid zone, seemed to have high potential for both crop growing and livestock production, given its rainfall and deep volcanic soils. However, nearly all the residents were aware that more appropriate soil conservation measures were needed.

5.6.6 - Lolkisale

Of all the villages visited during my formal interviews, Lolkisale was one that unfortunately had the poorest representation in my study of both *bomas* and sub-villages. Lolkisale was nearly impossible to reach during the 1998 rainy season, and was the last village I visited in my 1999. The village executive officer was very helpful, and was likely the most organized and willing to help me in getting a random sample. He was the son of an extension officer in Monduli town, with whom I had spoken a number of times about my work.

Lolkisale is well known in Arusha as a bean growing area, with a number of large commercial farms run by expatriates[10]. I had met a number of these farmers in Arusha on various occasions. Their farms consisted of hundreds of hectares, which were cleared of all bushes and natural vegetation. These were just outside Lolkisale village. They were operated with the exclusive use of tractors and there were no signs of weeds, which indicated that herbicides were widely used. In comparison, the local population had much smaller farms, where they occasionally hired tractors, but more commonly used oxen for plowing and planting. All of their fields were weeded by hand, and this limited both the effectiveness of the weed control and the size of the fields.

Most of the fields in Lolkisale were located near Lolkisale Mountain, which was a distinctive feature on the plains south of the Great North Road running from Arusha to Makuyuni (see Figure 5.12). The land near the mountain received higher rainfall than the

surrounding area, and was therefore used for growing beans. There was some maize production, but the rainfall was more conducive to bean production.

The majority of the farmers in Lolkisale village were WaArusha. However, outside the main village and further to the south in Simanjiro was a Maasai area. The 5 farmers I interviewed in Lolkisale were all WaArusha. The farms were growing both maize and beans. The maize was primarily for home consumption and the beans were a cash crop. The bomas I visited were between 1518m and 1570m in elevation. Lolkisale Mountain had an elevation of 2132m.

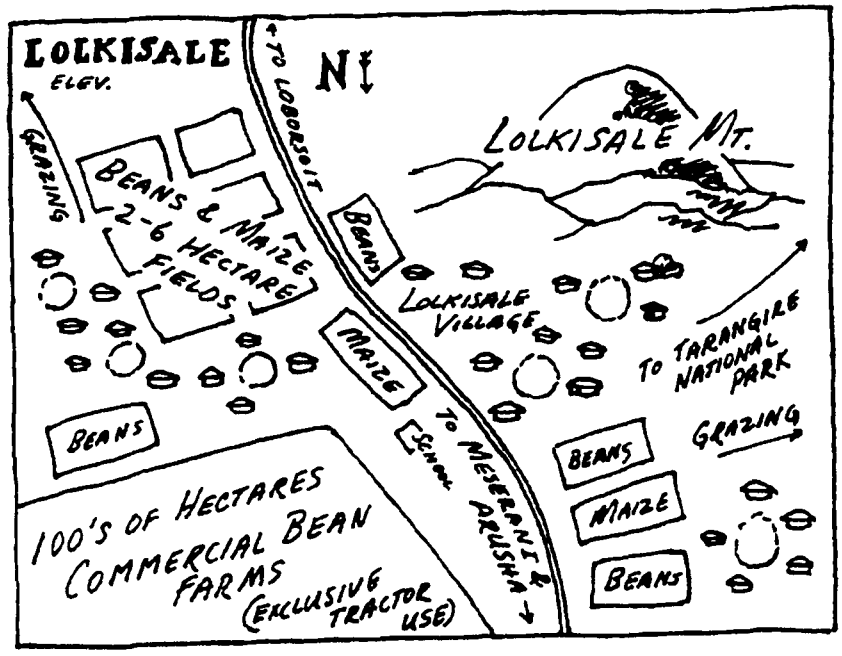

Figure 5.12 - Lolkisale Village

The crop fields ranged from 4 ha to 178 ha. The large farm was one owned by a WaArusha man that had 16 ha of crops near his home in Lolkisale. In each of two other sub-villages he had another 80 ha. Some of this was used as his own private grazing area, exactly how much was in crops was hard to decipher, but he was obviously a well respected farmer,

[10] This was similar to what was described by Lama (1998) in nearby Simanjiro.

with significant holdings. All of his fields were plowed with a tractor, and all were then planted with oxen and a plow. Using only the 16 ha, near this large farmer's boma, the average size of crop fields per boma interviewed in Lolkisale was 13.5 ha. All of the respondents had livestock, 3 of them men had very young families and very few livestock, as estimated by their tiny corrals. These young men (aged 30-39) were also borrowing oxen to do their field preparation.

Most of the farmers were using pesticides on beans, as it was readily available and bean pests were a real problem. None of the farmers were using fertilizer and the beans they were growing included Maulazi, Red Masai, Rosecoco, Soya, Canadian beans and cowpeas. Wildlife near the mountain that frequently attacked the crops, included wild pigs (*Potamochoerus porcus*), wart hogs (*Phacochoerus aethiopicus*), olive baboons (*Papio anubis*), black faced vervet monkeys (*Ceropithecus aethiops*), porcupine (*Hystrix cristata*)., and on the outskirts of the village Cape buffalo (*Syncerus caffer*). The farmer with the largest plots said that elephants (*Loxodonta africana*) are a problem on the Tarangire side of the mountain.

5.6.7 - Losirwa

Losirwa is located on the flat plains between the Losimingori Mountains and the Great Rift Wall. It is adjacent to Mto wa Mbu on the west and Esilalei on the south. This has been and continues to be exclusively a Maasai area, although Mto wa Mbu diverse population is moving out toward the edges of Losirwa village. Many of the Maasai *bomas* are right next to the main road that runs from Makuyuni to Mto wa Mbu. Others are further north on the rolling hills toward Selela. I conducted interviews in 10 *bomas*. The elevation of the *bomas* visited ranged from 956m to 1093m with an average elevation of 1014m. There is a Catholic Church in the village, and schools and shops nearby in Esilalei and Mto wa Mbu.

A few of the farms had crop fields near the *boma*, however, most were located at lower elevations nearer Lake Manyara or at the edge of the Great Rift Wall (see Figure 5.13). The irrigated plots were not as large or well developed as those were in Selela and Engaruka. Beans and maize were grown in both rain-fed and irrigated fields. The beans grown included Canadian, soya, kichumba[11] and red Masai beans. Rice was grown in irrigated fields by 2 of the 10 men interviewed. One man was growing chick peas and cowpeas. The cropping areas of each *boma* ranged from 1.6 ha to 13.4 ha. The average number of hectares under cultivation was 5.8 per *boma*. Although one respondent said he owned 40 ha, which he could cultivate, but was only cultivating 8 ha.

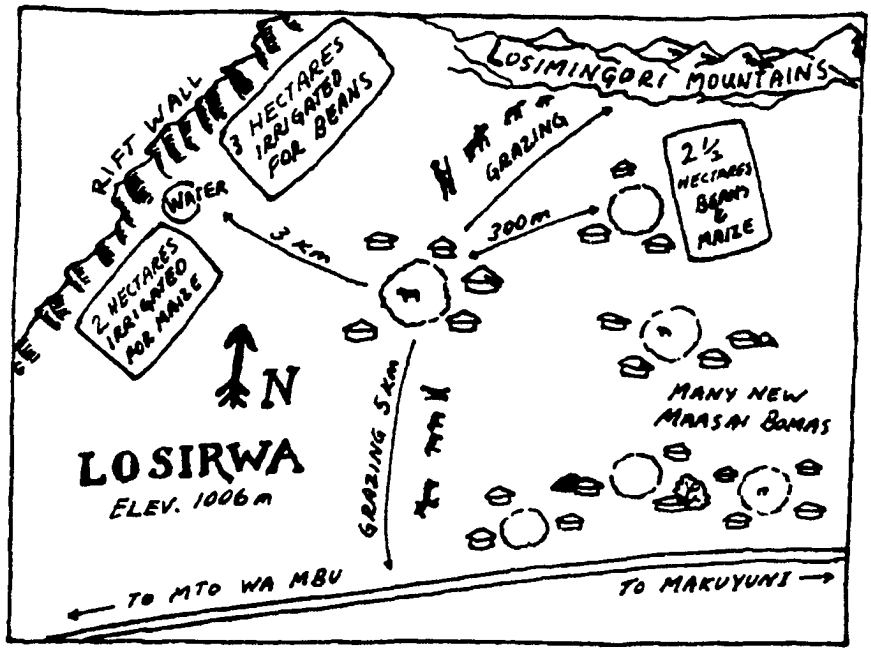

Figure 5.13 - Losirwa Village

The amount of livestock owned by the men interviewed was harder to determine in Losirwa, as they admitted that some of their livestock were not at these *bomas*. Most of the corrals were medium to large in size, indicating 20-40 head of cattle and larger numbers of

[11] Kichumba are small red beans

small stock. Observing the movement of cattle in the morning, upon my arrival for interviews most herds were no larger than thirty or forty head, although some men admitted that not all their stock was here. Twenty percent of the *bomas* visited were using pesticides for beans, only one of them was using fertilizer. Most of the irrigated crops looked fantastic, but the crops on higher elevations were generally poor, suffering from poor fertility, army worm damage, and dry conditions.

In every village there seemed to be an exception to the typical agro-pastoral practices. Statistically this would not mean much, but in the transfer of technology, particularly more sustainable food productions systems, one person can make a huge difference over time. There was one Maasai man in Losirwa who had only been in the area 6 years. He seemed a bit radical, as he had just squatted the land, without gaining prior permission to grow crops where he built his home. He had traveled around a bit and lived in other areas, but was a Maasai. Approaching his *boma* it was obvious that he was doing something different. His crops were far more productive than other nearby farms. He was very interested in sharing his success. He was the only farmer in Losirwa I visited that was using manure. He was practicing crop rotations, and he was the only one growing chickpeas and cowpeas which thrive in the drier soils. He was also growing tomatoes just outside the corral, and one of three farmers interviewed that was using hybrid seeds. He was using commercial fertilizers and some herbicides. Yet, he said it was only urea on the maize, as a side-dress, and pesticides on the beans if there is a problem. His results were amazing, and the success he has had, may influence others to adopt his more productive practices.

5.6.8 - Mbuyuni

Mbuyuni is located on the north and south sides of the Great North Road between Arkatan and Makuyuni. The village itself covers a huge area, which is deceiving, as many of the sub-villages are in lower areas that are not visible from the road. Mbuyuni had a number

of small shops, a large primary school, and grain mill. Mbuyuni's sub-villages included; Barabarani, Naiti, Lambo, Lolerae and Orkisimai, the location of which are noted in Figure 5.14. I conducted interviews in 20 *bomas,* 4 in each sub-village.

The elevation of Mbuyuni varied from 1187m in Orkisimai to 1482m in Lolerae. The average elevation was 1278m. The lower sections were located east of Makuyuni and to the in the depression between the Great North Road and the Losimingori Mountains (see Figure 5.14). Mbuyuni seemed to have the driest soils/climate in any of my study areas, with the exception of Engaruka Chini from the irrigation channels. It also had a very stony soil, which posed great difficulties when plowing with tractors. Oxen could more effectively plow the fields. Much of Mbuyuni also had small bushes and trees, especially in lower elevations. These trees with the sparse grass below them, provided grazing for livestock. It also provided a great habitat for wildlife. Wildlife such as zebra and impala were seen daily near crop fields, but not in the densely populated areas. The wildlife conflict in Mbuyuni was one that was mentioned in every interview. It was the only village where birds were mentioned, and this was several times, specifically pointing to hornbills (*Tockus erythrorhynchus*) and guinea fowl (*Numida meleagris*). Impala (*Aepyceros melampus*), kudu (*Tragelaphus strepsiceros*), giraffes *(Giraffa cameloparadalis*), elephants (*Loxodonta africana*) , Black Faced Vervet Monkeys (*Ceropithecus aethiops*), and ostriches *(Struthio camelus*) were also considered troublesome, but not to the degree of zebra (*Equus burchelli*), wart hogs (*Phacochoerus aethiopicus*) and porcupines (*Hystrix cristata*). Zebra were by far the worst agricultural pest.

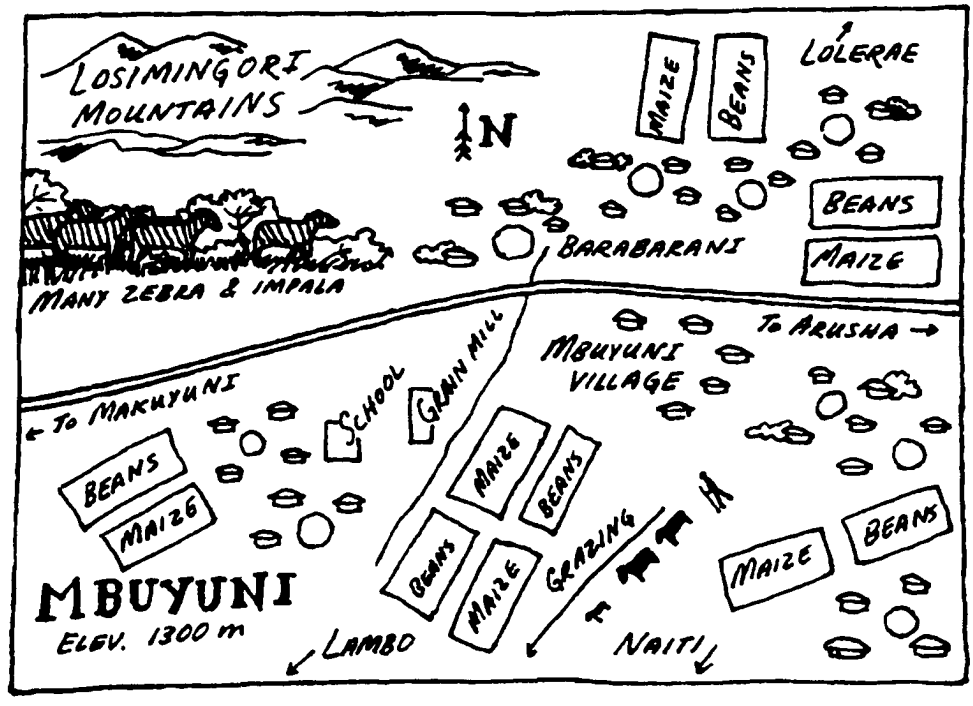

Figure 5.14 - Mbuyuni Village

The vast majority of the residents in Mbuyuni are WaArusha. All of the men I interviewed were WaArusha. A number of farmers interviewed owned and had used tractors. However, all of them said the future is in oxen. Even the men with tractors used oxen for the majority of the planting, and as insurance when a tractor broke down.

One man said with regard to the use of tractors, "*Most of the people will use oxen, For those that have been using a tractor in the past, many have stopped, because they lost the ability (either the tractor broke down or the crop prices won't cover the expenses) to use a tractor and are now using oxen.*"[12]

The fields tended to be larger than other villages in my study, but the crop yield was extremely low. Most residents grew maize for food, and beans were grown for cash. Pesticides were used by 95% of the men interviewed, but primarily on beans. Livestock - keeping was practiced by all the men interviewed. However, the corrals were significantly

smaller than those seen in Esilalei and Losirwa. They were, however, larger than the corrals seen in Lashaine. There was ample space for grazing, although the grass was sparse.

The crop fields for each *boma* ranged from 1.2 ha to 45 ha in size, and averaged 14 ha. Unlike Lashaine, where large plots were sometimes not used, the fields in Mbuyuni were significantly larger. Many of the fields were growing only beans, which is more drought tolerant. There was also maize in some of the larger fields, but with a much lower yield than other villages I visited. The major complaint was a lack of water. More than any other villages, the WaArusha of Mbuyuni constantly complained about a lack of water for people, livestock and crops. They also were the village that felt most strongly that the rains in recent years were less, due to the cutting of trees and bushes, the native vegetation. This was a difficult area for many of the WaArusha to adapt to. Most of the older men were the original residents that had been settled here by the government. For some of the men they had been moved to Ngorongoro area, but later were forced to leave and were given plots here. It was a difficult place to grow crops, especially when many of the older men grew up in the well-watered and fertile areas near Mt. Meru.

No one was using fertilizer, very few were using any manure. Seventy-five percent (75%) of the farmers interviewed had used hybrid maize seeds, but most were not buying these regularly, as the cost of the seeds and the risk of losing the crop usually outweighed the potential higher yield, with little or no fertility enhancement. There was a wide variety of beans grown including Canadian, *soya, rosecoco, choroco*[13], *katenda*[14], and red Masai beans, as well as cowpeas, chick peas, and ngwara. There was also one farm that was growing sorghum, primarily for preparing local brews.

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[12] Interviewee #90

[13] Choroco are small black bean, a type of lentil.

5.6.9 - Mswakini

Mswakini is located on the East side of the road from Makuyuni to Babati. This road is paved part way, primarily to get tourists to Tarangire National Park. The village covers a large area, just outside the Northeast side of Tarangire National Park. (see Figure 5.15). Given its proximity to the National Park, wildlife conflict is a major problem. Mswakini village has a number of small *dukas* or shops, a couple of camping sites for tourists, and a large primary school as well as numerous piped water sources both funded by Tanzania National Parks (TANAPA). The school and water sources were constructed, primarily to appease the citizens, as they are not paid anything for damage done to their crops by wildlife (URT 1998). The residents are not allowed to kill the wildlife, including the elephants, which are the most hazardous and troublesome agricultural pest in the area. Mswakini's sub-villages included Mswakini Chini, Mswakini Juu, and Mswakini Kati. I conducted interviews in 12 *bomas,* with 4 in each sub-village.

The elevation of Mswakini varied from 953m in Mswakini Chini to 1190m in Mswakini Juu. The average elevation at the bomas I visited was 1051m. Mswakini had a better soil for crop growing than did Mbuyuni. The soils were slightly sandy, but relatively stone free. Like Mbuyuni, Mswakini also had many small bushes and trees, but these were more common in higher elevations, with more grass than what was observed in Mbuyuni.

Being adjacent to Tarangire National Park this also provided a great habitat for wildlife. Wildlife such as ostrich (*Struthio camelus*) and zebra (*Equus burchelli*) were seen during the day near crop fields. Elephants were seen just over the border in Tarangire. The men I interviewed said elephants usually come out of the park in the cover of darkness, to sneak into the fields or even the *boma*.

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[14] Katenda was a small white bean.

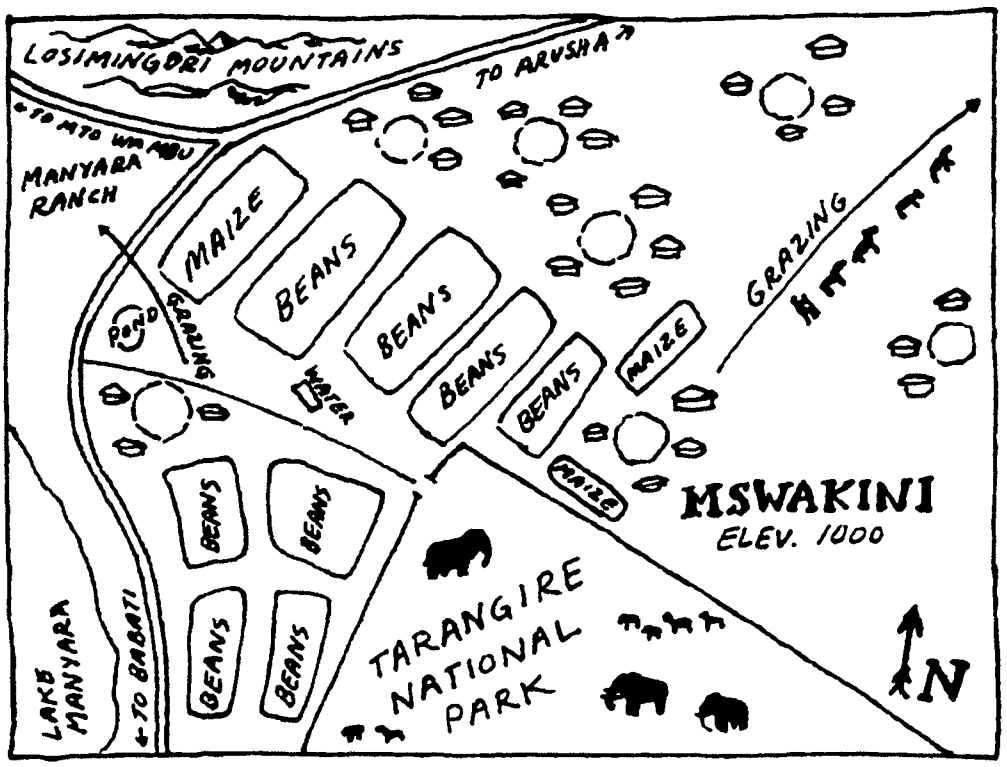

Figure 5.15 - Mswakini Village

According to one man I interviewed,

> *"Elephants can come to the boma and even take a 100 kg. sack of maize from your hut, they carry it in their trunk, walk away and eat it. A person in this village can grow 4 acres and only harvest only 1 acre. We try to chase the animals away, but elephants are dangerous, if they become angry you are in trouble."* [15]

The wildlife conflict in Mswakini was mentioned in every interview. Elephants (*Loxodonta africanus*) were the most feared and troublesome agricultural pest. Zebras (*Equus burchelli*) were discussed with almost equal disgust. Wart hogs (*Phacochoerus aethiopicus*) and porcupine (*Hystrix cristata*) , ostriches (*Struthio camelus*) and Thompson's

[15] Interviewee #108

gazelle (*Gazella thomsoni*) were also mentioned in most interviews, but were not as much of a threat to the crops as were zebra and elephants.

Almost all of the residents in Mswakini are WaArusha, Sakita (2000) estimated them to comprise 98% of the local population. While this was once a Maasai area, most have long since left. Residents that are not WaArusha, are most likely employed by TANAPA or another tourist related businesses. All of the men I interviewed in Mswakini were WaArusha. Like Mbuyuni a number of farmers that I interviewed owned and had used tractors. They too agreed that the future is in oxen.

Given the size of the crop fields it might seem that tractors would be more economical, however, as one old man in Mswakini said with regard to the use of tractors vs. oxen,

> *"My sons will continue to use oxen. I have learned from people that had tractors and have now stopped using them because of a lack of spare parts. People often have to sell all their cattle to buy spare parts. Cattle don't need spare parts, only enough grass and water."* [16]

The average cropping area per *boma* in Mswakini was the highest in my study area.[17] The crop fields for the twelve *bomas* ranged from 8 ha to 48 ha in size, and averaged 20 ha. Like residents in other villages, beans were grown for cash. Maize was in better condition than nearby Mbuyuni. I was visiting during the harvest season and the bean crops were significant compared to what I had seen in other areas, despite wildlife damage. Pesticides were used by 80% of the men interviewed, but primarily on beans. Livestock were kept by all of the men interviewed, and the corrals seemed slightly larger than those seen in Mbuyuni.

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[16] Interviewee #111

[17] Lolkisale could have larger average crop fields, as my sample was not representative of the population in all of the sub-villages. However based on observation, and my own travels to Simanjiro and the research conducted by (Lama 1998 & Igoe 2000) in nearby Simanjiro, this would certainly seem to be the case.

No one was using fertilizer, but 75% of the men interviewed were using manure on their fields. In some cases this was only used on nearby fields, but there were ox-carts in a number of the bomas visited, which would influence whether or not manure would be used.

Half of the men had used hybrid maize seeds, but most were not buying these regularly, as the cost of the seeds and the risk of losing the crop to wildlife outweighed the potential higher yield. There was a wide variety of beans grown including Canadian, *soya, rosecoco, choroco, katenda*, and red Masai beans, as well as cowpeas, chick peas, and ngwara. There was also one farm that was growing 4 ha of sorghum, but admitted losing most of it to birds.

5.6.10 - Selela

Selela was similar to Engaruka in that it was highly also developed agricultural area, where primarily Maasai were practicing intensive agriculture using irrigation. Like Engaruka the residents used irrigation canals to draw water from a permanent river descending from the Ngorongoro highlands (see Figure 5.16). Selela residents could also reap two harvests of most crops every year. During the month of July when most of the district was harvesting their only crop, Selela residents were busy plowing with oxen and planting their second crop. They grew maize and beans, as well as bananas, rice and assorted vegetables. Tomatoes were a common vegetable grown as a cash crop.

Selela is about 30 km directly north of Mto wa Mbu. It is approximately half-way between Mto wa Mbu and Engaruka (see Figure 4.1). Selela's sub-villages include Shuleni, Ranchii, Nadosoito and Selela sub-village. I conducted interviews at a total of 13 bomas, 3 or 4 in each sub-village. The elevation varied from 992m in Shuleni sub-village to 1170m in Nadosoito sub-village. The average elevation in the bomas visited was 1080m. Nadosoito sub-village is located near a large number of irrigated fields on either side of the road to Engaruka. There are hundreds of hectares of crops grown in this area. Below the main village

of Selela is Shuleni sub-village where more irrigated fields are located. The main village has a regularly scheduled market, a primary school, a number of small shops, and drinking establishments. There is also a grain mill in the town as well as a medical dispensary and a village office building. It sounds like more than it really appears to be, as many of the buildings are simply mud and wattle huts. There is a fairly diverse cross-section of people living in the main village, but the majority of the population is Maasai.

Most of the Maasai are practicing agriculture and livestock keeping, but livestock numbers were significantly lower than other villages in my research area. This lack of livestock is quite apparent, as few animals are seen and many bomas had very small corrals. Cattle numbers have been limited by the presence of the Tsetse fly and many people in this village are poor and cannot afford to buy cattle.

One of the men interviewed said,

> *"This area has plenty of grass, and is frequently used by Maasai in neighboring areas during the dry season, as there is ample grass in the lowlands between Selela and Losirwa. However, most of the Maasai are more farmers than they are herders, they invest their profits in land, not livestock, but the problem is marketing the vegetables they grow."*[18]

There were herds of cattle grazing east of Selela in Ranchii sub-village and also South of Selela closer to Losirwa. However, this was an area filled with bushes and small trees, a significant amount of wildlife, both likely the reason there were Tsetse flies. The bomas in this area were more traditional Maasai bomas with small crop fields 3-5 km away in the irrigated area near Shuleni sub-village.

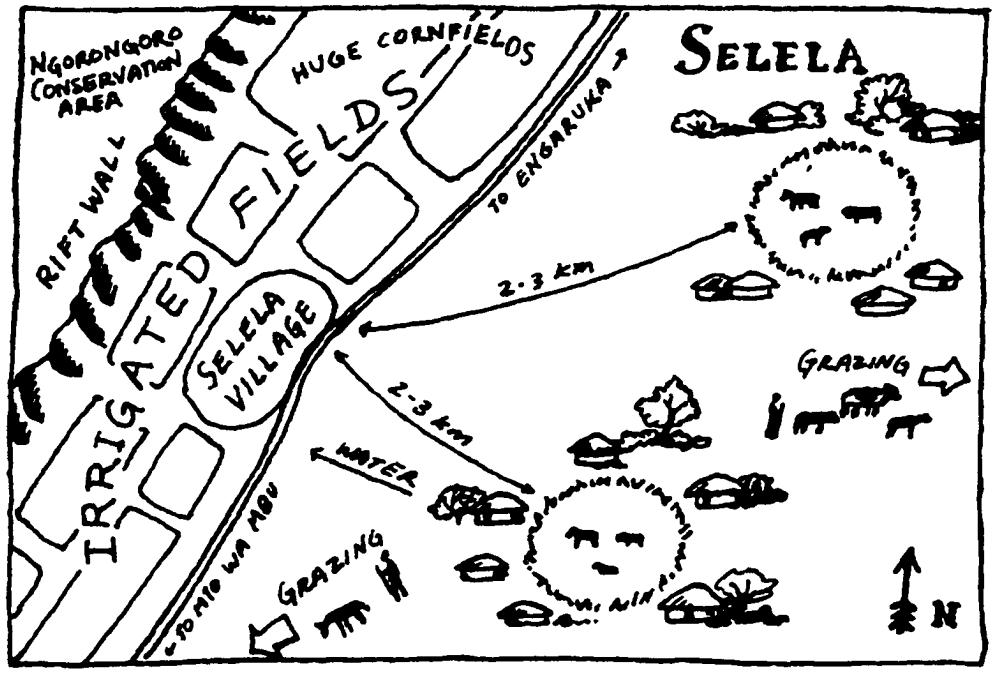

Figure 5.16 - Selela Village

The primarily irrigated crop fields ranged from 2.4 ha to 20 ha, and averaged 7.2 ha in size. I interviewed men from 13 bomas, all of them were Maasai. I likely could have found non-Maasai farmers if I searched them out, but it was the Maasai that I was seeking. It was interesting to note that most of the farmers could get some irrigated land given to them for crops from the village. This seemed to be about 2-4 ha. If someone wanted more than this they had to buy it. There were a number of men I interviewed that were quite proud to show off the land that they had purchased, which in Chapter 6 is described as illegal in most situations.

Since there was a wide variety of crops grown, pesticides were used by 77% of the men interviewed. Fertilizers were only used for tomatoes. Hybrid maize had been used by about half of the men interviewed, but it was clear that this was not something that was purchased annually. The crops were primarily maize and beans, especially in Nadosoito sub-

[18] Interviewee #26

village. In the village at large, the bean varieties included rosecoco, kichumba[19], Canadian, soya, choroco and ngwara. Rice was commonly grown, as well as numerous tree fruits such as Mangos, avocado, papaya and even onions in irrigated areas. Fingermillet (used for brewing beer) was grown by a number of men interviewed as well.

The villagers in Engaruka frequently mentioned the wildlife problems in Selela, in comparison to their own village. As put by one Maasai man in Selela, "*All the wild animals seem to be eating my crops.*" [20] There were complaints of hyena (*Hyaena hyaena*), porcupine (*Hystrix cristata*), black faced vervet monkeys (*Ceropithecus aethiops*), olive baboons (*Papio anubis*), elephants (*Loxodonta africanus*), bush pigs (*Potamochoerus porcus*), Thompson's gazelle (*Gazella thomsani*) and eland (*Taurotragus oryx*) all invading the irrigated crop fields near the rift wall. The difference between Selela and Engaruka was that Selela village was on a hill overlooking the irrigated fields below. There was also a large break in the rift wall, which seemed to be a corridor for wildlife coming down out of the Ngorongoro highlands. The most troublesome animals discussed were the Cape buffalo (*Syncerus caffer*), zebra (*Equus quagga*) and wart hogs (*Phacochoerus aethiopicus*). There were also herds of giraffe (*Giraffa camelopardalis*) nearby, as well as, impala (*Aepyceros melampus*), and wildebeest (*Connochaetes taurinus*), but these two did not seem to bother the crops.

Selela was a fascinating place. From the village center there were spectacular views up and down the rift wall. Wildlife was easily seen when traveling in almost any direction out of the village. It was a small village with a lot going on. Two older men told me that they

[19] While this may have been the case, it does disagree with Sutton's theory of Selela being another agricultural area south of Engaruka. There certainly could have been people there in the 18th century as Sutton suspects, and at that time would have lived lightly on the land. However, in Engaruka, there are still

[20] Interviewee #28

came here in prior to 1973, when the place was still wild. No one had lived here.[21] The old Maasai men as young wandering *morani* thought Selela would be a good place to go to settle. They later moved from Engaruka. They supposedly introduced oxen to the area from Engaruka. The distance from Mto wa Mbu makes hiring tractors were very expensive, therefore, oxen continue to be commonly used. Selela like Engaruka was a unique place to see so many Maasai adopting intensive agriculture.

5.7 - Summary

The beginning of this chapter portrays my research area in Monduli District, with regard to the general geography, environment and landscape. I have also highlighted each of the villages where I conducted research, with numerous drawings to display the layout of both the villages described and the typical *bomas* visited. Below, I have constructed Table 5.1 below, in order to highlight what was described earlier in this chapter. This format allows a faster comparison of villages, and in essence describes what was drawn in Figure 5.5. It also adds a few observations not mentioned, including: the average year the village was settled, the grazing availability (based both on observation and discussions with interviewees), the general cropping strategy, that is whether it was intensive, extensive or some combination and finally the ethnic group based on observation and discussion, as presented in Chapter 3.

stone ruins likely from the civilization Sutton mentions.

Table 5.1

Research Village - Summary Table I

Village	Average Elevation	Average Farm Size	Ethnic Group	Avg. Year Settled	Grazing Availability	Cropping Strategy[22]	# of Interviews
Arkatan	1325 m	7.7 ha	60% Maasai 40% WaArusha	1973	Good	Mixed E & I	8
Engaruka	874 m	4.7 ha	60% Maasai 20% WaArusha	1960	Very limited	Intensive	12
Esilalei	1046 m	11.33 ha	90% Maasai	1981	Excellent	Extensive	12
Lashaine	1409 m	3.5 ha	90% WaArusha	1968	Severely Limited	E – some I methods	16
Lendikenya	1466 m	6.6 ha	70% Maasai 30% WaArusha	1983	Fair	E, with some I – practices	22
Lolkisale	1549 m	13.5 ha	55% WaArusha	1975	Fair	Extensive	5
Losirwa	1014 m	5.8 ha	90% Maasai	1960	Good	E, a little Irrigation	10
Mbuyuni	1278 m	14 ha	90% WaArusha	1969	Fair	Primarily E	20
Mswakini	1051 m	20 ha	99% WaArusha	1974	Good	Primarily E	12
Selela	1080 m	7.2 ha	70% Maasai 10% WaArusha	1981	Fair	I- with Irrigation	13

[22] E represents Extensive agricultural methods, I represents Intensive agricultural methods

CHAPTER 6

LAND TENURE IN TANZANIA

6.1 - Introduction

Agriculture, environmental problems and land use change among the Maasai and WaArusha in Monduli District, are all affected by the land tenure system in Tanzania. I did not initially intend to study land tenure. However land tenure or the lack of it in East Africa has created many of the problems described in later chapters. It has influenced the landscape and the agricultural system. This chapter will view the current grazing and agricultural land issues facing the Maasai, the land tenure system in Tanzania, and will describe some data on these topics from my own work with the Maasai and WaArusha. In each interview I inquired about how land had been acquired, and how land use had changed with regard to both grazing and crop growing areas. One trend throughout much of my research area was that grazing land is shrinking as agricultural or crop growing areas expand.

The pastoral dilemma in places like Monduli District might be described as the "tragedy of the commons". Whereby, the users who share the common grazing areas have no incentive to conserve them or care for them in such a way to ensure those areas ecological and productive capacity over time (Hopcraft 1981, Gardin 1998). Yet, there is more to it than this simple statement. Historically, all Maasai land was used by the community (Arhem 1986, Ndagala 1998). The Maasai had a degree of control over the common land resource that is often not seen in other cultures (Galaty 1991, McCay and Acheson 1996). However, between

colonial land grabbing policies and a rapidly growing native population in pursuit of new land for crops, this created a situation where the Maasai could no longer, through traditional means, control their land.

According to Bennholdt-Thomsen and Mies (1999:160), *"Hardin made his statement with a fair degree of cultural and historical ignorance, to justify over consumption in the North"*, without recognizing the economies, resources, and social structure that were the norm for people like the Maasai.

This ever-increasing pressure on rapidly dwindling lands led to many of the environmental problems, which will be discussed in later chapters. The major difference between the Maasai and other societies where the "tradgedy of the commons" inducing behavior was common[1], is that the Maasai did control these resources (Galaty 1994b). They fought for access to these common property resources and established themselves on the Kisongo Plains, hundreds of years ago (Galaty 1993). Their entire system of pastoralism was based on using and sharing resources with other Maasai in a way that would benefit their people in times of drought, disease or inadequate grazing.

The Maasai understand the interrelationship between the people and their ecosystem. For centuries, they have used the land as the sole source of almost every element in their life, in ways that are sustainable for the land and for all wildlife sharing it (Western 1997, MERC 2000). They understand the need to maintain a healthy environment, and they fully recognize the environmental changes that have taken place. Yet it has been the alienation of their land and lack of secure tenure that has changed their environment. They have continuously lost land to other uses, created by pressure from the outside world, primarily wildlife parks

[1] A few other examples include over fishing until ocean stocks are depleted and air pollution in Asia, Europe and North America.

(Homewood and Rogers 1991, Igoe 2000) and agricultural encroachment (Ole Saitoti 1978, Galaty 1994b).

This lack of secure land tenure has faced the Maasai since the early Colonial governments (Neumann 1995b, Ndagala 1998). Little has changed with regard to alienation of land to this day (Galaty 1994b, Igoe 2000). The government, private and public industry, and even neighboring tribes have all taken land that was once considered "Maasailand" (Arhem 1986, Galaty 1994b). Both Hogg (1990) and Shivji (1998) pointed out that there was no evidence that the contention that to overcome the "tragedy of the commons" Africans must adopt the western notion of private land ownership. However, without some change in the security of land tenure in the near future, the Maasai will continue to see their land, their herds and their lifestyle disappear (Ole Saitoti 1978, Galaty 1994b).

6.2 - Land Tenure in Tanzania Today

The land tenure situation today in Tanzania is somewhat difficult to understand from a Western perspective. There are many ways that land has been controlled, but ultimately the government has always had the final say in land tenure issues. The government or the State is the main custodian of the land following the 1923 legislation and the subsequent amendment (Shivji 1998, Sosovele 2000). In terms of management, there is land that is managed by the local government under the Village Act 1998, but it has been argued that the local government is often seen as a branch of the national government (Sundet 1996).

Bagachwa et al. (1995:59) had the most accurate description of the current land tenure system in Tanzania.[2] I used their definitions and ideas, but I have added my perspective and examples to help describe each form of land tenure below.

[2] I must admit that I really did not understand the importance of land tenure or its complexity in Tanzania, until I began to write this chapter. I had to frequently inquire about the vague and conflicting written information I found, with researchers like Sosovele, Igoe, Brockington and finally my research assistant Lobulu Sakita.

1) ***Granted Right of Occupancy or public sector land:***

The state leases land to the individual or communities for a specific period of time, 33, 99, or 999 years. (This is often the method by which international corporations, tourist companies, large landowners, or local entrepreneurs gain access to huge tracts of land (Lama 1998, Igoe 2000).

2) ***Communal or village ownership of land:***

All land under village control is deemed to be under collective ownership. It must be surveyed and demarcated before a certificate of ownership is issued.

This would include common grazing areas, forests, swamps, and land that are not being used for housing or crop growing. There have been disputes over which village controls areas that have been commonly used by numerous villages in the past. Example in my research area included Sepeko, a common grazing area, which is used by Lendikenya and Arkatan.

3) ***Right of Occupancy land:***

These parcels of land are under the control of individuals for the purpose of developing them into agriculture, livestock keeping or service industries.

This land use right is granted to everyone under customary tenure access to land and they may use it as long as possible. This land is acquired by individuals in order to implement various projects of developments, including the expansion of agricultural holdings. The key factor is continued use, which gives the user, user's right and a quasi "ownership'. If the use of the land is stopped for any reason the right of occupancy is also stopped and assumed by another person, who will be granted that land by the authorities. Even though a title is filed with the government, in Tanzania there is no guarantee of

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However, even this seemingly vague situation, the law is clear about who owns the land in Tanzania. It is the State (ie. the President) on behalf of the people.

transferability, as all the land is still controlled by the government, that may find better uses for the land in the future (Shivji 1998).

4) ***Customary or Traditional Tenure:***

The land is gained through inheritance or customary rules among tribes, clans or kins-people.

Most of the people living in rural areas are growing crops on land that has been used prior to independence and villagization or land they inherited from their immediate family. In some cases these plots can be very large, and some villages have taken some of this land to redistribute it to others. A number of farmers in my research area, admitted to having given up land that they had considered theirs, for the benefit of those in need of agricultural plots.

There is another mechanism of accessing land that is under customary tenure (and even leased land), not mentioned by Bagachwa et al. (1995). Most villages allocate land to villagers as needed for building new homes and growing subsistence crops. This subdivision of land is common in most areas. This is referred to as the concept of user rights. It is somewhat different than customary tenure, in that the land is allocated by the village. However, provided the land is used as requested, this form of user rights usually reverts to customary tenure in the next generation (Sosovele 1999). This system of land subdivision, due to a shortage of land can lead to numerous problems including social conflicts, environmental degradation and a decline in production (Shivji 1998, Sosovele 2000).

6.3 - The History of Land Use and Land Tenure in Tanzania

The current policy of land tenure presented above displays the complexity of land tenure in Tanzania. The history of land tenure in Tanzania is complicated, and has been especially challenging for pastoralists. State ownership of land began during the colonial period, when the 1923 Land Ordinance was passed and power over land was given to the Governor. After independence, Tanzania continued what the colonial government had begun. Despite numerous efforts to have more concrete policies (URT 1994, Sundet 1996 & 1997, Shivji and Kapinga 1998), the system continues to favor those in power, and exploit those that use the land for grazing or subsistence agriculture.

6.3.1 - Wildlife Parks, White Settlers and Agricultural Encroachment

The sedentarization of pastoralists has been a priority for governments in Tanzania for decades (Neumann 1995b, Igoe 2000). Both the Colonial and Independent governments have insisted that the animal products can be more efficiently produced if the pastoralists would practice more sedentary agriculture (Homewood and Rodgers 1991, Neumann 1995b, Ndagala 1998).

According to Raikes (1981:23-24), often pastoralists have been viewed as economically irrational,

> *"This being evidenced by their tendency to accumulate cattle without regard to the economic benefits accruing from sale and unresponsiveness to price incentives and the phenomena like preferences for particular colors or shapes and sizes of horns..."*[3] *"Pre-colonial herding societies had strict controls over the use of pasture and the major causes of overgrazing has been the alienation of land and destruction of the social systems upon which such controls were based – both beginning during the colonial period and continuing since them."*

[3] Many politicians and officials in Tanzania continue this thinking of the Maasai as irrational to this day.

Interestingly the Maasai's less destructive (Howell 1987, Ndagala 1998), more environmentally friendly (Graham 1989, Galaty 1994b, Olol- Dapash 1999), and possibly most sustainable agricultural model for Tanzania's semi-arid land has been tossed aside (Ole Saitoti 1978, Sandford 1983, Scoones 1995). This is due to government pressure, which continues to disregard the reality of many failed ranching schemes (Lindsay 1987, Galaty 1994b), failed policies of creating water holes in drought prone areas (Scoones 1995, Western 1997), and in Tanzania the failed policy of getting people to live in Ujamaa villages where they would all work happily for the good of the community (Coulson 1982, Hodd 1988, Galalty 1994b).

Rigby (1992:28) said,

> *"This was a fundamentally racist and contradictory nature of colonialist conceptions of history and the culture of Africans in general and Maasai in particular. On one hand there is the nostalgic admiration for an invented past; on the other, an oft repeated and therefore deeply desired end to the Maasai. This contradiction is still manifested, not only in popular representations of Maasai* (where it might be expected on grounds of racist or ethnic prejudice) *but also in professional commentaries on development in Maasailand."*

Sedentarization has meant for the Maasai changing their migratory cattle raising patterns, which were largely based on surviving the droughts that frequent the area (Scoones 1995, Galaty 1994b). In Kenya, when eliminated from important watering areas in Amboseli, the Maasai without alternative water supplies had to watch their cattle die or resist the laws and graze (and water) their cattle inside the park. (Peluso 1993, Western 1997)

Throughout Maasailand, the Maasai have controlled land that was considered theirs. Their use of the land as a resource was unlike what many other Tanzanians considered its best use. Rigby (1981:161) points out that "*traditionally, nature is not considered an object in which the pastoralist establishes rights of seclusion. The flora and fauna are a gift from god (Ngai) and digging it up (hence destroying it) or killing the fauna that occupy it*

(hunting) has been considered a vilification of their resource base." Sperling and Galaty (1990:78) call Maasai land tenure "*the customary control of a domain, through a sphere of influence*".

The Maasai domain continues to be somewhat flexible, as they still take their herds far from their home during droughts. However, their domain has changed over time. In my research area, land use is now largely controlled by local "owners" of land, who protect their own agricultural holdings, their own special grazing reserves, as well as paths for moving to and from water and grazing areas. Most villages still maintain common grazing areas, but these are tiny compared to areas used in the past. Instead the Maasai now use wildlife areas, military areas, and forest reserves for grazing out of desperation, sometimes under the cover of darkness. When local areas become too overgrazed, particularly during the dry season, the "new" agro-pastoral Maasai, including even those that have government jobs and businesses, will herd their animals with a relative who then take the animals to pastures in highland or wetter areas. In my case study these areas included Monduli Juu, Mto wa Mbu or other areas near Lake Manyara or the Rift Wall.

One of the reasons the Maasai land was so easily taken, was that the Maasai have always been poorly represented in the government. This was especially true with regard to the Colonial government, but has continued to this day with Tanzania's independent government. This is in part due to their isolation and culture of cattle herding, which requires young boys to tend the herds rather than go to school (Ole Kuney 1994). While there has been some change, with many Maasai sending at least some of their children to school, they are still largely underrepresented in the government, which may in part be due to biases against pastoralsim. Another reason for the loss of pastoral lands has been the lack of understanding and appreciation of pastoralism, as a rational and economic use of the land by people like the Maasai.

Land tenure law and conservation law, both originated from European notions of the best way to use the natural resources (Boserup 1965, James 1971). Both were originally designed by Europeans in East Africa to facilitate the alienation of the resource base from resource users, like the Maasai (Igoe 2000). These policies made it easy to manage and administer the local population, whether this be by the German or British Colonial governments or later by the Tanzanian politicians. Both have also resulted in a centralized control of land and natural resources (Shivji and Kapinga1998).

The Europeans recognized early on the most valuable lands for agriculture, like the highland areas near Arusha and quickly took those lands for themselves (Spear 1997). Much of my research area encompasses the expanse of land between the Rift Valley in Northern Tanzania and the Mt. Meru and Mt. Kilimanjaro Highlands, which have been long called Maasailand. It was designated as Maasailand largely because the early colonists deemed it unworthy of cultivation. This area was early on recognized for its wildlife populations, largely because the Maasai did not routinely kill wildlife (Western 1997). But as time went on the colonists claimed the higher rainfall areas as wildlife areas (Neumann 1995a, Igoe 2000). Thereby forcing the Maasai to settle in more and more marginal areas, while losing their best dry season grazing and watering areas.

As the population pressure increased in the Arusha region, came the expansion of agriculture and settlers into land that was granted to the Maasai (Gulliver 1961, Spear 1997). Thus began what has now been more than a 100-year struggle to maintain their traditional lands. This example, in many ways, is not unlike the repeated breaking of treaties with the Native Americans in North America, which generally followed population pressure near previously reserved areas (Galaty 1994a).

During colonial rule, and even after independence land rights for local communities were defined as customary tenure, which was essentially supposed to be guided by "*native*

law so far as it is applicable and is not repugnant to justice and morality, or inconsistent with any Order in Council or Ordinance" (James 1971:62). With customary tenure the local people were given "user rights" which allowed them to continue using the land as they had for centuries, but at any time the government could claim the land for other purposes. Customary tenure was seen as inferior to statutory tenure, where some type of legal title or security would be issued to the land user (Ndagala 1998). Progress by most institutions has been defined as moving toward more statutory versus customary law (Boserup 1965). Essentially indigenous people like the Maasai had and in many cases continue to have no security of tenure and occupied land at the discretion of the government (Brockington 1998 and Igoe 2000).

While many people in Tanzania have suffered from repeated loss of land to the government, private and international projects, and the Villagization Scheme[4]. Few groups in Tanzania have suffered like the Maasai from repeated alienation of huge tracts of traditional grazing land, especially land that was later designated for wildlife rather than people (Galaty 1994a & 1994b, Ndagala 1998). Many times the alienation of Maasai land has been under the pretext of "the national interest" (Sosovele 2000).

The early establishment of game reserves in the 1920's began a different process of Maasai alienation that began with the Serengeti (Neumann 1995b). Here the British were trying to preserve the wildness of Africa that they saw disappearing, largely due to their own hunting and land grabbing, which had forced the natives to more marginal areas (Neumann 1995b, Western 1997, Shivji and Kapinga 1998). As Africans were pushed further into the marginal areas, it was recognized that these same areas were some of the last places where

[4] This will be described and discussed in ore depth later in the chapter, but in essence it was the development of communal farms and a communal way of life, in rural areas, where people, including the Maasai were relocated and told to work under Nyerere's socialist and government run villages. Ultimately, they failed, but the Maasai were one group that did find some benefits. They were given better access to health care and schools, and their adoption of sedentary agriculture and oxen, were certainly in part a result of this program.

large numbers of wildlife were still found. In piecemeal fashion the land was taken from the local people, over a number of years just prior to independence. The European preservationists had won out over the native Tanzanians. Such conservation measures did not take place in order to meet local community's needs, but instead the fulfillment of some selfish motives of the colonizers.

Traditional practices such as burning the grass to kill off ticks and cultivation of small plots were the first rights taken away in the Serengeti (Homewood and Rodgers 1991). But the people were assured they could continue to practice cattle keeping. The process of alienating land seems to have always begun with the recognition of some indigenous rights, such as hunting and cattle herding, which according to Neumann (1995a:160) was in part *"to fulfill the European vision of primitive Africans living amicably amongst the game."* However, the Serengeti became a Reserve in 1950 and a National Park in 1951, thereby eliminating all indigenous human activities, including use of the forest or grasslands.

The Ngorongoro Crater, which had been part of the Serengeti became a Conservation Area in 1959, essentially to offer the Maasai from Serengeti a place where they could continue their traditional lifestyle, with some cultivation (Homewood and Rodger 1991). In 1975, a new Conservation Ordinance prohibited cultivation within the Ngorongoro Conservation Area. Due to this and other more recent rigid control measures of Maasai livestock raising, the Ngorongoro Conservation Area has become a new area of contention. The Maasai and conservationists who would like to see it given full National Park status are at extreme odds with this issue (Homewood and Rodgers 1987a & 1991, McCabe et al. 1992, Shivji and Kapinga 1998). The Ngorongoro conflict continues to this day, and the Maasai now have numerous examples of how the rights of wildlife have usually prevailed over their own (Taylor 1996, Western 1997, Igoe 2000).

The Tarangire and Ngorongoro cases are interesting because, while pastorlism is prohibited in Tarangire near the park, farming is expanding very rapidly to the possible detriment of the park's wildlife. Many of the farmers are the people who have migrated to this area in search of good agricultural land for farming. Farming is prohibited in Ngorongoro. The authorities have promised to send food to the Maasai, but supplies have not always been forthcoming nor sufficient (Shivji and Kapinga 1998, Sosovele 2000). While farming is prohibited, the construction of hotels for tourism has continued to expand into the reserve. This development puts additional strains on the local resources, while at the same time the Maasai become tied to the authorities in an ever increasing difficult relationship (Taylor et. al 1996, Shivji and Kapinga 1998).

In the 1950's the Mkomazi Reserve was established in the Same District. Mkomazi is smaller than the Serengeti and much less known to this day. However, it followed the same path as the Serengeti, with complete removal of the Maasai and other pastoralists in 1988 after years of being able to graze their herds within the reserve (Brockington 1998).

Tarangire National Park was also a Maasai grazing area, particularly during the dry season, as the Tarangire River is one of the few permanent water sources in the Monduli and Simanjiro districts. According to Igoe (2000:146) in Tarangire, *"Until 1970 Maasai herding systems followed a migration pattern similar to that of the vast herds of wild ungulates with which they coexisted."* Ultimately like the Serengeti, the Tarangire Game Reserve became the Tarangire National Park, which meant once again all the Maasai had to evacuate the entire area. Leaving the park was not the only conflict faced by the Maasai. Many of the Maasai in this area had moved here when they were evicted from the Serengeti National Park (Igoe 2000). Adjacent villages to the new National Park, such as Mswakini, Makuyuni, and Mbuyuni were largely given to WaArusha settlers, who had been forced to leave the Ngorongoro Area and urged to move from the Arumeru region.

Baxter (1990:iv) described this situation like this,

> *"In order to survive pastoralists often circumvented their ruler's intentions. Few pastoralists have ever had anything but fear for officials, because all of their experience has shown that official interventions always made things worse. Governments, both colonial and post-colonial, have been in fact, if not the intention, predatory (Igoe 2000). A further consequence of the imposition of grazing and tribal boundaries is that open and flexible ethnic boundaries have become increasingly closed and rigid."*

6.3.2 - The Kenyan Example

As early as 1904, Kenya had created Maasai Reserves. Yet within these reserves, the early colonial administration saw the build-up of herds as an environmental problem. The Maasai saw this problem as being one of a limited land base (Campbell 1993). The Maasai in Kenya lost 50% of their land between 1904 and 1915. The Maasai were restricted by the white settlers, as the Colonial Government viewed the land as being underutilized (Lane 1998). After increasing conflicts with pastoralists and encroaching African and white farmers, legal procedures were initiated in the 1940's and 1950's to limit cultivation in places such as the Kajiado District which lies just North of the Tanzania border (Cambell 1993, Western 1997). However, their success was limited by the many immigrant farmers who were relatives of the Maasai by marriage, and therefore eligible to settle in the Maasai areas by tradition (Western 1997). At the same time the National parks Ordinance of 1945 began a process (which was later followed in Tanzania) where areas were set aside exclusively for wildlife, or protected with the allowance of some restricted land use by Maasai. (Campbell 1993).

This of course led to numerous problems and conflicts, including the killing of wildlife by Maasai, at a time when it was the wildlife the Colonial and later the Independent Kenyan government was trying to protect (Western 1997, AWF 2000).

According to Boserup (1965:86), the gradual disappearance of crop land and grazing rights leads to a change in land use. This often results in conflict, but also results in, "*one*

link in the chain of events that gradually changes the agrarian structure in such a way that private property in land becomes a dominating feature (in most cultures)." Yet, interestingly, Nyerere did not buy into this notion of a need for private property ownership. To this day there continues to be a lack of true private ownership, with title deed. The conflict continues to escalate among pastoralists, farmers, and conservationists.

Hopcraft (1981) also pointed out a Kenyan example, where providing land tenure was thought to be one way to alleviate this problem of restricted land use. In Kenya, the Maasai were given land in the forms of ranches (which were communally owned). However, it was often only a few that benefited from this arrangement and the majority of the people that previously had access to the land or water resources were then totally excluded (Graham 1989). Western (1997) worked with the Maasai and the Government to try to come up with a strategy to benefit both the local people and the wildlife in Amboseli. The challenge was that despite initial government agreements to pay the Maasai compensation for allowing wildlife on their land and ranches, these quickly faded as the agencies and administrators in charge of Amboseli National Park changed hands (Western 1997).

Other innovations, suggested by Hopcraft (1981), included grazing fees in Kenya. This too was not without its problems especially in many African nations, where any fee levied often lines the pockets of the elite few. This type of arrangement also goes against the very nature of Maasai communal resource use. However, according to Hopcraft (1981) grazing fees, much like what is done in the United States, could provide an incentive to limit livestock numbers based on what one needed and could afford.

Another idea from Hopcraft (1981) was land enclosure for the individual, in Kenya. This like the American West was thought to be a way to alleviate the problem with public grazing areas. However, it came with similar problems such as, severely limiting the flexibility that is

often needed in the drought prone pastoral areas. It also severely limited who could control and use the resources, which was largely in direct conflict with Maasai customs.

Finally, she recommended grazing blocks, which would restrict livestock movement and reserve areas for use as they are needed, giving other areas time to recover between grazing. To some degree this was evident in my study. In Arkatan and Lendikenya villages, where military land and other common areas such as Nanja were used by all, but controlled by the village. This seemed more like traditional land use strategies, as the concept of resting and rotating the land was not new to the Maasai. Yet even Hopcraft (1981) admited that these were hard to implement in times of little forage and large numbers of livestock. Kelly (1990) points out the failure of the grazing block scheme in Kenya's Northeast Province, which was partially due to a lack of dialogue and understanding of property and social relations among the local people.

The problem Spencer (1990:122) said, was that,

> *"Maasai who wish to take advantage of new opportunities is the need to transcend old boundaries in order to realize the full potential of new domains."* (In Loitokitok, Kenya) he points out, *"There has been an adoption of agriculture and this has been a sign of the breakdown of the traditional system of collective land tenure. Their land, unlike their herds have no potential for growth, and as they are divided among family members, this can lead only to smaller and smaller holdings dispersed to a growing number of descendants."*

His observations in Kenya were not unlike what I saw in Monduli District, particularly in Lashaine village and parts of Lendikenya. When the people were forced to live in a smaller and smaller area, the flexibility of the pastoral system was largely lost, and the traditional predominant form of agricultural production among the Maasai faced severe challenges.

Hogg (1990:22) described forced settlement of the Boran in Kenya, which occurred in 1966-1967. There was great similarity to the situation of the Maasai in both Kenya and Tanzania. The ramifications of this change has been profound.

"The Boran called it the time "when everything stopped."

The majority of herds not moved out of the area were destroyed by disease or the lack of grazing land. In a conservative estimate, as much as 90% of the small stock, and 95% of the camels, and 7% of the cattle were lost. This disaster was unlike anything except possibly the great rinderpest epidemic in the 1890's (Hogg 1990). This had a profound affect on the people and their adoption of a more sedentary way of life, which was one objective of the government. They always considered grazing areas a gift from God (like the Maasai) and felt there need not be any restrictions on grazing if you were Boran. They had deep resentment of grazing blocks and ranch schemes. The main catalyst in promoting change in indigenous grazing systems is grazing scarcity. However, a change in property rights cannot be understood in terms of economic analysis of costs and benefits, but must include an examination of the historical and cultural factors as well."[5]

The loss of grazing areas, grazing rights, and the enclosure of grazing lands in semi-arid areas that have unreliable rainfall is a recipe for disaster for the local people and the agricultural system that may well be well adapted to this unpredictable environment. The time has come to rethink the many failed pastoral development schemes and recognize both pastoral strategies and communal tenure (Sandford 1983, Scoones 1995).

6.3.3 - Policy Issues: individual vs. Community Rights in Land

As was pointed out earlier the British contributed to a farming revolution in Kenya by introducing private ownership of land. However, this was not without its

problems as the best lands were taken for the white settlers and the land alienation eventually led to the Mau Mau War. A similar situation of land alienation has more recently plagued Zimbabwe. The British in Tanzania created the 1923 Land Ordinance which similarly reflected and catered to the British interests. There was little development toward any form of native land ownership. Once Independence came, any British activity with regard to land tenure reform was stopped. The solution was left to the new independent Tanzanian government. According to Ruthenberg (1964:132) this led to stagnation in land tenure and the views of the new government were evident in this statement by President Nyerere:

> *"...we must reject the individual ownership of land. To us in Africa land was always recognized as belonging to the community. Each individual within our society had a right to use the land, because otherwise he could not earn his living and one cannot have the right to live without also having some right to maintaining life. But the African's right to own land was simply the right to use it, he had no other right to it, nor did it occur to him to try and claim...The TANU Government must go back to the traditional African custom of land holding. That is to say a member of society will be entitled to a piece of land on the condition that he use it."*

According to Ruthenberg (1964) Nyerere's formulation left a lot to interpretation, in the Maasai context it meant they were not using it, therefore could easily have it taken away or given to another for some more important purpose.

In Tanzania virtually all freehold land or land with title was abolished in accordance with Nyerere's socialist development policy beginning with the Freehold Titles (conversion) Act in 1963. Maasailand and other pastoral or semi-pastoral areas came under the special provisions of the Range development and Management Act, No. 51/1964. From 1963 to present, Tanzania's government has "*accepted the argument that the maximum advantage*

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[5] This last sentence, highlights the need for the type of study I conducted. Land tenure understanding and possible change cannot be understood, without first understanding the people and the system of land use they are employing.

can only be enjoyed in such a way that the range land is owned and managed communally" (Rigby 1992:207).

6.4 - Villagization: Tanzania's Most Well Known Land Tenure Policy

With the *1975 Village Act* (registration, designation, and administration of Ujamaa villages) and the villagization process, rural dwellers were brought together, sometimes forcefully into government controlled or reorganized villages (Freyhold 1979, Coulson 1982, Mapolu 1990). Land use in these villages became a mix of individual tenure and communal plots.

According to Bagachwa et al. (1995:52),

> *"By the end of 1975, 50% of the people were living in such areas. Since in most cases (including Maasailand) these lands were not chosen for their agricultural potential or capacity for sustainable agriculture this contributed to the degradation of these environments."*

This process of villagization goes by many names in Tanzania's Maasailand. Sometimes called Operation Arusha, sometimes Maasai called it *Operation Imparnati* (Ndagala 1982). The Maasai word Imparnati means "permanent habitations". In my study it was most often referred to as *Operation Vijiji*, by both Maasai and WaArusha inhabitants in my study area. According to Ndagala (1982) the Maasai have been going through a process of sedentarization for decades, and *Operation Imparnati* was simply an acceleration of that process. The whole exercise, according to Ndagala did not mean any real change in Maasai settlement, but was often simply a rearrangement of their homes or Bomas into lines around facilities such as schools, water sources and health and veterinary centers, which many Maasai looked at as a benefit. They continued to take their herds to traditional grazing areas and the land was communally divided into manageable units. The only drawback for the Maasai, was that their land was carefully surveyed and evaluated, and in many cases this lead

to an increase in immigration to their traditional grazing areas by agriculturists like the WaArusha.

6.5 - Post Ujamaa

However, by the time Tanzania faced its economic crisis in the 1980's, many of these village facilities failed. One of the greatest impacts to the Maasai was the loss of free or highly subsidized veterinary services and well managed cattle dips, which when removed, caused serious losses to the local herds. Cattle that had previously not had the benefit of regular tick and parasite control had decreased resistance to the diseases endemic to the area. Once these services were removed, the cattle quickly succumbed to the diseases, to which a few years before, they had developed some natural resistance (Pegram 1993, Ndagala 1996). The Maasai and WaArusha in Monduli continue to complain about the lack of veterinary services and the expense of parasite control. They frequently point to the empty corrals and dip tanks, and continue to hope these will be restored. There was also the omission of traditional land-use rights, such as grazing area and water rights.

The *1982 Local Government (District Authorities) Act* consolidated the *1975 Act,* giving powers on all village matters, including land allocation for communal or individual use to the village council. The system while providing some local control, had no written guarantee of rights over land ownership, which could be terminated by the central government. Agricultural policy changes in 1983 attempted to reduce this insecurity by establishing a system under which the villages are allocated 999 year leases with the power to sublease any part of their land to individuals, enterprises, or institutions for shorter periods of time between 33 and 99 years.[6] Such leases could not be sold (Bagachwa et al. 1995), yet

[6] The current recommendation by the Commission of Inquiry into Land Matters, according to Shivji (1998) is that the maximum right of occupancy be 99 years, with a minimum of 21 years.

sales of the "user's right" under customary tenure do occur, even though the land itself still belongs to the state. (Sosovele 2000).

This *1982 Local Government (District Authorities) Act* ignored a few important aspects of traditional land use rights, namely the access to water rights, as well as, grazing rights of pastoral groups in arid and semi-arid areas. While the villages in my study area all pointed out common grazing and watering areas, this omission, along with the expansion of agriculture into marginal areas (prior use being limited to seasonal grazing) has led to a source of conflict between pastoralists and agro-pastoralists (Bagachwa et al. 1995).

To add to the pastoral dilemma, another law passed a few years later. During *Operation Vijiji*, many Maasai were integrated into Ujamaa villages. This included some of the Maasai in the research area. Many were allocated new plots of land for homes and agriculture. In 1992, these lands were later assimilated back to the new village councils, but any original holders of land under customary law (like the Maasai) lost this land to people who had been relocated to villages during *Operation Vijiji*, such as the WaArusha (Mvungi and Mwakyembe 1996).

According to Bagachwa et al. (1995:59),

> *"In 1992, The Regulation of Land Tenure (Established Villages) Act No. 22 – effectively extinguished all customary rights to land in villages incorporated between 1970 and 1977 (which were the Ujamaa villages), and it terminated any legislation under which customary rights were being claimed. It did allow village councils to include former customary rights in the village titles, provided they were recognized before the titles were validated. This act is completely ambiguous with regard to villages incorporated outside this 7 year window,"*

This was said to have a catastrophic affect on pastoralists, as it allowed other groups to move into the former Ujamaa village areas, provided it was approved by the village council and there was not a validated title to the land. In most cases, the Maasai had peacefully moved into Ujamaa Villages. Many had taken up some

agriculture, benefited from the access to health care, schools and veterinary facilities. Most continued to use their traditional grazing areas. However, with this rule, there was a great deal of question as to who now owned the land the previously held and who owned the land they were now on.

Additionally, during the Ujamaa period some of the land held under customary law was taken over by parastatals for the development of large -scale range and agricultural projects. In my study area, the Manyara Ranch was one such parastatal. It was located between Makuyuni and Esilalei. Most of these commercial ranching schemes failed miserably. This ranch was luckily reverted back to the Maasai and WaArusha (in a Land Trust) in neighboring communities for communal grazing (Sosovele 2000). It also continues to serve as a major wildlife corridor between Tarangire and Lake Manyara National Parks, as well as, the Ngorongoro Conservation Area (Homewood and Rodgers 1991, Meindertsma and Kessler 1997).

Insecurity of land tenure is often seen as a disincentive to proper land husbandry (Hardin 1998), particularly for those holding land under customary law (Boserup 1965). While the Maasai have long held land that was used communally for grazing their livestock, the division of this land and growth in local populations has been a major factor leading to many of the issues discussed in later chapters. The insecurity of land tenure stems largely from government policies that have taken land from the people prior to independence through colonial policies that favored white settlers (Ndagala 1998). This trend of insecure land tenure continued later in the 1970's with the Ujamaa Villages (Arhem 1986, Ndagala 1992b) and more recently through alienation by private individuals and foreign corporations (Galaty 1994, Shivji 1998, Igoe 2000).

The problem with this according to Shivji (1998) was that the majority of people in Tanzania produce for subsistence and the local market, while outside investors produce

agricultural products, which have rarely been food crops. These products are produced solely for profit, and most often a foreign market. The profits are then taken outside Tanzania, usually at the expense of the local small farmer or pastoralist, who are struggling to find enough land to produce food.

Most of Maasailand, has at one time or another, been considered free for the taking. It has been taken by cultivators, commercial farmers, ranchers, and state corporations or wildlife protection areas. Cultivation usually served as rightful evidence of customary tenure. This of course for Maasai has created many conflicts over the years, as much of their land was used only for seasonal grazing. The policies that have been used to displace Maasai, have varied tremendously, but the end result was always the same. Less land for the Maasai.

In recent years the Tanzanian Maasai have adopted strategies to protect their resources. Many of their plots, according to Ndagala (1996) have been strategically placed on the fringes of protected pastures or high potential areas that will likely be a target for land hungry cultivators. He provides the example of Simanjiro, but the same certainly seemed to be happening in Monduli, especially near the highland pastures of places like Lendikenya, and Sepeko, near Arkatan. Some villages have been given clear title to their land giving more locus rule, with regard to the administration of that land (Ndagala 1998).

6.6 - Village Control

All the villages in my study area had control over the land. They did not necessarily hold title to the land, nor did they have complete control, as that rests with the national government. However, the village councils were ultimately accountable to the Commissioner for Lands, appointed by the President. Thus, there has been a top-down approach to land management, whereby according to Shivji (1998:94) "*...The noble (Land) Commissioner,*

who left alone, would (or should) act for the national good! (However), Tanzania's experience has been otherwise".

Being an agro-pastoral area, most villages in my study area controlled both grazing and cropping areas. If someone wanted additional cropping areas, or was a villager[7] who wanted to start a farm or build a house, they had to formally request this from the village council. The village maintains the exclusive right to allocate land, and lands not owned by the village or an individual were owned by the state. Outsiders could be allocated land, but the rules controlling this were different, as people could not transfer it to the next generation (Shivji 1998).

This local control has not been without its' problems. Most of the plots allocated were rather small, and some precluding the economic use of both draft animals and tractors (Sosovele 2000). Additionally these lands could only be allocated out of the village commons. In Maasai areas, they had to come out of the common grazing areas, adding to the problem of increased grazing pressure on existing common areas (Suyaan 1999). Additionally, there was tremendous pressure on village councils to lease land to private individuals, organizations, churches, and industry, which generated additional cash flow to the village (Suyaan 1999, Igoe 2000).

According to Shivji (1998), there have been many abuses to this system. Given Tanzania's policy of top-down land tenure control and reform, which have been based on bureaucratic approaches and statutory systems of adjudication and titling, the insecurity of land tenure for indigenous peasant and pastoral communities has been on the increase.

Land tenure in the late 1990's has been largely dualistic in nature. The small farms had customary tenure, if there was continuous use or they had user rights when they were

given new plots with the approval of village or communal authorities (Bagachwa et al.1995, Shivji 1998, Sakita 2000). The problem with this system was that there were few legal titles, as most village land has neither been surveyed or demarcated (Sosovele 2000). Occasionally individuals gained a title deed, through right of occupancy or leases, which are supposed to be filed with the village. The right of occupancy was for a set period of years, but the customary law often provided a more indefinite system of tenure, which may could be passed along to the next generation (James 1971). However, the right of occupancy has held up in courts to be most like the free-hold system. It was most often associated with secure tenure in a Western sense, differing only in that it could not be transferred. Many large farmers have been granted leaseholds, which are 99-year leases, subject to land conditions. However, these were more of a legal title to the land, which was usually filed with the government (Bagachwa et al. 1995).

The ultimate control of the land, at this time, continues to rest in the hands of the President and the central Tanzanian government. This according to Sundet (1996:69) was important to the government because "*The President has been able to acquire land for development purposes, whenever he has deemed it to be of 'benefit to the people' to do so.*" To depart from this system would be, "*just like making him and his government beggars for land for the implementation of government policies and projects.*"

The land tenure concept for rural Tanzanians continues to evolve and "*is still fuzzy and confusing*" (Sosovele 2000). Given the actions or non-action by the government of Tanzania, it seemed likely that the system will continue to be in a state of flux for sometime to come, especially with regard to pastoral rangelands.

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[7] A villager is defined by the Tanzanian Government as a person who is: a) an ordinary resident and works in the village, or b) whose major means of livelihood is derived from working on village land or c) who is traditionally recognized as a villager by the village community (Shivji 1998).

Kikula (1999:34) states that in the future, *"It will be important to extend the inquiry of land tenure and conservation to aspects of traditional wisdom of pastoral and other resource management systems."* These were noble words of advice and became the path that has been taken by Maasai NGO's trying to protect pastoral rights (Igoe 2000). Yet, the conflicting interests of the State, the agriculturists, the pastoralists, and private industry will continue to influence land tenure with little hope of using indigenous systems of land management.

6.7 - Current and Future Land Tenure Conflicts

6.7.1 - The Study Area

To determine what specific land tenure issues were of concern in the study area, interviewees were asked two questions. First, I asked how they acquired land for growing crops and second, how the men interviewed were allotted land for grazing purposes. Almost all the respondents said the village controlled the grazing area, although in Lashaine and Arkatan, a nearby military training area, provided grazing when no exercises were going on. A few people admitted to illegally grazing in both the forest reserve and military areas, but this was no more than 2% of my sample.

With regard to cropping areas, there were many ways that land was acquired for growing crops. In Lashaine and Engaruka, very little or no land for growing crops was available when requested by a villager. In villages such as Esilalei and Losirwa, land seemed to be more readily available for cropping. The challenge as mentioned above was that these were primarily Maasai areas, and the land allocated for crops were the very grazing lands that have supported them for centuries.

6.7.2 – Responses from Interviews

A number of the men interviewed had more than one agricultural plot, therefore they provided more than one answer when asked how they acquired cropland. A total of 159 answers were recorded among the 130 men interviewed. From this total number of responses, 47% of the men reported that the land they were using for crops had been allocated by the village.[8] Twenty-two percent (22%) of the men responded that the cropland had been inherited from a family member, therefore placing it under customary law. Another 12% (all WaArusha) said they had been relocated by the national government to Mbuyuni and Mswakini, after being told to leave the Ngorongoro Conservation Area or encouraged to leave the overcrowded Arumeru district. Ten percent of the total were using the land before village control or Ujamaa, and were holding this land under customary law. Another 4% had been allocated land during Ujamaa (these were Maasai), and finally 5% of the responses were that they had bought the land.[9]

[8] Showing that much of the common grazing land is being "given away" in smaller plots.
[9] This of course is not allowed officially 1 in Tanzania, but many informants in the field, as well as (Igoe 2000 & Sosovele 2000) said it is quite common nevertheless.

Table 6.1

Summary of Land Tenure Arrangements in Southern Monduli District

Form of Tenure/Transfer [10]	Number of Responses	Percent of Total [11]
Village Allocation User Rights	75	47%
Inherited from Father Customary Tenure	35	22%
National Government User Rights –Customary Tenure	17	12%
Owned Land before Ujamaa or Independence Customary Tenure	13	10%
Ujamaa –Land Allocation At this point in time Customary Tenure	6	4%
Purchased Illegal use of Customary Tenure or User Rights	8	5%

6.8 - Contemporary Issues Arising from Land Tenure Problems

There were many issues, with regard to conflict and land degradation, that are directly related to land tenure. In the following section I have included a discussion about how insecure land tenure has led to wildlife conflicts, social conflicts, and environmental conflicts.

6.8.1 – Wildlife Conflicts

The wildlife issue and conflict will be discussed in more detail in Chapter 9, but the conflict has arisen largely out of taking land away from the Maasai, creating a situation in this research area where wildlife are increasingly seen as a major threat to crops and livelihood.

[10] The terms below that are highlighted were the answers given to me, I categorized them using the system presented by Bagachawa et al. 1995, earlier in this chapter.
[11] Adds up to more than 100% because most men used or controlled land under more than one land tenure arrangement.

According to Neumann (1995b:372),

> *"As often as not, the land alienation that has marginalized and impoverished pastoralists in Tanzania has been the result of state wildlife conservation policies."*

One informant in my research area put it this way,

> *"It is bad to mix agriculture and pastoralism and then try to maintain our traditional (Maasai) culture. Land-use becomes a real problem. Maasai are changing. We don't have the cattle we once had, and many Wazungu (whites) won't admit the Maasai adoption of agriculture. They want to take the Maasai back 100 years."*

This statement in part stems from the many well supported indigenous NGO's that now receive financial backing from the "West" to continue to support the traditional Maasai pastoral life and the protection of wildlife (Igoe 2000). The reality was that economic pressure has been continually forced upon the Maasai to adopt a more sedentary lifestyle. This runs directly in the face of wildlife conservation (Ole Saitoti 1978, Western 1997). While the NGO efforts often included sustainable development initiatives and better land-use planning, secure land tenure for the Maasai was still the major issue. The evolving land tenure system without long term protection of common grazing areas and the ever present and growing interests of the wildlife preservationists (usually Americans and Europeans), may be the demise of the well known Maasai pastoral system. In Monduli, the greatest pressure may come from the perceived need to protect the numerous wildlife corridors that allow wildlife to move throughout the National Parks in Northern Tanzania.

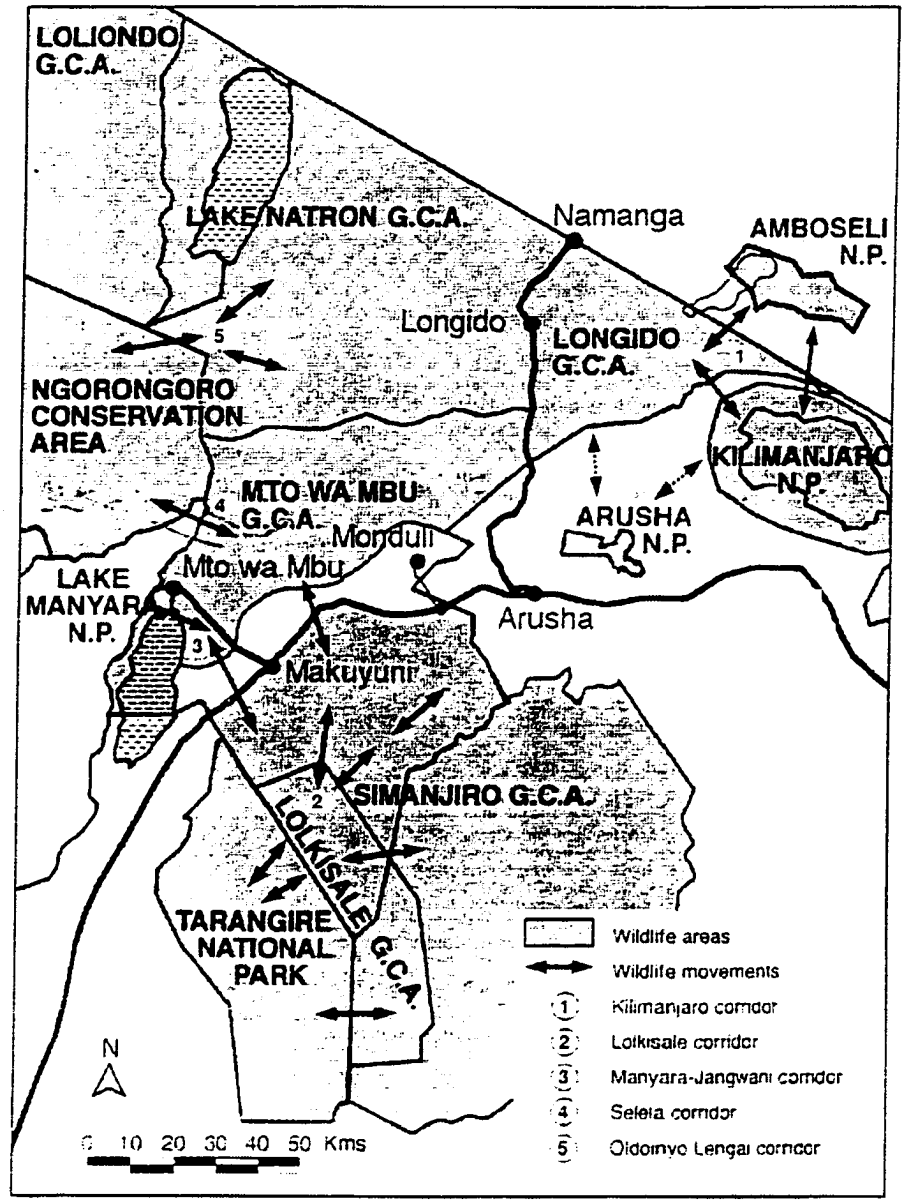

Figure 6.1 – Wildlife Reserves and Corridors in Monduli District

From Meindertsma and Kessler (1997)

According to Ole Saitoti (1978:21), a U.S. educated Maasai and longtime supporter of the Maasai rights and wildlife in Tanzania, said this ultimately means without some real change, *"The land will get smaller, competition will intensify and the (wild) animals will be the first to go."*

This wildlife dilemma was discussed earlier in chapters 5, and will be discussed in much more detail in Chapter 8 and 9. The loss of grazing lands and less pastoralism, with growing agricultural areas results in less land for the wildlife. It also restricts the movements of wild animals through their traditional corridors, which are very common in Monduli District (see Figure 6.1).

6.8.2 - Social Conflict

As would be expected rapidly increasing human populations are likely to increase social tensions, as well as, conflicts with wildlife (Boserup 1981, Yeager and Miller 1986, Scoones 1995). This was especially true with regard to the Maasai in Tanzania, who have seen so much of their land taken away over the last 50 years. For many of the older men, land alienation was something they were very familiar with, and willing to openly discuss.

Much of the Maasai land, which was "grabbed" for agricultural purposes, has been taken by the WaArusha. This has been done through various means. Informally this was accomplished through marriage and kinship networks as described by (Spear 1997). Land alienation was also accomplished through government intervention. Some of the men interviewed said they had been allocated land during the colonial period just prior to independence in the village of Mbuyuni.

The WaArusha have traditionally been better educated, more vocal, and more willing to make sure their interests were protected (Ole Kuney 1994). According to Ole Kuney (1994), some of this land grabbing was initiated by the WaArusha themselves. As their population grew in the Arumeru district, especially in the 1950's and 1960's, there were

numerous traditional Maasai areas such as the villages of Makuyuni, Mbuyuni, Mswakini, Lolkisale, and Lashaine that have now largely become WaArusha villages (see Table 3.1). This more recent land reallocation was accomplished through direct government intervention, including *Operation Vijiji*. The Maasai were not seen as actively using these lands (for agriculture), so rules governing customary tenure were not applied. As Maasai land scarcity has increased, there has been a tendency for the Maasai to blame the WaArusha for this problem.

While there has been little physical conflict in the past, the resentment and social conflict remains (Ole Kuney 1994), as many of the men of both WaArusha and Maasai tribes fully recognize what transpired. The Maasai have been particularly upset with their loss of good grazing lands.[12] The WaArusha constantly complained that the land they were given was not what they expected. This largely stemmed from expecting their farms to be better watered. Yet, the Maasai have known all along that these areas were best suited to a more pastoral livelihood. They took advantage of water when it came, and in this study did not constantly voice discontent over there not being enough rain, as did many WaArusha men.

The dissatisfaction with the loss of grazing lands was expressed in many interviews. This was not a question I asked, but was rather an issue the men wanted to discuss, within the context of agricultural expansion, growing populations, and larger and larger wildlife reserves.

Salzman (1980:12-13) points out in a general context, almost exactly what has happened to the Maasai in my own research area,

> "(When there is) *competition between tribal groups for scarce pasture, (it) leads to inter-tribal conflict, with the victors taking control of*

[12]Again I want to note that there is some evidence, as noted previously in Chapter 3, that there have been recent outbreaks of violence, among Maasai pastoralists and farmers in former grazing areas. See (Mfugale 2000, Rwegayura 2000 UN Integrated Regional Information Network 2000). Whether this trend continues or possibly influences change in the Land Tenure structure is yet to be seen.

territory and the vanquished retiring to agricultural areas and a settled life in the absence of available pasture. He points out that there is also the failure and fall away model, where pastoralists who do not succeed in building a viable household productive unit, and who in consequence cannot support themselves or their families through pastoralism, drop out of the pastoral sector, taking their families into the sedentary agricultural sector and seeking employment there. Thus there is a "shaking down" of the pastoral population, the unsuccessful members "going under," one consequence of which, it has been suggested is maintenance of balance between the naturally reproducing and expanding human population and the static and non-expanding pastures. The associated converse model is that of "succeed and surpass," points to individuals who build such large herds that they cannot be properly supervised and who are able to convert from a wealth in livestock to wealth in land. They too are dropping out of the nomadic sector and moving to the settled sector, but rather than going under they are "going over," becoming landowners and part of the local elite. He suggest unlike others that these models are neither irreversible nor absolute."

All three of Salzman's proposed pastoral models were seen in my research area. Most Maasai were adopting more sedentary lifestyle, after they had seen their grazing areas shrink to a point where they could no longer subsist on the products from their herds and flocks alone. I also saw the failure and fall away model, where some young or older Maasai had simply abandoned the traditional lifestyle to work for wages in or near Arusha. Finally, I also met a number of Maasai that fit the "succeed and surpass" model. These were Maasai who controlled huge plots of land, hired many WaArusha or other workers, and became part of the local elite.

As suggested by Salzman the Maasai and WaArusha farmers did not see their current situation as absolute. Most of the young men saw their wage labor as a means to get their own farm and herd. And while the Maasai had adopted a more sedentary lifestyle, most still dreamed of having huge herds of cattle that they could graze over a wide area. The reality, however, was that without a more secure land tenure system, many of the smaller farmers will continue to lose grazing land, and as their families grow, there will likely be a reduction in their cropping areas as well (Galaty 1994b). The recent expansion of large farms by both Maasai and WaArusha that Salzman

called the local elite, as well as foreign investors will likely continue, creating additional pressure on the land resource.

6.8.3 – Environmental Conflict

There were many environmental conflicts in the research area. The men interviewed readily expressed their views, but they were not presented in the context of land tenure, nor did I probe for information with land tenure in mind. However, the importance of the environmental and land-use change cannot be overlooked and must be related to land tenure policies. I presented the basis for these environmental challenges in Chapter 2 and Chapter 3. I outlined what some of those problems were in Chapter 5, and I will discuss them at length in the following 3 chapters with regard to using oxen, practicing agriculture, and land-use change.

The bottom line, was that land tenure policies have never left the Maasai in any situation more favorable toward pastoralism. Most Maasai in the semi-arid and sub-humid lands of Monduli district had all adopted agriculture practices to protect their remaining land base. With the loss of grazing lands, the only incentive has been to make a short term profit from the land, before it was taken away or lost to other uses or other people (see Chapter 8 for an economic analysis of why they choose low input over more intensive systems). Therefore the poor land use practices of the modern agro-pastoral Maasai have been the result of development and modernization, including the development of wildlife parks, and it was not the fault of traditional pastoral practices (Stiles 1981).

Many authors (McCown et al. 1979, Boserup 1990, Kikula et al. 1993) pointed out both the inevitable decline in crop yields and the destruction of the environment which has so often arisen from insecure land tenure. The decrease in crop yields will be presented in Chapter 8 and the environmental problems will be discussed in Chapter 9.

The Tanzanian land tenure system is still in a great state of flux. While writing this dissertation there were numerous pieces of legislation in Tanzania that could impact the future of pastoral areas and land tenure, including the full approval of the Land Act of 1998 and the Village Land Act of 1998. However, many informants said this may not ever come to fruition.

The traditional Maasai land tenure system worked because it was flexible. It worked because rainfall has not been dependable and there had to be flexibility built into the agricultural system. While the small plots of land that have been passed down through the generations may offer some degree of security, the fact is that rainfall may never come to those plots. The remaining open grazing lands are being lost to agriculture, public use, and wildlife. There are so many unknowns in the land situation throughout much of rural Tanzania, it is nearly impossible to see where this will end.

6.9 – Summary

The history of land tenure in Tanzania is filled with unique examples of African and Socialist ideals (James 1971, Nyerere 1973). The adoption and later failure of policies like *Ujamaa Villages* have had a huge impact on the people and the landscape. Land Tenure policies of both the Colonial and Tanzanian governments, have often targeted the Maasai, as they supposedly *"weren't really using the land"*. If they were using it, it was certainly not to its full potential, according to independent government definitions (Shivji 1998). The Maasai, as described in Chapters 2 and 3, controlled land that was once considered unsuitable to agriculture and therefore also unsuitable for "development". Never having had legal title to the land the Maasai used or physical evidence of using it under customary tenure, led to the policies of

"giving the land away" or making better use of it through agriculture and reallocation to farmers. This often occurred when new National Parks were instituted (Neumann 1995a, 1995b), or when the population was expanding in nearby villages in places like Arumeru and Arusha.

While the Maasai resisted this type of land use change in nearby Amboseli National Park in Kenya, with some small degree of success (Western 1997). There have been many examples where they lost their land and all rights to it in Northern Tanzania, including the Serengeti and Tarangire National Park (Neumann 2000). To the Maasai the possibility of Ngorongoro soon following this same path is very real (Taylor et al. 1996). With the loss of these lands, it was not the wildlife that were the first to go (as predicted by Ole Saitoti 1978:21), it was the Maasai. While humans may prevail over wildlife in the end (Yeager and Miller 1986), it may be the Maasai culture and pastoralism that disappear before the wildlife.

Comparing the Maasai situation to the North American Indian, both groups faced treaty after treaty which were broken, as development pushed into their "open" land. Like what is happening to the Maasai pastoralists in Tanzania, eventually the North American Indians were relinquished to the most marginal lands in the United States. The traditional Maasai land tenure system has continued in some areas in Monduli, but these areas of Maasai control continue to be pushed into the most arid portions of the district. Early policies of Colonial land grabbing have long since been over. However, in its place is a vague system, especially with regard to the Maasai, who are now scrambling to protect their dwindling land resources.

Agricultural encroachment by other ethnic groups, foreign investors (Lama 1998, Igoe 2000), agricultural development among the Maasai themselves and future land alienation in the name of wildlife protection all threaten the Maasai and Maasai culture. There are no easy answers for alleviating these problems. Oxen and

agriculture were certainly not the driving force in land tenure issues. However, land tenure as described in this chapter, has had a huge impact on the adoption of oxen, the agricultural system, and the land use change in Monduli District.

Maasai Oxen, Agriculture and Land Use Change in Monduli District, Tanzania

Volume II
Chapters 7-10

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CHAPTER 7

OXEN IN TANZANIA AND MAASAI OXEN

7.1 - Introduction

This chapter examines how draft animals were adopted and used by the Maasai and WaArusha farmers in Monduli District. From this adoption and use of draft animals, there have been many changes to the agricultural system and the local environment. This chapter will answer many of the questions posed in Chapter 1, with regard to the adoption and use of oxen by the Maasai. It will also highlight some of the differences between the Maasai and WaArusha in their use of oxen. Finally, many of the indicators and questions of sustainability presented in Table 4.1 (see also Table 10.1) will be answered.

The Maasai have not often been viewed as agriculturists who use oxen, however, under the conditions outlined in earlier chapters, the adoption of oxen is appropriate given their stage of agricultural development. The Maasai have been the subject of a great deal of pressure to integrate themselves into the agricultural economy, both as a way to increase their income and protect their land resource. This change was the basis for this study of the sustainability of Maasai adoption of oxen and agriculture. Without the use of oxen, agricultural development in this region would remain very low, despite the many failed schemes to modernize it, with the introduction of tractors. Yet this introduction of a new

technology is something, that I believe has been a major change agent in both the environment and the culture of the people in this area.

According to Maasai warrior Emmanuel Ole Mollel and Yunus Rafiq,

> *"Not every foreign element is ready to go into Maa's life system. The elements have to be modified, studied, accessing their advantages and disadvantages, then inducing them into (the) system without disturbing the existing culture." "The jungle (pastoral) life system has faceted the Maasai people to be highly disciplined and has made them that they can survive any sort of life, i.e. they have mastered the environment without passing any threat to it. Changes have already taken place in Maasai culture, what we have to think of now is how we can keep this culture without further destruction." (page 18).*

Viewing the statement above, it became obvious that draft oxen are an introduced, as well as, foreign element in the traditional pastoral life of the Maasai. Oxen alone are simply castrated bulls. The Maasai have long kept castrated bulls, before they more recently decided to use them for work. However, this new introduced element of the Maasai culture has had profound effects. It has both advantages and disadvantages. Adopting animal traction has been part of the reason the Maasai in this region have changed from pastoralists to agropastoralists.

In this chapter I will describe the results of visiting with farmers both during the planting and the harvesting season, in order to see oxen at work (see Figure 7.1). My research methods in this area were more than just interviews. I worked oxen in the field, I examined their yokes, the wounds on their necks, and the tools required to put oxen to work in the field, such as whips, ropes, chains, plows, sleds and carts. My perspective was one of a student trying to learn how oxen were being used, as well as, the perspective of a fellow user of oxen, where I could critique and compare different techniques of animal training and use. The farmers targeted for this study were all users of oxen. This was not difficult, as most farmers in my research area had oxen and almost all of them, even tractor owners, ended up using

oxen or sometimes donkeys for agricultural activities. I did not try to conduct a survey of tractor use, because when each man interviewed was asked what percent of the people in the sub-village, were using oxen. Most of the men answered 90-95%. The only exceptions were Engaruka and Mbuyuni and Lolkisale. In Engaruka, fewer people owned oxen, but 100% used oxen, as tractors were not currently available. In Mbuyuni and Lolkisale tractors are more widely used, but most people, even tractor owners end up using oxen, as I will describe later (see figure 4.1 and 4.2 for a review of the village locations). This chapter will describe my research results. It will also describe the history of oxen in Tanzania, including its advantages over other forms of farm power. In the final section, the constraints, challenges and problems associated with animal traction adoption and use among the Maasai and WaArusha will be presented.

Figure 7.1 - Maasai Oxen in Engaruka

7.2 - The Prospects of Animal Traction in Tanzania

Despite the obvious potential to feed itself and possibly even produce surpluses (Lyimo and Kessy 1997), Tanzania has reached what many researchers have stated is a *"critical moment in its history"* (Ezaza 1991, Sarris 1993, Ragumamu 1995, Grigg 1997). There is a growing gap between population growth and the availability of locally grown food. The food security situation will likely become worse in the near future (Cleaver and Schreiber 1994, Watkins 1996, Brown 1996). Understanding ethnic groups, the regions they live in and their potential to improve the nation's agricultural performance is critical to the nation's continued stability. Animal Traction is not the answer to solving even a fraction of the problems that Tanzanian farmers now face. However, with an understanding of local issues and constraints (Starkey and Mutagubya 1992), animal traction can offer an appropriate and affordable technology to a nation that is in desperate need of improved agricultural performance. Among the Maasai and WaArusha in my study, oxen are a much needed and used power source, which has allowed farmers to increase their agricultural output, without an increase in human labor.

Animal Traction or draft animal power is a readily available power source in many regions (Starkey and Mutagubya 1992, Mgaya et al. 1994). In the Arusha region, cattle are everywhere and oxen are the most common source of draft animal power. The use of draft animals remains the most appropriate alternative power source given the low purchasing power of the majority of the nation's small farmers (Lyimo and Kessy 1997). Tanzania, unlike nearby Ethiopia, has a relatively short history of using draft animals (Kjaerby 1983). Most farmers in my study agreed with the published sources, that oxen were introduced by colonial farmers, about 1900.

7.3 - History of Oxen in Tanzania

The first white settlements in Arusha were in 1902, when 100 Afrikaner families drove their ox wagons North after the Boer War. Their settlements were short lived, but they had been granted each 1000 hectares on the Northern slopes of Mt. Meru, between Oldonyo Sambu and Engare Nanyuki (Spear 1997). These first settlers brought oxen with them, but oxen were later introduced to the local population by the German and English farmers in Northern Tanzania shortly after the settlement of Arusha, and at a time when their plantations were growing in size and producing crops for export (Meertens et al. 1996, Mtunze and Lyimo 1999, Spear 1997). From these early colonial settlers many local farmers learned how to use this technology from the *"Wazungu"* [1] (Kjaerby 1986, Mothander et al. 1989). While they initially used oxen on settler plantations, many realized draft animals could also be used to expand their own agricultural operations.

Since this early introduction, the spread of oxen has largely been the result of an informal transfer of technology. There were Government policies initiated in the 1960's and 1970's to promote the use of oxen, which have had some impact on the adoption of draft animal power. There have also been numerous efforts by NGO organizations such as the German Aid Agency (GTZ) (Starkey and Mutagubya 1992), Mifpro (Galema 1994), Mbeya Oxenization Project (Rempel 1993, Marshall and Sizya 1994) and Tiller's International to encourage the use of oxen. Throughout Tanzania oxen have been used to primarily expand the agricultural land base, through a process of extensification (Kjaerby 1983, Kjaerby 1986).

Despite many attempts in Tanzania to promote tractors instead of oxen (Starkey and Mutagubya 1992, Sosovele 1999b), these have largely failed in the most rural areas, as oxen have been more economically sustainable.

[1] Or the white or Europeans as they are called in Swahili.

To this day many people continue to believe the Maasai are wandering pastoralists, with little need for draft animal power (Starkey and Mutagubya 1992). As was pointed out earlier, the Maasai have been adopting a more sedentary lifestyle, and with it the rapid adoption of oxen as their primary source of agricultural power. This adoption has been rapid, in part, because Maasai men still largely adhere to the principle of disliking the use of a hoe. Oxen were considered an intermediary, which allows men to cultivate the land, without actually hoeing it themselves.

Among the Maasai in Monduli District, the adoption of oxen has followed this informal transfer of the technology. The WaArusha have been familiar with oxen since the earliest white settlers arrived in Arusha. They quickly adopted the technology and used it on their own small farms (Kjaerby 1986, Spear 1997). As land became scarce near Mt. Meru, many of the WaArusha moved off the mountain and onto the nearby Kisongo Plains and Monduli Highlands, taking with them their oxen (Spear & Nurse 1992, Spear 1997). The WaArusha's use of oxen was undoubtedly observed by the Maasai. Early on they might have looked disapprovingly at this use of cattle, as they had "*strict prohibitions against cultivation*" (Jacobs 1965). However, over time the economic and environmental reality changed the Maasai. They have adopted oxen and they have done it easily and very successfully.

7.4 - Learning to Use Oxen

Working with the Maasai and WaArusha I asked each farmer where they learned the technology. Not one responded through the extension service. Viewed as pastoralists, and one ethnic group that has often been forgotten in formal extension programs, the Maasai were frequently left out of the extension loop. Finding an extension officer who was willing and

able to communicate with groups that have not always followed traditional educational and agricultural trends can be a challenge.

In areas of widespread animal traction, including the Monduli District, the use of formal extension services appears to have had a minimal effect on the transfer of draft animal technology (Sosovele 1994, Starkey et al. 1994). This appears to be the result of the training of extension officers in offering anything beyond basic techniques in the use of the animals and the plow (Starkey and Mutagubya 1992). Technologies such as weeding, improved animal training, designing improved harnessing systems, and creative ways to finance draft animal power have often largely beyond their scope, abilities and expertise. Animal traction may on the surface appear to be a simple technology. However, its use and development leads to individuals with the need for additional resources and information, in order to fully capitalize on the possibilities that draft animals have to offer.

Animal traction technology can spread rapidly and spontaneously, once a critical mass of people have adopted the technology (Starkey and Mutagubya 1992). Given the fact that many WaArusha had experience with oxen, when they moved to traditionally Maasai areas, such as Monduli district, the use of oxen did spread rapidly. Most WaArusha men I interviewed said they had learned this technology from their father, 65% of the WaArusha men had been using oxen for 30 years. Many of them brought the animal traction technology with them when they moved to the Kisongo Plains, as indicated earlier by Spear (1993b, 1997). Eight percent (8%) of the Maasai men interviewed said they learned how to use oxen directly from the WaArusha who introduced oxen to the lower Monduli District. However, 40% of the Maasai men interviewed said the real reason they decided to adopt oxen was because of Ujamaa and the Villagization scheme. Those Maasai, who had not been organized into villages, were later influenced by Edward Sokoine. In 1983, Sokoine, made a campaign through much of the Monduli to convince the Maasai to adopt agriculture and oxen.

As an example, here is a statement by one Maasai in Esilalei,

> *"Oxen have been used in this area since 1983. This technology was introduced by the late Prime Minister Edward Sokoine. He introduced ox yokes and plows."* [2]

In providing appropriate training in the use of draft animal power there are many resources and successful examples from Africa and Tanzania (Kjaerby 1983, Rempel 1993, Birch-Thomsen 1993). While there have been many failures in the programs to promote and disseminate knowledge about using draft animal power, there are numerous examples of systems and approaches that have been effective in Tanzania (Galema 1994, Sosovele 1994, Urasa 1994, Mwakitwange 1994). Starkey et al. (1994) provided numerous broad examples and recommendations, which were both timely and specific to Sub-Saharan Africa.[3] The Maasai adoption of oxen was certainly one successful case of informal transfer of this knowledge.

The spread of animal traction can be a slow process (Starkey and Mutagubya 1992). Long learning periods do not necessarily mean that the technology is inappropriate. It simply means that the transfer of technology and its adoption must be done cautiously. There cannot be one formula that works for all people in all regions. I think the first thing I learned in Uganda in 1995 (my first trip to Africa), was that my "cookbook" approach to animal traction development was simply not relevant. There are so many variables that no one system of delivery or technique will work with all audiences. However, given the history of Tanzania, and the fact that peasants rarely make choices irrationally (Rempel 1993), it has probably

[2] Interviewee #2

[3] Paul Starkey is a British agricultural development expert, specializing in the field of animal traction. He is well known and has published more volumes on draft animal power in third world development than any other individual. Visiting with me in 1991, at my home in Berwick, Maine, we engaged in the most lively and thought provoking dialogue I had ever had on draft animal power. His ideas and perceptions challenged everything I knew about the "right" way to work oxen. He likely inspired my need to explore the use of oxen in a new light, more than any other individual.

been best that animal traction has spread slowly. Widespread adoption of one single system would not be an appropriate nor viable option for Tanzanian small farmers, especially for the Maasai.

As most technology is transferred informally between generations, families and migrants, there needs to be a better understanding of this form of technology transfer (Sosovele, 1994, Starkey et al. 1994). Every time I spoke with a farmer, I heard answers that agree with what Starkey and others have found. There is far more animal traction technology transferred informally than has ever been transferred through formal sectors. Thus, it would seem that instead of providing training for individuals that have never used the technology or improved techniques (who face an amazingly steep learning curve), a better prospect might be to provide farmers using the technology with ideas and incentives to spread their own knowledge.

One great example of how the informal spread of animal traction takes place, comes from an interviews with a Maasai man, who had taught his wife to drive oxen just two years earlier. He said, "*Women can drive and plow with oxen, since I taught my wife two years ago, now my neighbor's wives do this too.*" [4]

Most of the Maasai and WaArusha were willing to share their ideas about the spread of animal traction, and describe how they learned to use oxen. According to the WaArusha in my study, 18%of the men (all WaArusha) had family members who had been using oxen for at least 40 years. Another 12% of the men, again all WaArusha, had been using oxen over 50 years. Almost 2% said their family had been using oxen for at least 60 years. These findings correspond with Mothander et al. (1989), Starkey & Mutagubya (1992), and Spear (1997). Most of the Maasai have adopted oxen since Ujamaa, and 19% of the men (primarily Maasai) said it was actually during the settlement of these villages that they learned to use oxen. This

was through a process of informal transfer of the technology. They observed the use of draft animals among other groups and slowly began to adopt the technology. Another 4% of the men (all Maasai) admitted to having learned the technology from the WaArusha. Interestingly, 5% of the men I interviewed, (again primarily Maasai) said that they adopted oxen after a demonstration and speech by the late Prime Minister Edward Sokoine (A Maasai from Monduli) in 1983.[5] Finally, the remaining men interviewed had learned the technology more recently, or in the case of Engaruka from a Msonjo and a Meru farmer more than 40 years earlier.

If there were to be any improvements in the use of oxen by the Maasai, this would need to be done with care. The quote by Mollel and Rafiq at the beginning of this chapter point to the importance of working with the people. Development, through the use of participatory planning, with local leaders, as well as, NGO's that specialize in working with groups would be likely to yield the best results. Sustainable skills and agricultural techniques were needed. These would be more likely to be attained, especially with regard to use of implements beyond the plow and simple sleds that were being used, with participatory training.[6] This type of training will be discussed in more detail in the Chapters 9 and 10, as improving the agricultural techniques, could address issues of declining yields and sustainability.

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[4] Interviewee #9, from Esilalei

[5] Edward Sokoine was one of the most successful Maasai politicians, becoming Tanzania's prime minister from 1980-1984. The Maasai I interviewed all embraced his ideas seriously and spoke of him as a politician they truly believed in. According to Igoe (2000) he was a strong advocate of Maasai land rights, and constantly urged the Maasai to embrace the future, development and education. He died tragically in a car accident in 1984.

[6] Too many programs in the past simply introduced draft animal power in some superficial sense and fully expected farmers to adopt this technology. Starkey et al (1994) states that there should be no "blind" transfer of animal traction technology. This was in some ways the case with Tillers International in the programs that we conducted in Kisangara and Ngulu (In the Kilimanjaro Region 1999). We thought we had a sense of what was expected, as the Tillers International's Director, had conducted a scoping exercise. However, the actual farmers chosen for the program (instead of those in the scoping exercise) and the local contact/coordinator had other agendas. We tried to adapt to their needs after our arrival, but the "tools" we brought with had us somewhat locked into one program. At the end of our four weeks we conducted a formal evaluation of all participants.

7.5 – Tanzania's Potential for Expanding the Use of Draft Animals

The regions of highest draft animal use have been in the cotton and corn belt of Mara, Mwanza, Shinyanga, and the nearby regions of Arusha, Singida, Tabora, and Iringa (Starkey and Mutagubya 1992). Starkey and Mutagubya (1992) estimated that only about 1 million cattle are employed in agricultural operations, cultivating 27% of the crops grown nationwide. With over 12 million cattle in Tanzania, of which only about 10% were used as draft animals (Mtunze and Lyimo 1999), there are theoretically ample numbers of cattle that could be employed as draft animals in agricultural operations all over Tanzania (Mgaya et al. 1994, Lyimo and Kessy 1997). Cattle were and will continue to be a major resource of many farmers (especially Maasai), acting as a source of capital, regular income, equity, insurance, and prestige (Rigby 1992, Spear 1997). The huge gap between the land tilled with draft oxen and the cattle available for use offers a tremendous amount of room for improvement. Given the prospects for animal traction listed below, there were many reasons to expand the number of farmers using this technology.

7.5.1 - Agricultural Extensification Using Oxen Today

Animal traction can increase the total production by increasing the amount of land in agricultural production (Gulliver 1961, Boserup 1965, Sosovele 1991). One farm family with a few teams of oxen could expand their land base in a very short period of time, versus a farmer who was dependent solely on hand labor (Panin & Ellis Jones 1994).

One farmer in Lendikenya said,

> *"In 1977 I had only one acre, oxen have allowed me to increase my crops to 11 acres. This would not have happened with a hand hoe."*[7]

Finally the entire team heard for the first time what the real interests and concerns of the farmers were. In the future, with this as a stark reminder, I am convinced that participatory planning is the place to begin.

[7] Interviewee #69, a WaArusha

In this study 74% of the farmers interviewed said they had expanded their crop fields by using oxen. A number of these farmers said they tried to increase the size of the fields by 1-2 acres/year. Another 8% said they have expanded their crop fields with the use of a tractor, but then they used oxen after the tractors plowed the virgin sod. The remaining 18% of the farmers in my study responded that they would like to expand, but in villages such as Lashaine and Engaruka, the available crop land has been taken, and the village will not allocate additional land, so they do not have this option.

A WaArusha farmer in Lendikenya said,

> *"Yes. Obviously (oxen can be used to change the farm size). You have to clear the fields (of bushes and weeds) and the oxen allow you to expand to any size you want. When I first came here I paid laborers to clear the land, then I planted with a jembe (hand hoe), then after that I used oxen."*[8]

Extensification of agricultural operations might be viewed as unsustainable in the long run (Blench 1999). However, Tanzania has a total of 94 million hectares, of which 40 million hectares were supposedly suitable for cultivation (Ezaza 1991, Lyimo and Kessy 1997). Currently only about 7 million hectares are under cultivation, thus demonstrating a huge gap between what might be possible and what was under production (Ezaza 1991, Lyimo and Kessy 1997). Tanzania's own National Food Strategy stated that between 1980 and the year 2000 "*not less than 53% of the increase in agricultural production is expected to come from area expansion*" (Hodd 1988). While this could be called a very optimistic assumption, there do remain large areas of potentially productive land left unused. Poor infrastructure, with particular regard to transportation, as well as government policies that have restricted or limited the use of otherwise productive lands, and the presence of the

[8] Interviewee #78

Tsetse fly[9], have all limited the expansion of agricultural areas. In my research area, wildlife reserves were sometimes discussed with contempt, as these too, according to the local people, could be areas for growing crops.

7.5.2 - Improving the Timeliness of Agricultural Operations

Huge gains can be made by increasing the timeliness of agricultural operations such as plowing and weeding, through the use of draft animals (Shetto et al.(no year), Rempel 1993).

One Maasai farmer interviewed in Lendikenya when asked about the advantages of oxen in the farming system, responded,

> *" The advantage I get is (more) food because of using oxen. It is not easy to grow crops by hand. Even using everyone in this boma (which was at least 40) I could not grow crops like I can using oxen.."*[10]

Some of the WaArusha and Maasai in West Arumeru and Monduli seemed to use the oxen on a more regular basis, than what could be seen in areas such as nearby Simanjiro and the Kilimanjaro and Tanga regions. In addition to plowing and planting which were major activities, the Maasai and WaArusha were also using oxen for transporting firewood, as well as, poles and thorn bushes for house and corral construction. They also used the animals for transporting water and harvesting crops. Some WaArusha said the animals were used for hauling manure to the fields. One WaArusha farmer said he had weeded with oxen, proudly displaying his ox muzzles and cultivator. Extension officers seemed to want to believe that a lot more people were weeding with oxen, but even the SG-2000 farms[11] had cultivators with very little evidence of regular use (Meindertsma and Kessler 1997). I never viewed anyone

[9] which has severely limited the range in which cattle and humans can survive
[10] Interviewee #81
[11] Internationally supported NGO, working on improving the access to better implements, improved animal training and other "Green Revolution" technologies."

weeding a field with oxen. Weeding for the most part continues to be a time consuming and tedious task with a hand held hoe.

Finally, and most importantly to the Maasai and Warusha , the use of oxen was seen as a way to get one's fields plowed faster than a hand hoe when the rains come, and in many cases even faster than a tractor. Having to wait for a tractor to come to plow the fields was seen as a major problem, as most fields in any given area all needed to be plowed at the same time. Waiting for a tractor could delay planting, which could often mean having a poorer crop for the season. Even for tractor owners they often relied on oxen as a backup in case of breakdowns (see Table 7.1).

One WaArusha farmer in Mbuyuni summarized the need for oxen in this way,

> *"Even the Maasai who were not using oxen in the past are now using them. Oxen are still useful for those with tractors. About 75% of the people are using oxen. Yet, even tractor owners, when they have breakdowns, they must ask* (people with oxen) *for help. In this village there are about 10 tractors. The number of people with oxen you cannot count (because there are so many). For those* (people) *that are using oxen you usually get a good yield. You don't have to get spare parts or fuel, and you don't have to wait for them* (tractor owners) *to come to the field."*[12]

7.5.3 - Animal Traction Can Reduce Labor Constraints

Labor, has often been seen by farmers, as a major constraint in their agricultural operations (Starkey and Mutagubya 1992, Panin and Ellis-Jones 1994). It relates to the timeliness of agricultural operations, as women were the major agricultural labor source. Animal traction can help remedy the challenges associated with a seasonal shortage of labor, by providing the power to achieve similar results with less human labor. Such operations include the initial preparation of land, primary and secondary tillage, but also weeding, harvesting, and transportation bottlenecks. On many farms weeding was a primary bottleneck or constraint due to a seasonal shortage of labor, often leading to fields that were not

[12] Interviewee #84

adequately weeded (Kwiligwa et al. 1994). If draft animals were properly trained and implements available for weeding, this bottleneck could be remedied. Yet weeding with oxen is a big step forward. It would requires animals that can be precisely controlled, and the use of muzzles to keep the animals from eating the crop.

A great deal of time is spent by African women and children "head loading" everything from household water to firewood as well as, produce and commodities to market. Decreasing the agricultural and transportation burdens on women and children would allow them to pursue education or other income producing activities, by freeing up their time (Sylwander 1994, Tangka 1999). The time and effort spent carrying things from one point to another has been one reason labor has been a constraint on other pertinent agricultural tasks (Starkey and Mutagubya 1992, Rwelamira and Sylwander 1999). The Maasai women have been no exception. [13] Making appropriate technology like draft animal power more available to women has been a major interest of the FAO, in their efforts to reduce the workload of rural women (FAO-SDWW 1996).

The unfortunate truth has been that most draft animal programs in their initial stages increased the burden on women and children. This was because men view much of the weeding, harvesting and transportation as women's work. Men have often refused to participate in such activities, despite large increases in farm productivity and acreage with the use of oxen (Rempel 1993, Rwelamira and Sylwander 1999). Weeding is a particularly troublesome task, as crop areas increase in size. This is especially true of the Maasai and WaArusha, as the example below illustrates, when the two women interviewed were asked about their daily workload.

> *"Men and women have separate fields, the women* (his wives) *all weed in the husband's field, then they must go to their own fields to weed, if*

[13] Although many Maasai women use donkeys to transport water to the *boma* for both domestic use and young animal consumption (Jacobs 1980)

there is time...A lot of energy is used to work these oxen, a tractor you just pay and the job is done quickly, the future of oxen is dimming (from a the women's perspective)."[14]

These women said that the future is in tractors, and rightly so, as they later point out,

"Men oppress us, they want us to beg from them. The old men plant single crops and get good yields (the women do the planting and weeding in his fields)*, and then they buy cows. We mix beans and maize in the same field,, in order to always try to get something to feed our family, when diseases strike the fields."*[15]

7.5.4 - Ox and Donkey Carts

Most Maasai and WaArusha in my study used oxen only for fieldwork. Yet, both oxen and donkeys can be used for transport. Many Maasai and WaArusha women used donkeys with packs made from cow skins for transport (Starkey and Mutagubya 1992). A few WaArusha farmers used donkeys with carts. They were preferred over oxen, because they could be more easily handled, and were faster than oxen on roads. These carts were used for hauling water in drums, harvesting crops and carrying crops for sale to local markets. Only 9% of the farmers had carts, but another 4% expressed their desire to own a cart. Animal drawn carts were not readily available in local villages, as they were in Arusha. The price for a commercially made cart in Arusha was about $250.00, but various NGO's such as VetAid and SG-2000 sold carts for less money. The greatest challenge for a Maasai or WaArusha was not so much the price, but the transport cost of getting it to the more remote villages and the maintenance of carts once they get them there (Urasa 1994).

Most Maasai and WaArusha farmers who did not have a cart did use a locally made sled, which was simply a large forked branch with small poles nailed across the branches to provide a surface on which the harvest, water drums or a plow could be placed. The oxen were hitched to the front of this sled by a chain. These were also used to take sick or dead

[14] Interviewee #70, two wives of a man in Lendikenya. One wife was Maasai the other was WaArusha.

animals back to the boma, and in a few cases were also used to take sick people to the road for transport to the hospital. The disadvantage of these locally made sleds was that they were thought to contribute to gully erosion on the roads and paths, as they removed vegetation while being dragged behind the oxen. Farmers recognize the advantage of carts, but the sleds were made entirely of local materials and were one of the few options readily available to reduce the drudgery associated with harvesting, water collection and moving other objects. Similar observations were made by Starkey and Mutagubya (1992).

7.5.5 - Animal Traction Can Improve Profitability

There are many ways that animal traction can improve the profitability of the farm. This could be through both intensification and extensification (Panin & Ellis Jones 1994). Animal traction could also improve farm profitability by allowing farmers to be more timely in their planting, as the window of opportunity in many areas is quite narrow. It can allow better weed control, by burying the weeds and weed seeds deeper than a hand hoe, and better improve weed control, through the adoption of animal powered cultivators.

One WaArusha man in his fifties from Mswakini, described the profits he gets from oxen in this way,

> *"There are big profits from using oxen. You see this boma, I have a big family* (many wives and children). *I can take care of all their food needs because of oxen. I have bought livestock from selling crops. Some people even buy tractors or cars from selling crops that they have grown using oxen."*[16]

When asked how draft animals changed the profitability of the farm, most farmers responded that they now have more food (42% of farmers surveyed), which allowed them to not only feed their family, but they also did not have to sell livestock to buy the food (38% of farmers surveyed). In fact, the profits generated using oxen allowed most men to increase

[15] Interviewee #70, two wives of a man in Lendikenya. One wife was Maasai the other was WaArusha.

their livestock herd (42% of farmers surveyed). The extra crops also help to pay school fees, buy clothes and meet other family needs (24% of farmers surveyed). Others pointed to assets like a tin roof, a shop they owned in town, or ox-carts and tractors that they purchased with the profits realized from the sale of crops grown in fields plowed and planted with oxen (8% of farmers surveyed). Most interesting were the 4% of the farmers that responded that the use of oxen had allowed them to pay the dowry for a new wife.[17]

Not having to use a tractor was seen as an advantage of oxen over tractors. Farmers in my survey pointed out the following:

1) Most important to the farmers after feeding their family, was not selling cows to pay for a tractor or simply not spending the money to rent a tractor and getting just as good a yield/acre (29% of the farmers surveyed). Here is a typical response to the question of how draft animals have changed the profitability of the farm. One WaArusha farmer in Lolkisale put it this way, *"I will keep on using oxen. Imagine* (I know) *two people who bought tractors, they are no longer using them. The price of spares was too much. Those people have sold their cows to buy spare parts. For Maasai tractors are not good, as it can finish* (wipe out) *all your cattle."* [18]

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[16] Interviewee #117

[17] Over the last five years, I have given more slide shows and talks and lectures about my travels in East Africa than I can count. One of the stories I include in every talk was the day I was offered a Maasai wife, in exchange for a pair of my very large American oxen.

It happened when one interview was over, and the tables were turned on me, as they often were at the end of an interview with a Maasai. There was always great inquiry among Maasai and WaArusha about the photos of American oxen that I always had with me. This particular man said he wanted me to bring him a pair. In fun, I mentioned the difficulty of bringing animals by plane, that weigh well over ton.

His response, "You have this technology to put cattle in test tubes. Bring two of those and we will put them in my cattle."

I continued to explain even the difficulty in doing this.

He then yelled to his teenage daughters who were hiding in a nearby hut. They came running out. He told them to line up and then he said to me, "Pick One! You are coming back to Tanzania, when you do I will have a wife and a hut waiting for you. I have heard you called the White Maasai. All I want is two of those cattle. This is a very good price."

Lobulu, my assistant, agreed that it was, with a huge smile, he kicked back and let me try to talk my way out this predicament.

[18] Interviewee #121

2) Waiting for a tractor, was also thought to be a real problem, as most farmers request them at the same time (response by 5% of farmers surveyed)[19]. For example, a WaArusha farmer from Arkatan said, *"I can use my oxen anytime I need them, unlike a tractor which you have to find and then wait for."*[20]

3) You can grow more crops with fewer expenses, a great example was *"For a person that planted four acres with oxen and another with a tractor, the one with oxen has no expenses. The one with a tractor has so many expenses, 10,000 Tsh ($14.50 U.S.) to plow, 10,000 Tsh to plant.*[21] *If you only got 4 sacks per acre (yield), it is a loss with the tractor, but with the oxen you have no expenses."* [22]

4) You can sell the big oxen, and buy more cattle or twice as many young oxen (response by 2% of the farmers surveyed). One example was as follows, *"...sooner or later you sell the oxen and buy smaller ones and the surplus money I use for other things. The smaller oxen are then trained and sold again years later. I get a good income from ox farming."*[23]

5) The ability to plow wet fields (response by 1% of farmers surveyed). One man put it this way, *"Even my son managed to buy a tractor, but he cannot really escape using oxen, because during the rainy season the land can be wet, too wet for a tractor. In that case he had to use oxen."* [24]

6) A few farmers said the yield was better in ox plowed fields. Compared to tractor fields, it was because the soil did not become "hard" or compacted. Compared to hand hoed fields, it was because the soil was more uniformly turned over burying weeds and any manure

[19] Tractors are most often provided by wealthier farmers that own them. This was most often WaArusha in my study. I never saw a tractor in any Maasai boma, but there were at least 3 seen in bomas owned by WaArusha, although all of these farmers had tractors that were not working and used oxen as their primary means of farm power.
[20] Interviewee #106
[21] Ten Thousand Tanzania Shillings was the equivalent of $14.30 US
[22] Interviewee #96, a WaArusha man in Mbuyuni
[23] Interviewee #77, a WaArusha man in Lendikenya
[24] Interviewee #107, a WaArusha man from Arkatan

spread on the fields. Some men said this was due to spreading out the chore of hand weeding, for example, *"Oxen plant more precisely than a tractor, so the weeding is easier and since you only plant one acre per day with oxen, compared to 6 or seven per day with a tractor, the weeds don't all come at one time."*[25]

7) There was no need to buy fuel or spare parts. A WaArusha man put it this way, *"My sons will keep on using oxen. I have learned from people that had tractors and now have stopped using them because of a lack of spare parts. Cattle don't need spares, they need only grass and water."* [26]

8) Oxen can be rented out to make extra money and as one stated by one Maasai, "*You can then use the money to hire others to do your weeding*," a job which Maasai men really despise.

One Maasai farmer in Selela described how much he had gained from using oxen, stating,

> *"The profit from using oxen has built this shop in town, allowed me to buy a Land Rover and even allowed me to get more wives."*[27]

Similarly, a Maasai man from Lendikenya said,

> *"It (oxen) is profitable. I can buy anything I want from the harvest to meet the needs of my family buy goats, cattle, or even build a house. I can do anything."*[28]

7.5.6 - Animal Traction's Advantages over Tractors

Tractors have failed time and time again all over Africa. Tanzania is no exception (Kjaerby 1983, Ishuza 1989, Sosovele 1999b). Pingali et al. (1987) cite the "tractor fiasco in

[25] Interviewee #76, a WaArusha man in Lendikenya
[26] Interviewee #112, a WaArusha man from Mswakini
[27] Interviewee #32
[28] Interviewee #75, this Maasai man was very memorable. He was the best story teller of all the men I met, everything was done with a great sense of animation and the story. His answers were the most colorful, detailed

Tanzania", where 10,000 tractors were employed in agriculture in the 1980's, but only 40% were operational within a few years. With Western advice and money Tanzanians all too often ventured into mechanized farming where they grew alien crops instead of traditional ones (Mwalyosi 1993, Mkomwa and Shetto 1999). Agricultural research and development have often been aimed at large scale farming systems, with little regard to local knowledge, and readily available resources, like draft animal power (Sosovele 1999b).

One of the justifications of for Nyerere's villagization schemes was the potential for large mechanized farms, but the use of tractors has actually dropped each year since the early 1970's (Birch-Thomsen 1999, Sosovele 1999b). In contrast, despite earlier government programs promoting the use of tractor power, animal traction use has increased at least three fold in the same time period (Starkey and Mutagubya 1992, Sarris 1993). While there are success stories of farmers using tractors, these are primarily on farms with foreign backing or owned by expatriates. It is quite common to see tractors in the countryside, even seeing one in a Maasai or WaArusha *boma* is not uncommon. However, many of these are not operational. There is often some status associated with owning them, as they are not cheap. Yet there is also usually the underlying problem of keeping them running and the need to maintain oxen to either compliment the work of the tractor or use as a back-up when the tractor breaks down.

One WaArusha farmer from Mbuyuni pointed out,

> *"Even if someone gives you a tractor you cannot manage to afford it, because of the high price of spare parts, oxen do not have these problems."*[29]

By the 1980's in Tanzania, it was obvious that the success of nationwide *"tractorization"*, was not a reality (Kjaerby 1983). At this time many NGO's and "outside

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and enjoyable to listen to, of all my interviews. I am sure he may have gotten carried away a few times, but most of his answers followed what his neighbors were saying, but with more detail.

donors" began to promote animal traction and a number of ox training centers were established (Sosovele 1999, Mtunze and Lyimo 1999). The government instituted a new policy stating; " ... *an increasing share of total energy supply will come from oxenisation while tractors will be deemphasized, except when they are highly desirable ... on the basis of cost considerations*" (Hodd, 1988).

Tractor plowing was common near the larger cities and towns where fuel and spare parts were readily accessible. Thus, the use of tractors was partially the result of better infrastructure to support tractors. In the study area, tractor plowing was more common near Arusha, Monduli town and Mto wa Mbu. It was virtually nonexistent in the remote and small fields of Engaruka. Thus, the further from populated areas with adequate support systems, the more expensive and difficult it becomes to employ tractors. On the roads in rural areas where there was mixed farming and cattle, there was a far greater likelihood of seeing draft animals at work and the stripped frame of a tractor decaying on the edge of a village. This follows the government's 1997 agricultural policy to promote tractor hire centers through the private sector (URT 1997), but the private sector will only have tractors where there are farms large enough to support their use (Panin & Ellis-Jones 1994).

There was no shortage of farmers interested in using tractors. In fact, most farmers will admit to the desire to use tractors when they can afford to do so. Most of the young men in my study were interested in these tractors despite the huge economic obstacles that must be overcome in order to purchase or use them. The results of my study showed that the sons of the farmers interviewed sometimes looked to the adoption of tractors in the future. There were also white farmers who continued to insist that the use of oxen is a backward technology, and that Maasai and WaArusha farmers would be more well served if they adopted tractors. However the reality was that there was not the available capital or the

[29] Interviewee #103

supporting infrastructure available to an average Tanzanian farmer, that there was to a white settler (Panin & Ellis Jones 1994).

Tractor plowing in my study ranged in price from $14 - $25/acre U.S ($34.50-$61.80/ha). The average price was $18 U.S. This was substantially higher than ox plowing which averaged just $10/acre or $24/ha. Interestingly, Panin and Ellis-Jones (1994) noted that in Sub-Saharan Africa the price is for hiring tractors is usually twice that of using oxen, which was almost exactly what I was told.

Many farmers in my research area used tractors, but the use of tractors varied with the weather, the size of the fields, the availability of a tractor, as well as, the price to hire them. In my study, 22% of the Maasai and WaArusha farmers used tractors in the past before they had oxen or when their oxen had died or been too ill to work. 10% of the farmers in my survey used a tractor only for breaking virgin sod, rather than struggling to do it with oxen. Twenty-seven percent (27%) of the farmers said that they had never used a tractor, and 41% said they use them regularly, but not on all fields or every year. The combination of both tractors and oxen, was noted by Panin & Ellis-Jones (1994) as an increasingly important option for even commercial farmers in Africa.

Although, all of the men I interviewed used oxen, the WaArusha seemed to use the tractors more often than the Maasai. The Maasai usually saw oxen as a way to avoid cash inputs into their agricultural operations. Fewer WaArusha used them for breaking sod, but this might be due to the more recent expansion of Maasai farms, whereas the WaArusha have been growing crops steadily over a longer period in Monduli district.

Table 7.1

Tractor Use by Maasai and WaArusha in Southern Monduli District

Tractor Use	Maasai	WaArusha
Using Tractors and Oxen	25.4%	55.4%
Not Using Tractors	32.20%	21.5%
Used Tractors only for Breaking Virgin Sod	17%	4.6%
Used Tractors in the Past	25.4%	18.5%
Total[30]	63 interviews	65 interviews

Yet even the WaArusha admitted that having oxen was an advantage. One farmer in Mbuyuni, put the situation this way, *"In the past I was just using tractors for plowing, but I used oxen for planting. Now I use oxen for both. I guess the tractors are finished* (meaning no longer being used or the time where tractors prevailed is over)." [31]

7.5.7 - Renting Oxen

One advantage of oxen over tractors might be the lower cost of hiring the farmers with oxen to plow fields versus the tractor. Yet, renting out one's oxen was the one characteristic of keeping oxen that differed considerably from village to village. None of the Maasai and WaArusha farmers in the villages Lendikenya, Lashaine, Mswakini and Mbuyuni hired[32] out their oxen. In Lendikenya and Lashaine, they considered this a bad business. However, in Engaruka and Selela, where there was land scarcity and more intensive agriculture, 76% of the Maasai hired their oxen out in trade. They frequently plow one acre

[30] The other two farmers were one Msonjo and one Msomalia, who both lived in Engaruka and had been using oxen exclusively for nearly 40 years each.
[31] Interviewee #88, Mbuyuni

with a span of oxen (either 4 large oxen or 6 smaller ones) in exchange for a female goat or in exchange for grazing the crop aftermath.[33] In these villages, renting out oxen for plowing and harvesting was an added bonus and way to diversify the use and costs of keeping and training the animals. There were a few farmers in nearby Losirwa and Esilalei that also hired out their oxen.

The WaArusha in Mbuyuni and Mswakini were familiar with hiring out oxen, but admitted that this was not something they do now, as many of them had moved to these villages from the more agriculturally intense Arumeru district. For example, one WaArusha man pointed out,

> *"Now, this business is not going on, but in Arusha they had this in the past, in the 1960's."* [34]

The sharing of oxen with neighbors, was seen as a definite advantage over tractors, especially for poor farmers.

In Lendikenya one man pointed out,

> *"A person that is poor can be helped (by a neighbor) with oxen, but a poor person won't get any help with a tractor."*[35]

Another farmer in the same village said,

> *"If 97% of the people have oxen, the other 3% who don't have them can simply borrow them."*[36]

Interestingly many Maasai had never heard of hiring out their oxen, and in fact saw this as a bad business, based on their traditions of sharing with other Maasai in times of need.

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[32] The term hiring out the oxen is likely more correct, rather than renting them, as the owner of the oxen almost always goes with them. One Maasai man in Selela pointed out that otherwise the person borrowing the oxen might whip them too much or work them too hard.
[33] Most Maasai and WaArusha said that one span of oxen could plow a 1/2 acre (0.2 ha) per day, by working from early morning for 4-5 hours. Thus it took two days to earn the female goat or equivalent of $10 US.
[34] Interviewee #93, from Mbuyuni
[35] Interviewee #64, a WaArusha
[36] Interviewee #78, a WaArusha from Lendikenya

As examples here are some quotes from Maasai in my research area, when asked if they hire out their oxen for plowing and other work.

"No, you just help people. It is a shame to have such a business in Maasailand."[37]

"No, I just help those that do not have oxen."[38]

"No this is not a good business. I just help someone that does not have oxen!"[39]

This sharing of a resource like oxen is admirable, especially as many farmers have disease problems that might wipe out their oxen or frequently face some other dilemma that makes plowing with tractors far out of their financial reach. Yet, among the Maasai, not unlike many Tanzanians, there is a great sense of responsibility toward one's friends, family and neighbors.

How long this cultural tradition holds out, I believe is directly related to the intensity of the agricultural operations, as more intensive agricultural areas all over Tanzania use this strategy of hiring out oxen as an income generating resource (Kjaerby 1989, Sosovele 1991, Boesen and Ravnborg 1992).

7.5.8 - Oxen versus Donkeys

Oxen were not the only draft animal with greater potential in the research area. It should be noted that 91% of the farmers interviewed said oxen were their preferred draft animal. However, most admitted that this was because oxen could work longer hours during the plowing season, or that donkeys got tired more quickly.

I had heard this statement early on in my interviews, which had led me to believe that most Maasai would not want to use donkeys,

[37] Interviewee #77, from Lendikenya
[38] Interviewee #80 from Lendikenya
[39] Interviewee #58, a WaArusha from Lashaine

"If I only had donkeys I would use them, but Maasai believe that by mixing animals (donkeys and oxen in yokes) there is a chance of the oxen dying and you end up with only donkeys and no oxen."[40]

When asked why they preferred oxen to donkeys, typical responses in my research area were: "*Donkeys are lazy,*" [41] "*Because oxen can work more than donkeys,*" [42] and "*I prefer oxen because donkeys are very lazy. They cannot work like oxen,*" [43] finally, one Maasai man from Lashaine summed it up like this, "*Oxen are harder, they can work longer, donkeys are too lazy and very weak.*" [44]

My observations showed this perception of donkeys being weak, was more a result of a poor harnessing system for donkeys, as they simply wore the same yoke as the oxen. Rather than any physiological weakness (Pearson et al. 1999), their anatomical difference with a higher held head forced them to push into the yoke straps from the front of their neck or throat, rather than the hump, which was pronounced on all the oxen. They cannot perform adequately with a yoke designed for oxen. It is like wearing a shoe that does not fit, the animals are constantly in pain or discomfort, and cannot perform as might be expected if they had an adequate harness. The donkeys would plow reluctantly, but only with the strong persuasion of men with whips. Donkeys are also about half the weight of many of the mature oxen, and coupled with being poorly yoked, they cannot perform in field operations without an adequate yoking system (Pearson et al 1999).

Only 6.5% of the farmers interviewed said they actually preferred donkeys over oxen. These were all WaArusha farmers. This was because they were thought to be more easily trained, more disease resistant and better able to work after a drought than were oxen.

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[40] Interviewee #71, from Lendikenya
[41] Interviewee #33, a Maasai from Selela
[42] Interviewee #35, a Maasai from Esilalei
[43] Interviewee #41, a Maasai from Engaruka
[44] Interviewee #65, from Lendikenya

One WaArusha man praised donkeys in this way,

> *"The advantage of donkeys is that they don't have health problems like cattle. It is also easy to train donkeys."* [45]

A small number of the men interviewed (2.5%) said, they preferred having both animals to use for farm work, as it offered some security in times of disease or drought.

According to one Maasai man, oxen are preferred for plowing,

> *" ...because donkeys get tired quickly. Oxen can work more hours, but I use donkeys when I do not have enough oxen for plowing. I usually mix oxen and donkeys together in the yoke."* [46]

Donkeys did have a number of advantages over oxen. Some WaArusha and Maasai men admitted that donkeys were easier to train. According to one WaArusha man from Lashaine, *"They* (Donkeys*) go very straight, they are rather polite and cooperative animals. With oxen they take longer for training, but donkeys only take one day to train."* [47]

On a number of WaArusha farms in Mswakini, and in other areas all over Tanzania, donkeys could be seen hauling water or farm crops in carts. Donkeys were the preferred animals to use on a cart, as they could be more easily and more accurately directed in tight places.

A WaArusha man in Mbuyuni discussed the advantage of donkeys on a cart,

> *"Even today I have used donkeys to collect crops from the field with a cart. Mostly oxen are preferred for plowing, as they can work more hours, but the donkeys are better for carts."* [48]

The ox yoke was used when donkeys pulled a cart, but the heavy tongue weight and wheels on the cart made pulling a cart more bearable for the donkeys. The donkeys used the top of their neck to move the cart, rather than the throat as they were forced to do when

[45] Interviewee #84, from Mbuyuni
[46] Interviewee #20, a Maasai from Losirwa
[47] Interviewee #60

plowing, allowing them to spread the load over more heavily muscled and larger surface area. This operation was much more comfortable for the donkeys.

Despite the vast majority of the farmers admitting oxen were preferred over donkeys, 53% of all the farmers interviewed said they had used donkeys for plowing and planting crops. The Maasai and WaArusha described this more as a measure of desperation. Donkeys were simply not considered as strong as oxen, as noted above. Donkeys would also replace oxen if they were sick or died.[49] They would be yoked with oxen, as the yoke would ride more comfortably on a donkey if it was yoked with an ox.[50]

At first, I thought the WaArusha would have had a higher adoption rate of donkeys, due to owning less livestock and being in more arid sections of my research area. However, 40% of the Maasai farmers said they did not use donkeys, compared to 49% of the WaArusha. Thus the adoption of donkeys might have been slightly higher among the Maasai, which would have at first, seemed unlikely given their reverence for cattle. However, donkeys might have been more common in Maasai bomas, as most wives own donkeys. They were not always seen in WaArusha bomas, but this is only speculation.

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[48] Interviewee #85

[49] Donkeys seemed to suffer less from many of the diseases that infected the cattle. They have a greater resistance to ticks and tick borne diseases. It was obvious that when donkeys and cattle shared the same grazing area the donkeys always had few ticks on them compared to the cattle which sometimes had dozens of blood filled ticks attached all over their bodies. The cattle are more likely the preferred host, as donkeys do sometimes suffer from tick-borne diseases.

[50] In viewing oxen and donkeys at work in a traditional East African yoke, it was obvious that the donkeys were incredibly uncomfortable. Without a hump for the yoke to ride against, the donkeys when yoked by themselves pulled from the front of their throat, pushing against the strap that held the two skeis together. I was amazed they would work at all, but with plenty of whipping and yelling they seemed to give in to the drivers wishes. When yoked with an ox, the yoke would tend to ride lower on the donkey and be turned downward, as the ox drew the load with its head lowered. This seemed to make it somewhat more bearable by the donkey. In either case oxen were considered stronger, but was merely a function of donkeys wearing a yoke that was totally ill suited to the job of plowing. The donkeys in yokes did work better on carts. This was largely due to the heavy tongue weight on the carts, which allowed the yoke to rest on the top of the donkey's necks, rather than having the brunt of the force against their throat as was seen in plowing.

For both groups donkeys were a readily available power source, and in times of need, during droughts or epidemics of disease when cattle and oxen were suffering. According to one WaArusha farmer said with regard to the advantage of donkeys,

> *"Donkeys can work even during a drought. They can eat trees* (also Pearson et al. 1999). *Oxen do not work well after a drought when there is no grass. Donkeys however, cannot work as long* (in the field) *as oxen."* [51]

Another WaArusha man similarly pointed out,

> *"Oxen can work longer, but donkeys can work without good feed. They can eat plants the oxen cannot eat. I use donkeys only if the health of my cattle is not good."*[52]

In this light, donkeys seemed to perform an important function in this area, offering a measure of insurance for farmers that were growing crops, reducing their reliance on tractors or hand hoeing for cultivation.

Interestingly, as women often used the donkeys for transport with packs or saddles, it was often the women that had to capture and yoke the donkeys. The men had little contact with the donkeys and the donkeys were more afraid of men.

7.5.9 - Intensifying Agriculture with Animal Traction

Draft animals have been shown to not only be an agent of extensification but also a way to intensify agricultural operations (Boserup 1980, Starkey 1991, Balcet 1998, Kilemwa 1999). About half the land under cultivation in Tanzania was used for maize or corn production (Sensa ya Kilimo na Mifugo 1996). Maize requires large areas of land for its production and has a huge labor requirement for its timely planting and weeding. Oxen have and can play an increasingly important role in its development and use (Birch-Thomsen 1999). Both Birch-Thomsen (1999) and Pingali et al. (1987) point out high-yielding varieties and fertilizers are not a precondition for mechanization, nor is mechanization a precondition

[51] Interviewee #92, from Mbuyuni

for the adoption of high yielding varieties and fertilizers. However, there does seem to be a trend in some areas of Tanzania toward both the intensification and expansion of the areas under cultivation after draft animal adoption (Kjaerby 1983, Birch-Thomsen 1993 and 1999).

In Sukumaland, as population densities increased from 1961 to 1991, arable land per capita decreased. There was also an increase in the number of oxen employed in agriculture. Through this process of intensification (more labor/unit of land area), farmers increased their productivity by replacing sorghum with crops such as maize and rice, which are more responsive to labor intensive practices such as weeding and the application of manure. While this process decreased the amount of sorghum and cassava, it was a conscious decision based on the economics of population pressure and the ability to capitalize on one's resources (Meertens et al. 1996).

Oxen could also be seen in the nearby highland regions of the Arumeru district, which has one of the highest agricultural population densities in Tanzania, as well as, some of the most intensive agricultural practices (Spear 1997). This region has faced a great demand for its fertile well watered soil. Traveling through this region, it was obvious that farmers were under tremendous pressure to utilize every square inch of soil. Crops were planted in complex systems of intercropping and tiers, allowing farmers to grow two and three crops in the same plot. The amazing thing was that some farmers used oxen in these agricultural operations, despite the fact that the animals had no grazing areas at all. They were housed on the farmstead and stall fed, crop residues and fodder that was carried to them. Their value was both a power source for plots, a source of income when they were hired by neighboring farmers, their manure was spread on the small family plots, and in the end, the oxen themselves also became a source of income. Most oxen were sold at maturity, when their size and weight were at a maximum, and they would bring a premium price for beef.

[52] Interviewee #94, from Mbuyuni

This practice allowed the animals to grow in value as they were being used for work. The Maasai and WaArusha in Monduli district readily use this strategy as well.

In combination with other agricultural inputs and improved management strategies animal traction can be viewed as a timely and appropriate technology in many regions (Sosovele 1991, Starkey and Mutagubya 1992). The combination of animal traction, increased fertilizer and manure use, as well as the adoption of hybrid seeds, has led to the increased production of both food and cash crops (Birch-Thomsen 1990, Meertens 1996). This can lead to small farmers that not only have the ability to produce for their own subsistence, but also allow them to participate in the marketplace and purchase the required inputs and technology that will maximize the benefits of animal traction (Boserup 1980).

One Maasai farmer interviewed in Lendikenya when asked about the advantages of oxen in the farming system, responded,

> *" The advantage I get is (more) food because of using oxen. It is not easy to grow crops by hand. Even using everyone in this boma (which was at least 40) I could not grow crops like I can using oxen."*

The amount of maize that could be grown with improved practices in the more well watered sections of Monduli district, were much like "Green Revolution" improvements seen in other parts of the world (Schusky 1989, Conway 2000). I will expand upon the topic of oxen as a tool for intensifying agriculture in chapter 8.

7.5.10 - Oxen in Forest/Logging Operations

I visited the Meru Forest Plantations with an extension officer that suggested that their work with oxen might interest me. Faculty members of the Sokoine University Forest Research and Training Center and the Zonal Forest Manager were all enthusiastic of about the use of oxen. According to studies done in the Meru Forest Plantation, the use of oxen in forest harvesting operations "has proved to be very profitable and successful". Seymour et

al.(1993) stated that despite very little use in the past, ox logging has a very bright future in Tanzania. The price for fuel, logging machinery, associated equipment, and trained personnel have all increased at a rate dictating a need for more sustainable and appropriate logging technology. Their economic analysis showed that the cost per cubic meter of harvesting logs with oxen was 580 Tanzania Shillings, versus 1580 Tanzania Shillings per cubic meter with tractors. In addition, the initial purchase cost of mechanical harvesting equipment was prohibitive, while the use of oxen required no foreign currency or outside expertise.

Oxen were not used by Maasai and WaArusha for commercial logging, but were employed for gathering building materials from the forest and bush, for building both kraals and homes. They were not used often for hauling firewood, as this was largely a woman's job, but donkeys were sometimes employed for this work. This is time in the yoke used by the Maasai and WaArusha as a training exercise for young animals, and also a conditioning exercise for older oxen prior to the plowing season.

7.6 - The Obstacles, Constraints, and Challenges Facing Animal Traction in Tanzania

Describing only the many advantages oxen have in an agricultural system does not tell the whole story. There were many problems the farmers faced in trying to use and adopt the animals. Obstacles like the promoting the use of draft animals by women can be more easily overcome than obstacles such as cattle diseases that plague the region. Livestock diseases were a major issue for the Maasai and WaArusha, this particular topic was one that generated far more data than initially expected. It not only highlights the obstacle this creates in keeping oxen, but also portrays the constant struggle against disease that face all cattle raised by the farmers in the research area.

Once the draft animals are adopted and put to use, the next issue is controlling the damage to the environment. Most farmers admit they can expand the agricultural operation, but in the initial stages this is often done with complete disregard for soil conservation measures and the impact on grazing areas. As described in Chapter 2, this can be expected, but combined with other issues, including strong cultural traditions, this has created a unique case in this instance. This issue will be introduced here and highlighted in Chapters 8 and 9.

7.6.1 - Development Policies and Development Experts

There has long been a widespread notion that animal traction was an outdated and backward technology (Pingali et al. 1987, Starkey et al. 1994). In fact, many development programs and nations including Tanzania, proposed to skip the animal traction stage of development and go from the hand held hoe directly to the use of tractors (Sosovele 1999b). While these attempts failed on a large scale there is still a bias against the use of draft animal power. In Tanzania, despite the official policies supporting animal traction (URT 1997), there continues to be a lack of support and especially funding for this policy area. This lack of enthusiasm is especially true among the young and educated, who feel that tractors are the way to the future. There were many examples in my research where the men were afraid their sons were going to try to move away from using oxen, despite their success with the animals.

One Maasai man said this,

> *"The coming generation will run for tractorization. Everyone works so that maybe they can have a tractor."* [53]

Another pointed out the reason they may have to adopt tractors in Lashaine,

> *"Maybe the new generation will use tractors. This is because there might not be enough land for grazing the draft animals. Tractors would reduce the grazing pressure."* [54]

[53] Interviewee #66, from Lendikenya
[54] Interviewee #56, a WaArusha from Lashaine

While Sokoine University in Morogoro has theoretical training in animal traction and some on-going research, agricultural education institutions continue to lack training in hands-on skills with animal traction technology. The government support for both training and research in animal traction has dwindled (Sosovele 2000). Ox training centers have long proved to be largely ineffective (Starkey and Mutagubya 1992). Critical research institutions like CARMATEC in Arusha, which both designed local carts and implements as well as testing foreign designs have become largely non-functional, due to a lack of funding. In addition, many educators have never been exposed to animal traction in the field. Finally, many young farmers continue aspire to the "Western Farming System", and there were plenty of companies that are willing to inspire their dream. Finally, there have been many development experts and multinational corporate leaders who cannot believe that animal traction could be a viable and necessary technology for the rural poor. The utilization of local resources and local expertise and the notion of self reliance does not sell products or improve stock prices on Wall Street.

7.6.2 - Gender Bias in Using Oxen

There has been a definite gender bias noted with the use of oxen by women in Africa (Sylwander 1994 and Marshall and Sizya 1994). Raising and handling cattle has always been considered a primarily male activity. In the Maasai culture women use donkeys to assist them in their transportation activities. Maasai women maintain some control over the donkeys and use them regularly to move water and supplies. When donkeys are yoked, for plowing or other activities, it is often the women who have to capture and initially restrain the animals. In contrast, the care and use of cattle and oxen in agricultural activities was the sole responsibility of men. Only in certain instances of hardship were women used to drive or plow with oxen on Maasai and WaArusha fields. The farmers I interviewed who permitted

and used women during ox plowing or other ox related operations did so because they lacked *morani* or other men in their family who might do this work.

It is well documented that women in Africa have been the primary producers of most food crops (Boserup 1990, Sylwander 1994, Rugamamu 1997, Kilemwa 1998). Yet, there has been a lack of access, by women, to extension training in appropriate technology. There has also been a lack of available credit, in order to capitalize on the possible agricultural improvements through the use of animal traction technology (FAO-SDWW 1996, Rwelamira and Sylwander 1999).

The use of oxen by men for land preparation and plowing, while excluding their use for weeding, harvesting and transportation, often leads to an increased workload for women and children (Sylwander 1994, Tangka 1999). Simply expanding the land base has proven to be a poor solution to increasing crop production. Farmers who plow and plant more crops, but ignore the extra labor required for timely weeding often find themselves with poor crop yields due to the inability of the women and children to adequately weed the extra acreage (Sosovele 1994, Kilemwa 1999). In addition, any additional acreage that is planted and somehow weeded, resulting in an increased crop yield will also result in additional harvest time, increased transportation requirements and increased crop storage areas.

Sylwander (1994:260) points out,

> "*It has been argued by many people, that the intensification in agriculture through the use of draft animal power can separate women from agricultural life, thereby domesticating women (in the sense of making them spend more time in the homestead). This does not seem to be the case in Eastern and Southern Africa.*"

This did not seem to be the case in this study either, as 28% of the households interviewed said that their Maasai and WaArusha women are using or have used oxen. This was not an ideal scenario for the men, and it seemed from the responses, that the use of oxen

by their women was not something they wanted others to know about. Largely for cultural reasons and pride men would have preferred the women to stay in the home, but this is not always the case.

For example, here were the responses from two Maasai men, who recognized that oxen were used by women, but preferred not to allow them to use oxen.

> *"Women are not using oxen, but they can use it. The men don't like to allow them to use oxen. It is preferred that they stay in the boma to prepare food for the men in the boma."*[55]

> *"Maasai women are not using oxen, but there are some areas where oxen are used by women, like Kisongo, Mswakini and WaArusha women are using oxen."*[56]

One of the most memorable examples was one Maasai man I estimated to be in his fifties. He was not in good health, yet had a number of young wives. His response to whether or not women used oxen was,

> *"They* (women) *are using oxen in 2 bomas only. This boma is one and in one other boma far away. Even 2 daughters that I have who are married know how to use oxen at their bomas. The other men in this area feel it is a problem for women to use oxen.. When I married a new wife from a boma that doesn't use oxen, I had to tell her father that the girl would be used in the field and be expected to drive oxen, so he would not be surprised to hear of this later."*[57]

Discussions with farmers pointed out that women were using oxen when there were not enough men around to do the job. This included families with few sons, young families with no *morani*, and even those families with boys at school. Most women assist with planting, by placing seeds in the furrow behind the oxen, but if 28% of the bomas visited admitted to having wives who used oxen, most of the women are quite familiar with this technology, no matter what the other 72% of men said.

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[55] Interviewee #38, from Engaruka
[56] Interviewee #16, from Losirwa

One WaArusha man from Lashaine went so far as to say,

> *"No completely not. If you do* (allow women to use oxen) *the father of the wife will penalize you."*[58]

Among Maasai and WaArusha women, most continue to marry young, have large difference between the age of the spouses, live in polygamous relationships, and have an unequal work burden between the sexes (Moridat 1997). Combined with a high bride price and low educational status, they are living in an environment that perpetuates their low status (Boserup 1990). Boserup (1990) goes on to state that traditionally in Africa the status of women is that of non-adults. In my own study I frequently heard Maasai men refer to women and children as *"engirae"* that is, they are one in the same.

It was interesting to see that while so many researchers (cited above) point out the genuine bias against women using oxen, among the Maasai there were actually a large number of women who must use the animals. Given the generally perceived low status of women in Maasai culture, it was quite surprising to hear so many men admit to having their wives use cattle for what is generally considered men's work.

7.6.3 - Lack of Capital to Acquire the Animals or Necessary Implements

Cattle and animal drawn carts and implements were expensive, but sought after items by Maasai and WaArusha farmers. Most young men striking out on their own did not have the resources to buy cattle, implements, seeds, and other agricultural inputs, without some type of assistance (Starkey & Mutagubya 1992). In many villages, young men were assisted by their families. But in villages with limited crop land, the typical low crop yields and prices for crops were generally not enough to allow direct purchase by the majority of farmers lacking cattle, plows or improved seeds. Most young farmers without any livestock assets to

[57] Interviewee #21, from Selela
[58] Interviewee #60

fall back on, therefore relied on wages or crops grown with minimal inputs to get their start in agriculture. The lack of credit facilities or cash crops that can support the purchase of cattle in areas that have the potential for draft animals, can be a serious economic constraint (Shetto et al.(no date), Tangaka 1999). Kjaerby (1983) examined several studies in Tanzania and found that on average the farmers using draft animal power were wealthier than those farmers in the same region using the hand hoe (jembe). Personal experience would suggest the same, which also suggests that draft animal power will not be available to all farmers, given the nature of human drive, desires, and motivation (Galema 1994, Mwanakulya 1999).

The Maasai were more willing to loan oxen to young or poor farmer in order to allow them to get started in farming, than were WaArusha farmers, although the sharing of animals was expressed by both groups. Once the fields are plowed, the young farmer still has to acquire the seeds, plant the crop, and weed it throughout the season. Most of these plots used by young men were quite small.

The price for a mature team of oxen could be in the hundreds of dollars, so most young men hoped to buy a few young bulls or steers and train and grow them at the same time. There was risk with owning animals in this disease prone area (as will be described later). However, the payback was often substantial, in both the labor derived from the animals, the possibility of hiring them out, and ultimately in their sale, as oxen normally bring a higher price than do other cattle, except large bulls, in the market. The one major item requiring purchase was always the plow, which at about $90 (63,000 Tsh) in 1999, was never mentioned as an impediment to agricultural production in my study. Furthermore, unlike what was reported in 1989, by Mothander et al., where there had been a shortage of plows available to farmers, there did not seem to be a shortage of plows or local means by which to purchase them at the time of this study.

7.6.4 - Cultural Bias Against the Use and Adoption of Draft Animals

With over 120 ethnic groups in Tanzania, and each growing crops and raising livestock specific to their region and culture, it was obvious that culture can be a major factor limiting the use of draft animal power. I had certainly heard the well-known notion that Maasai despise working the land (Jacobs 1965, O'Connor 1966, Ole Mollel, Bodley 1994). However, in looking into this issue, I found some interesting perspectives to the contrary.

Pingali et al. (1987) stated in their research on the evolution of farming systems in Africa, they had been unable to find any actual cultural barriers that limit the use of animal power. In fact, they attributed the non-adoption of draft animal power to many other factors. In the past and among the Maasai there certainly were cultural biases against sedentary agriculture. Yet, there were also many examples that the Maasai are not a static culture and they had descended from people who had traditionally grown crops (Spear 1993, Waller 1993). The phenomenon of being "pure" pastoralists, was actually something that was relatively new (Galaty 1993, Sutton 1993).

The Consultive Group on International Agricultural Research (1997) pointed out an additional constraint. The adoption of draft animals, they said, can be limited by farmers practicing undeveloped mixed farming and low intensity farming. In some ways this seemed to be a very broad and inaccurate statement. What is undeveloped mixed farming? What is low intensity farming? Perhaps according to Boserup's agricultural development "ladder" this may be true (see Table 2.1). Yet, it would seem that not adopting draft animals goes well beyond the farming practices as stated above. Starkey and Mutagubya (1992) made a statement that "*pastoralists*", such as the Maasai, "*...have little need for draft animal power*", as their lifestyle does not mix crop farming with pastoralism.

My observations showed that the Maasai in the Kilimanjaro and Arusha regions were the masters of animal traction. Their handling of oxen was exemplary. They could drive six

oxen hitched to a plow with only a flick of their whip and a few whistles or words. They told me this was because they understood cattle more than other ethnic groups. To some degree this could be correct, but I believed it was more likely a function of early handling of calves, housing them in close proximity to people, and petting, disciplining, and herding the animals throughout their life (Sperling & Galaty 1990, Conroy 1999).

Pingali et al. (1987) also mentioned a number of African pastoralists such as the Fulani, the Fulbe, as well as, the Maasai in their work. Stating that despite a historical aversion to sedentary agriculture, they have out of necessity adopted more sedentary ways, and were quick to adopt animal traction in the process (Spear 1997). The Sukuma also adopted oxen quite easily, because they too were familiar with cattle and the cash flow by generated by the early adoption of crops was very favorable toward larger plots (Sosovele 1991). Numerous sociologists and anthropologists have discussed the use of oxen by pastoralists, and many have discussed the use of oxen by the Maasai specifically (Ndagala 1992a, Spear 1993 and 1997 Meindertsma and Kessler 1997). In addition, most farmers in mixed farming systems also keep cattle. The exceptions have been farmers who are limited because of severe land shortages (Pingali et al. 1987). Therefore it seemed that the definition of the farming system or culture may by itself have little to do with the adoption or non-adoption of draft animal power. The combination of many factors, which are sometimes grouped as cultural constraints, may more accurately be broken down into geographical constraints, financial constraints, or a lack of perceived or real need for the technology.

7.6.5 - Geographical Constraints

Geographical constraints have been a serious limitation to the use and adoption of draft animals. In some areas, the lack of land to support the feeding of cattle limits their use and adoption (Boserup 1965 & 1981, Starkey and Mutagubya 1992). In mountainous regions, the use of oxen has been limited by the perception that the animals were not able to maneuver

through the steep trails and paths leading to the fields and farms, or their presence might create greater soil loss. Furthermore in regions that specialize in tree fruits and permanent crops there may not be a need for draft animal power.

Pingali et al.(1987), in agreement with my own observations, found that the Meru of Tanzania use animal drawn plows in the lowlands, but continue to cultivate hilly slopes by hand. Mountain farms, situated on steep slopes, like those I saw used by the Pare, often utilized rocky fields that were not conducive to row crop production and animal power. The Sukuma have chosen to avoid animal power on the slopes, as the soils were very light and susceptible to erosion (Rugumamu 1995). The Meru and Chagga on Mt. Meru and Mt. Kilimanjaro respectively have a long field preparation period and small plots of land, therefore can often complete all of their work without the need for draft animal power.

The exception to this rule may be the WaArusha and Maasai whom I studied in the highland areas of Monduli district. Most use oxen, some even on the steepest slopes. I am not sure if this was because Maasai and WaArusha view oxen as a preferred method over hand cultivation, but the Maasai in my study surely continue to have an aversion to using a hand-hoe and stooping to prepare the land "like a woman". Oxen were seen as an acceptable intermediary. The men were not specifically hoeing the land themselves, the oxen were doing it.

7.6.6 – The Lack of Implements

This is in part due to economic constraints outlined above. However, many failed schemes to promote draft animal power resulted because of the use of foreign made agricultural implements, with great difficulty in repairing them locally or acquiring spare parts (Mothnader et al. 1989, Sosovele 1991 and 1999b). Under periods of economic hardship, such as the "structural adjustments" in Tanzania, there was often a sharp drop in inventories and availability of foreign made spare parts (Mothander et al. 1989, Pingali, et al.

1987, Sosovele 1991). Without first building the capacity to manufacture or repair animal-drawn implements positive long term prospects for the implements were limited. There is also a lack of infrastructure to allow the distribution of even Tanzanian manufactured implements in many remote rural areas (Shetto et al. (no date), Starkey and Mutugubya 1992). In addition, there has been a lack of farmer input on the design of appropriate and cost effective equipment (Mothander et al 1989, Panin & Ellis-Jones 1994). Instead there has been a focus on importing designs that may be totally inappropriate and too costly (Starkey and Mutagubya 1992).

Many animal traction projects provided plows or incentives to purchase plows (Galema 1994). While this was an important first step, the use of the plow without other agricultural implements often increased the burden on women (Sylwander 1994 and Marshall and Sizya 1994). Therefore for the most effective use of draft animal power, equipment necessary for weeding, ridging, and transportation must always be addressed in any program promoting draft animal power (Inns 1994). Furthermore, even when these implements are promoted they must be available. The availability of plows was not usually a major constraint. The low availability of carts, cultivators, and other equipment has often created a great bottleneck in many animal traction systems (Mwakitwange 1994). The idea of providing incentives through implements is an idea I will present in the final chapter as a way to motivate people to use conservation practices.

7.6.7 - Cost Effective Alternatives to Animal Traction

Where alternatives such as cheap labor, tractor or other transportation options are readily available the use of oxen is often seen as an unnecessary expense. The adoption of draft animal power is a major investment (Kilemwa 1999). Farmers are reluctant to invest in a technology that does not or will not have an immediate payback, or be an improvement over their current agricultural system (Panin and Ellis-Jones 1994). Inns (1994) points out

that draft animal power should not be considered or promoted in isolation. There are many examples from around the world, where human labor, draft animal power and tractors are complimentary. The Maasai and WaArusha in my study were certainly quick to point out the costs and disadvantages of tractors and the advantages of oxen, despite not being asked this question. However, their general opinion was if they could plant more crops, in a more timely manner, and were relatively sure the rainfall was adequate (early rains) they did not hesitate to use a tractor to expand their cropping area. Furthermore they would use a tractor almost exclusively to break new soils or grasslands. This was considered very difficult given the thick sod and often hard soils, and once the tractor had broken the sod, the oxen took over in subsequent years.

7.6.8 - Lack of Appropriate Extension Support and Farmer Education

According to Starkey et al. (1994) development agencies and NGO's have been more successful at introducing animal traction technology than government-run programs. However, he noted that progress among extension based programs has been likely to become more effective with the adoption of more farming system-farmer centered approaches and participatory planning and processes.

In personal visits to many extension offices it was obvious that there is a great deal of inefficiency, *"lost"* money and funds by the government and its employees in Tanzania. Time after time, I heard about and saw programs that began with high hopes, but ran out of funds before they ever achieved any results. One WaArusha man simply said, *"This is the way it is with the black man."*.[59] With very little incentive to be accountable and a long history of funding programs that did not acquire full accountability, the Ministry of Agriculture and the donor agencies have both taken a hard look at how to improve

[59] Interviewee #102, from Mbuyuni

performance. Not only are participatory methods necessary, there is also the need for "*results based funding*", which was a common term I heard in development circles.

The problems I most frequently heard related to draft animal use among the Maasai and WaArusha, was the risk of loss to disease, the need for improved yokes, and the need for carts. I saw little need for improvements in training or plowing. The Maasai oxen were as well trained and conditioned to the work, as any I had ever driven.[60] The use of plows was also well done, with regard to controlling the animals and getting them to do what was desired. There was great concern over the impact of agriculture on the environment and a call for improvements in ridging the fields to reduce erosion, and constructing roads, that were not prone to gully formation.

7.6.9 - The Availability of Land for Expansion

The use of draft animals was limited in many of the most fertile and readily accessible areas by the lack of land available for agricultural use. Outside Dar es Salaam, all around Moshi and Arusha, where the huge markets existed and fertile well watered soil was available, there was an obvious lack of grazing land, and cropland for expansion. The availability of land, or even its accessibility by adequate roads and other modes of transportation, remains a serious bottleneck to expansion. Finally the huge portions of the country that appear abandoned are often Tsetse fly areas which make the use of draft animals and other forms of human based farming systems out of the question.

Despite the well documented fact that much of Maasailand, and especially large areas of Monduli district are largely inappropriate for agriculture , due to their weather patterns (Jacobs 1965, Meindertsma & Kessler 1997). There has long been a seemingly endless push

[60] I drove Maasai oxen regularly when I saw them in the fields. It was more a way to get the attention of the men, as they had never seen a white man drive oxen. I used my native commands in English, without any lack of animal control, which further mesmerized the men. Oxen are largely visual, more than they are auditory, so I simply walked and moved just like the oxen's driver and never had a problem.

of agriculture into areas that should not be farmed (O'Connor 1966, Hatibu et al. 1995, Meindertsma and Kessler 1997). However, these ecological constraints did not seem to inhibit the Maasai adoption of extensive agricultural cropping systems, based largely on animal power.

The only constraints I observed were those imposed by the village council's with regard to protecting grazing areas, and the absolute limit on agricultural expansion based on the availability of land in villages such as Engaruka and Lashaine, which were particularly land strapped.

7.6.10 - Government and Policy Constraints

A major constraint in Tanzania's agricultural sector has been the policies and programs adopted by the government (Hodd 1988, Mapolu 1990). Despite the popularity of Julius Nyerere, Tanzania's first and most well known President, his failed villagization scheme, with a major focus on producing cash crops faced a major setback during the world energy crisis in the 1970's (Sarris and van den Brink 1993). The government also continued to maintain strict socialist policies for agricultural marketing, and the result was the development of a huge black market and "informal sector". Concurrently the nation amassed a huge foreign debt, and invested in industries that relied on outside imports. This was at the same time leaders were espousing the need to be more self-reliant (Sarris and van den Brink 1993). This resulted in the more recent effects of structural adjustments put in place to restructure the foreign debts and ensure their payment (Sarris and van den Brink 1993).

Despite meddling by outside experts, government policies and natural disasters, peasant farmers continued to produce food usig techniques with which they were most familiar (Maliymkono and Bagachwa 1990). Scattered across a nation with diverse people

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One man commented to my research assistant, "Did you see how smart my oxen are, they can understand two languages."

and climates, Tanzanians have demonstrated amazing abilities in substituting food and cash crops to meet subsistence needs (Mapolu 1990, Sarris and van den Brink 1993). Deborah Bryceson called Tanzanian peasant farmers "the nation's strongest and most pivotal social institution" (Hodd 1988). Being resilient these farmers chose systems of farm management that minimized their exposure to undue risk and maximized the use of their two most readily available resources human labor and land.

Today, despite all the efforts to boost agricultural production through collectivization, modernization, biotechnology and policy meddling, 70% of the cultivation in Tanzania is still done with the hand held hoe (Ker 1995, Lyimo and Kessy 1997, URT 1997) called the "jembe". This tool has remained largely unchanged for centuries. It is primarily a tool used by women who constitute about 70% of the total agricultural workforce (Sylwander 1994). With 80% of the population involved directly with agricultural production, the peasant farmer constitutes the largest group involved in agricultural production (Lyimo and Kessy 1997). The use of primarily human labor has severely limited the capacity to expand agricultural operations (URT 1997). Poor land preparation and delayed or inadequate weeding are considered major causes of low crop yields. Agriculture is limited for the poorest farmers and as they have poorer access to resources. These include: the ability to cultivate a larger land area, their ability to adopt improved technology, improved management practices, and finally, the need for more timely planting and harvesting (Lyimo and Kessy 1997). It is at this most basic level of agricultural technology that animal traction offers a number of prospects for the future.

Finally, the major constraint has been the lack of government policies that effectively encourage and promote draft animal power (Starkey et al. 1994). Policies that provide incentives such as adequate farm prices, veterinary care, viable and dependable transportation options, and adequate extension support are basic necessities if animal traction is to be

encouraged[61] and utilized (Starkey & Mutagubya 1992, Panin & Ellis Jones 1994). In many rural areas there was a severe lack of transportation to major markets especially during the planting season, when major inputs and supplies were needed to compliment the use of animal traction (Starkey et al. 1994). There was also the lack of village support, as demonstration plots, field days, and even village leaders sometimes inadvertently discourage the use of animal traction (Mwakitwange 1994, Sosovele 1999). While the latest Tanzanian policies for agriculture and livestock speak of promoting animal traction, it points out that NGO and Private Sector monies will be necessary to implement much of their policy ideas (URT 1997).

7.6.11 - Animal Training and Harnessing Constraints

Animal training has rarely been considered a major constraint to developing animal traction technology. Being my area of professional expertise (Conroy 1999), it needs to be mentioned, but only briefly. Most farmers initially adopting oxen use them for plowing and possibly transportation. However, as the technology develops there is a greater need for understanding how animals can be harnessed for maximum power and comfort, while at the same time maintaining their complete control, especially with regard to weeding (Loewen-Rudgers et al. 1990, Starkey et al. 1994, Lyimo and Kessy 1997). Many authors never mention animal training, but it is actually a crucial part of animal traction. There is a lot for a farmer to learn in adopting the use of draft animals. Training can be a constraint in regions where the draft animals have not been used. Even in areas of high draft animal use and adoption this constraint is a problem once a farmer tries to utilize the animals for maximum effectiveness and profitability. I was amazed at the Maasai system of ox training. The men I spoke with used a series of sequential steps beginning with early handling, then tying

[61] A review committee was commissioned by Tanzania's Prime Minister to review and propose "a way forward for agricultural production" (Sosovele 2000), which will likely impact future agricultural policy

animals, and following this with yoking young teams between larger teams. Prior to heavy work like plowing, they initiated the "new oxen" to light work such as dragging firewood and home building materials, to both build their confidence and stamina.

7.6.12 – Miscellaneous Risks Associated with Cattle and Draft Animal Ownership

In some regions cattle rustling was a major problem. This was especially true among the Maasai, despite their statements that it really does not occur these days (Jonsson 1993). Farmers in Ngulu (Mwanga district, Kilimanjaro Region) frequently expressed worries that Maasai in nearby areas would come at night and steal their cattle. The investment in oxen was seen as a risky venture in most areas because of both cattle rustling and disease. Their worries were not unfounded, as I often read about cattle being lost to rustlers and even joked about it with the Maasai that I visited. I met Maasai men who had been arrested for cattle rustling, others that had been jailed, and others (Maasai, WaArusha, Pare, and even expatriates) who had been the farmers that had had their cattle stolen. Wildlife predators were numerous in Monduli district, and although the Maasai and WaArusha take great care of their livestock, cattle were regularly lost to predators. Most often these were the younger animals, but oxen could be lost as well.

7.6.13 - Diseases

The prevalence of cattle diseases and the lack of veterinary care was also a real constraint to the use and adoption of oxen in some areas (Mwakitwange 1994). Among the Maasai and WaArusha, I almost hated to ask this question, because it was one where the interviewees became increasingly animated to make sure I understood their dilemma in this regard. The reason for this reaction, was one they thought my research would bring back the government and subsidized services they had come to rely on. In Tanzania, there had been a large amount of government and NGO subsidies to veterinary care, and the Maasai and

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(URT 1997).

WaArusha had come to depend on this (Meindertsma and Kessler 1997). During the interviews they expressed their reluctance to spend the money required for veterinary care. In every village visited farmers would begin by asking me what type of medicines I had brought for their cattle. They assumed because I was white, my backpack was full of medicines that would make their sick cattle well.

An example I will not forget of the consequences of losing one's oxen was a very thin farmer and his very thin family suffering from *njaa* (lack of food)) plowing with three donkeys and one ox. I inquired if he preferred using this combination. He replied, that three of his oxen had died and this was his only option. He had to get his fields plowed if there was to be any hope of a crop in the coming season. The seriousness of the loss of oxen was apparent as many farmers described strategies of coping with lost oxen, most often the use of donkeys, or borrowing oxen from a neighbor. The use of tractors usually was out of the reach of the poorest farmers as described earlier in this chapter.

Cattle survive in great numbers in East Africa, but they are constantly faced with many challenges to their survival. There are many parasitic and contagious diseases endemic to this area (Starkey and Mutagubya 1992, Meindertsma and Kessler 1997). The tick and the tsetse fly, are the main vectors of disease, and both were common in Monduli District. Speaking to the Maasai about cattle for any length of time, you always end up talking about disease problems. This was a cause of major economic losses to most herders on a regular basis.

Homewood and Rodgers (1991) pointed out that nutritional deficiencies including pasture, water and mineral availability, boma conditions, travel stress, drought, as well as disease vectors and wildlife as reservoirs of disease, are all major contributors to the high disease incidence among Maasai herds. Add to this a reluctance to spend money on drugs,

drugs that do not work, and waiting for the free veterinary services to return, all of these have lead to incredibly high mortality levels in the herds.

Diseases have been such a problem that many of the men interviewed in my study said they have to use crop sales to replace dead livestock.

One Maasai from Selela said,

> *"Growing crops has changed my herds. If I get good yields I will buy another cow. Diseases are a problem, so I have to use crops to replace dead cows."*[62]

One Maasai from Selela went so far as to say,

> *"The problem here is that people here who are farmers are not actually herders. Most of these people use their profits to increase their land, not their herds."*[63]

Interviewing Maasai and WaArusha farmers, as was mentioned in Chapter 4, three languages used, Maa, Swahili and English. Sometimes this led to a confusion over which diseases we were discussing. This was especially true when local slang words were used to describe a disease or a sick animal. I constructed Table 7.2 below to interpret for others what was discussed in my study. The Maa word "*Olomiloo*" or "*Olimiloo*" was one term that was frequently heard in my study and mentioned in Homewood and Rodgers (1991), as well as Potkanski (1997). Neither described the disease, only that it was thought to be Bovine Cerebral Theileriosis. While there are many protozoan species of the genus *Theleria* causing diseases like East Coast Fever (ECF), none of the literature I reviewed was clear as to what the term *Olomiloo* meant. Even my research assistant referred to a number of different diseases, such as Heartwater, Anaplasmosis, and Babeosis, as *Olomiloo*. One extension officer said it is Rumenato, which I took to mean Heartwater, which is caused by the organism *Cowdria ruminantium*. I speculate that the Maa word Olimiloo may actually

[62] Interviewee #36

represent Tick Fever, which is a fatal combination of Anaplasmosis and Babeosis, as both diseases can be carried by the same tick (Fraser and Mays 1986). Heartwater is also tickborne and could certainly infect cattle at the same time, but it is carried by a completely different *Genus* of ticks.

Table 7.2

Most Common Cattle Diseases in Southern Monduli District – Listed by Incidence

Disease in English	Disease in Swahili	Disease in Maa
1. East Coast Fever	Ndigana Kali (ECF – Hot)	Oltigana or Oltikana[64] (meaning like Anaplasmosis)
2.Trypanosomiasis	Ndorobo	Endorrobo
3. Foot and Mouth Disease	Homa ya Miguu na Midomo	Oloirobi lengutok oringejek
4. Anthrax	Kimeta	Emburro or Engironaj
5. Babeosis (Red Water)	Mkojo damu	Oloodokulak
6. Heartwater	Maji ya moyo	Alakiriki
7. Rinderpest[65]	Sotoka (sometimes called LUNGS)	Oloodwaa
8. Anaplasmosis	Ndigana Baridi (ECF – Cold)	Otikan
9. MCF	Homa ya nyumbu (fever of wildebeest)	Engiya Oingati[66], or Inkutukie Olchangit (translated as months of wildlife)[67]

[63] Interviewee #26

[64] The word Oltigana, is very similar to Otikan. I was told ECF was similar in symptoms to Anaplasmosis, therefore ECF was referred to as Oltikana translated to English from Maa meaning "like anaplasmosis". Both diseases cause high fevers in infected cattle. Anaplasmosis is caused by a rickettsia and ECF by a protozoan. Both cause damage to the spleen, but ECF causes lymph nodes to swell, while only anaplasmosis causes anemia, by destroying the red blood cells.

[65] This viral disease in the late 1800's virtually wiped out 2/3 of the Maasai cattle (McKelvey 1973) It is spread by air and close proximity to animals that are contaminated. The hunger the Maasai faced was devastating, but their populations were further brought down by Small pox.[65] (Sinclair 1979). The disease had a great impact on not only cattle, but also wildlife populations, Sinclair called it one of East Africa's *"Great Perturbations"*

[66] *Engiya Oingati*, Potkanski calls it *Ingatee*, which represents the same second word, but a different spelling. Since the Maa language is not a written language, these differences in spellings persist.

[67] A viral disease which is associated with wildebeest. Young wildebeest when infected *in utero*, spread the disease through secretions of the nose and eye, which can infect cattle that graze in these areas shortly after the birth of the infected calves (Fraser and Mays 1986, Homewood & Rodgers 1991, APHIS 1997b). Cattle and Adult wildebeest are not shedders or infective to other animals. Potkanski (1997) and the Maasai in my study believe this is an infection from the afterbirth of the wildebeest. According to Homewood and Rogers (1991) this

I had not prepared to go into the field to do diagnostic work on cattle diseases. However, each day offered plenty of opportunities to do so. There were always animals that were sick and suffering from some ailment or disease. I wish I had studied more about the diseases commonly seen before my research in the field.

7.6.13a - East Coast Fever - ECF

Of all the diseases seen or heard of in my study area, ECF was by far the most common and most deadly. It was always the first disease mentioned and the men interviewed made a point to discuss its seriousness. I did not attempt to do counts on deaths, because I had not tried to count live animals. However, I asked about each disease and the problems encountered. Many times to prove they were not kidding about ECF, I was taken to cattle that had died from ECF or offered meat from one that had died from ECF. The only traditional control measure was to avoid ticks and this was nearly impossible in the agro-pastoral setting throughout my research area.

Here is a statement from a WaArusha man that was offering me beef at his boma,

> "*East Coast Fever is the major problem. Even today we are eating a cow that died from ECF.*"[68]

7.6.13b - Trypanosomiasis – Tsetse Fly or *Dorobo*

The Tsetse fly is name for many species of biting and blood sucking flies whose major hosts are specific wild animals. When in contact with humans or cattle they will often readily attack these new hosts. The flies prefer bush vegetation and trees to open sunlight, they require a certain degree of moisture and hosts to feed on. Eliminating the wild hosts and manipulating the environment have been used as control measures in the

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belief has long been a motivation for Maasai to avoid wildebeest calving areas, which was a relatively effective control measure.

past, but the flies have never been eliminated, as their numbers are too great, their species too diverse and the hosts that they can feed on, including cattle and humans, ever present.

The Tsetse fly and the disease the flies often carry a parasite called trypanosomes, which cause trypanosomiasis. This disease was mentioned almost as often as ECF. According to Raikes (1981) and Tarimo (1988), trypanosomiasis is the second most important disease affecting cattle in Tanzania, after East Coast Fever. Traditional tsetse free grazing areas have been converted to other agricultural uses, and the result has been to push livestock into tsetse infested areas, leading to an increase in trypanosomiasis

Trypanosomiasis was considered more easily treated with modern medications and not as deadly as ECF, by the men I interviewed. However, with an estimated 530,000 km^2 (56%) of Tanzania's land area infested with the Tsetse fly, trypanosomiasis is a serious problem. Of this total land area, 247,000 km^2 is designated for wildlife, leaving the balance (283,000 km^2) potentially available for livestock production and agriculture. Jonsson et al. (1993), point out that in Tanzania, 80% of the livestock are located on 20% of the land area, a pattern which has led to serious depletion of grazing areas, due to overstocking. The Tsetse fly is therefore often considered an impediment to the development of agricultural and livestock sectors in Tanzania. It could also be called one of the causes of overgrazing, because it often forces livestock owners to remain in certain areas.

In years past, land that remained uncultivated, claimed Ford (1971), was land that remained tsetse infested. In Tanzania uncultivated land was largely marginal land, historically used by pastoralists, like the Maasai. According to numerous maps in his book, the tsetse has long infested a large part of Maasailand. Raikes (1981) points out that the best way to eradicate the tsetse fly is to intensify land use. This not only kills off the fly's hosts and breeding grounds, it will also ensure they will not return.

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[68] Interviewee #91

There have been numerous programs to eliminate the tsetse fly by altering the environment (Ford 1971 Raikes 1981). In general removing bushes and trees and having open grassland is an effective technique. Even the presence on large numbers of elephants has been known to reduce tsetse fly populations. The immediate outcome of this removal of the fly is the expansion of grazing into those areas (Ford 1971, Jordon 1992). This leads to an increase in herd size. Unfortunately this has often led to a down side, where human numbers are usually on the increase, more land is required, this pushes agriculture into the former grazing lands, and the livestock density increases on the former tsetse range. Tsetse flies are common to many national parks, and the presence of the fly is one way to reduce conflict over land, by keeping livestock herders away (Ford 1971, Jordon 1992). The challenge lies on the borders of such lands, where livestock can be decimated by the expanding tsetse fly population.

In this study (as well as Lama 1998), the Maasai and WaArusha have been moving to more marginal areas, taking them closer to the national parks. Wildlife were often blamed as the cause of this disease. Pastoralists in Africa have been prone to being pushed further and further into tsetse fly infested areas. Yet even with agro-pastoralists, cattle ownership is important and as cropping areas spread closer to tsetse fly zones, there has been an increase in the frequency of disease (Starkey and Mutagubya 1992). Despite the cutting of trees and more intensive land use schemes, as the *morani* herder can still move the cattle long distances, exposing the animals to the disease.

Oxen were important to Maasai and WaArusha farmers, and the last 30 years has seen an enormous increase in their numbers and use. The economics of draught animal power was very attractive, especially to those farmers in more marginal areas, as the use of oxen decreased their cash expenses (as described in section 7.5). However, there was a great risk in

raising oxen in tsetse infested areas, as the animals were some of the most valuable animals on the farm.

One WaArusha from Mbuyuni said,

> *"It is very difficult to raise oxen here, when they become big they can die at any time and it is a big loss."*[69]

However, disease problems were also seen as part of the conflict between agro-pastoralists and wildlife. Nine percent (9%) of the Maasai and WaArusha farmers interviewed said ticks were brought by the wildlife. They attributed diseases such as foot and mouth disease, trypanosomiasis, anthrax, rinderpest, babeois, heartwater and malignant catarrhal fever to nearby wildlife. This of course led to differences in opinions between what wildlife conservationists and local farmers thought ought to be done to control cattle diseases. For example, there were vastly different opinions on what to do with the Tsetse Fly. The farmers want to eliminate them so they can farm and raise livestock, the conservationists disagree, because the Tsetse fly alone offers a natural buffer of protection to the wildlife within the parks (Homewood and Rodgers 1991).

7.6.13c -Disease Control

Many of the common diseases can be controlled by limiting the vectors that harbor and transmit the disease. In Monduli district and other nearby areas, the tick and the tsetse fly have long been known to be the primary vectors of disease (Jonsson 1993, Meindertsma and Kessler 1997). The Maasai have known this for centuries, and have purposely avoided Tsteste fly infested areas, and have used burning grasslands to both control ticks and indirectly maintain large open grazing areas, which do not support Tsetse fly populations.

Over the years, both the Colonial and Independent governments have offered support for controlling cattle diseases that most often plague the area (Ford 1971, McKelvey 1973,

Raikes 1981), but this support has changed over time. In 1984, free cattle dips[70] were stopped and prior to 1992 all biologicals (vaccines and bacterins) were also subsidized by the government. This support for vaccines and other biologicals was slowly withdrawn since 1992. This change was a constant complaint voiced by the farmer/herders in my survey.

Table 7.3

Responses from Interviewees about the Most Common Diseases in Cattle. Villages (Abbreviations used)

Interviews	Ark	Eng	Esil	Las	Lend	Lolk	Losi	Msw	Mbu	Sel	Totals	%	Rank
Response # men /vil.	6	12	10	17	18	5	10	12	20	13	125	100	
Disease													
ECF [1]	6	8	10	17	18	4	10	9	19	13	114	91	#1[71]
Tsetse	6	9	9	0	3	3	7	7	14	12	70	56	#2
F&M[2]	4	5	3	2	8	2	5	4	10	9	52	42	#3
Anthrax	1	4	2	7	10	0	1	8	10	1	44	35	#4
Babeosis	2	0	2	10	18	0	0	0	2	0	34	27	#5
Heart-water	5	0	2	8	18	0	0	0	1	0	34	27	#6
Rinder-pest	1	1	0	4	5	3	0	9	7	0	30	24	#7
Anaplas-mosis	1	0	0	0	1	2	0	2	6	0	12	9.6	#8
MCF[3]	0	0	5	1	0	0	3	0	0	0	9	7	#9

[1] ECF is an abbreviation for East Coast Fever
[2] F&M is an abbreviation for Foot and Mouth Disease
[3] MCF is an abbreviation for Malignant Catarrhal Fever

According to Dr. A. N. Rwegasira, the Veterinary Officer for Monduli District, vaccine support or subsidies were still offered for the following diseases at the time of this study:

1. Rinderpest – free
2. Anthrax there is a subsidy
3. Brucellosis – there is a subsidy
4. Tsetse fly control and monitoring by extension subsidized by SNV, (a Dutch NGO).

[69] Interviewee #102

[70] These are tanks where the cattle swim through an acaricides, designed to kill and repel ticks. Twice weekly dips were said to provide the most effective tick control. Spraying cattle all over their body with an acaricide is also referred to as a "*dip*" in Tanzania. Many Maasai and WaArusha do their own spraying, although not as often as would have been done in years when this service was free.

Ford (1971) pointed out that there were two ways animals avoid getting diseases. One was physiological, where the livestock develop some immunity to the local diseases (Fraser and Mays 1986). This certainly seemed to be the case with the East African Zebu and tick born and trypanosomiasis (Pearson et al. 1999). This occurred when the contact between the host and pathogen was fairly constant (Raikes 1981), as it would be throughout most of Maasailand, with regard to many of the diseases above. This immunity by indigenous animals was lost according to Pegram (1993), if the animals receive constant acaricide treatments against tick borne diseases and were no longer exposed as calves or seasonally in the rainy season. And Ford (1971) pointed out that many Maasai in the past purposely drove cattle into Tsetse fly infested areas in order to provide the animals with ample grazing in years of drought, thereby exposing the animals and encouraging natural immunity.

The second control measure was an ecological adjustment, such as, when the herders have moved to different areas to avoid ticks or burning the grass to kill them (Potkanski 1997). Abundant grass growth is a major factor in determining the tick population, and the intensity of the contact with diseases such as ECF (Raikes 1981). Traditionally tick control was done through burning, clearing land and cattle browsing to keep the grasses short. Keeping buffalo away from pastures were also used to reduce tick numbers, and therefore reduce the load on the animals. Even the grazing Maasai herds on the plains helped control tick numbers by keeping the grasses short. However, given the current trend toward controlling fires, at least one traditional method seems to have been recently lost. This may have major impacts in areas like Selela, Esilalei and Losirwa where there is tall grass and the current regulations are severely limiting burning for any reason.

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[71] (Raikes 1981, Homewood and Rodgers 1991, Potkanski 1997)All listed ECF, as the most serious disease problem.

Table 7.4

Common Diseases in Monduli District, Causative Organisms, and Mode of Transmission [72]

Disease	Causative Organism	Mode of Transmission
1. East Coast Fever	Protozoa *Theileria parva*	Ticks Rhipicephalus appendiculatus
2.Trypanosomiasis	Protozoa –*Trypanosoma vivax* *Trypanosoma congolense, &* *Trypanosoma brucei.*	Tsetse Fly Most often the Glossina spp.
3. Foot and Mouth Disease	Virus – Family Picornaviridae Genus Apthovirus	Direct or Indirect contact with infected animals.
4. Anthrax Occurs irregularly, as rainfall & environment are key factors	Bacteria – *Bacillus anthracis*	Many modes of transmission, feeds, water, soil ingestion, biting insects, and inhalation.
5. Babeosis (Red Water)	Protozoa – *Babesia bovis or Babesia bigemena*	Tick, primarily Boophilus spp. and possibly biting insects
6. Heartwater	Rickettsia – *Cowdria ruminatum*	Tick, 3 species belong to Amblyomma spp.
7. Rinderpest	Virus – *Morbillivirus sp.* One serotype – one vaccine for life	Direct contact with nasal and eye discharges, or feces of infected cattle and indirect contact with the same, ie. feed, water, equipment, clothing etc.
8. Anaplasmosis	Rickettsia – *Anaplasma marginale*	Ticks – many possible species, primarily Boophilus and Dermacenter spp.
9. MCF	Viral – An Alcelaphine Herpesvirus 1, *Connochaetes spp.*	Wildebeest calf nasal and eye secretions, feces, and hair. Picked up by cattle inhaling or consuming the same

[72] Largely adapted from information in Fraser and Mays 1986.

Ford (1971), Lambrecht (1972) and McKelvey (1973) pointed out that different ecological manipulation strategies were used to control the tsetse fly and the spread of trypanosomiasis throughout Africa. These ranged from catching the flies, using chemicals to fight them, controlling the exposure of people and cattle to the fly, and treating all people and livestock, while killing off animals that harbored the disease. These strategies were all seen as a way to maintain a habitat that the fly would not survive in. The result was a dramatic decline in the disease almost everywhere (Ford 1971). However, despite this success, the alienation of land from the native people like the Maasai for wildlife parks, has largely created a safe haven for the flies and the disease they carry.

Most of the men interviewed recognized that the killing of wildlife and burning of the grasslands were not acceptable strategies for controlling ticks and tsetse flies. Yet, most agro-pastoralists cannot avoid certain grazing areas that might be infected with ticks or tsetse flies during droughts, due to a lack of available grazing land. Instead they now try to prevent the disease through prophylaxis or treat their animals once infected. Table 7.5 shows some of the practices I observed compared to recommended practices.

All the men I interviewed seemed to think I carried a bag full of medicine in my backpack and that my mission was to cure the diseases their animals were inflicted with. I was often told this was because the white man had good medicines. As I examined this further, it seemed that the Maasai in many cases were actually sold "bad medicines". Many of their bottles of medications had been expired. They also suffered from poor or inadequate storage facilities/techniques for medications, as none of the bomas or the small rural shops (*dukas*) that sold these medications had refrigeration. Finally, I did not examine this idea, but extension officers said that the local herders often dose the animals with less than what is

recommended because of the lack of money to purchase adequate amounts of medicine.[73] The most common problem associated with diseases mentioned in my own study was that the medications did not work, even after the animals were treated.[74]

In Tanzania ticks are one of the most serious constraints to increased cattle production (Mella 1988). For nearly 100 years, millions of naturally tick resistant cattle have been dipped or treated with acaricides for ticks regularly for the benefit of the small proportion that are susceptible to the diseases (Pegram et al.1993). The result has led to the resistance of ticks to acaricides and a more stable environment for ticks and tick-borne diseases.

In Table 7.5 below, ECF (East Coast Fever) listed first, was considered the most serious and troublesome disease. According to Mella (1988), immunization will work, using the infection-treatment method. The Muguga strain vaccine and a long acting tetracycline, has had promising results in Tanzania. Also effective according to Mella (1988) were Halofuginone lactate (Hoechst Company) and Parvaquone (Welcome Company). The local treatment for ECF was to take a hot iron heated in the fire and shove it into the infected lymph nodes of cattle suffering from disease. I never returned to see the prognosis, but I cannot imagine the animal benefited much from this treatment, as it was now even more stressed and exposed to other ailments, including fly strike and fly larvae infections.

With the loss of subsidized tick control, there was a need for new ways to control the tick borne diseases that were common in the research area. Pegram et al. (1993:4-6) offered new

[73] Mella (1988) pointed out that there are strains of ticks in Tanzania that are resistant to acaricides, yet said a more prevalent problem is that acaricides often lose their efficacy when they are mixed in a manner that improperly dilutes their active ingredients.

[74] In nearby Arusha there was the Tropical Pesticide Research Institute (TPRI), which was responsible for testing and recommending appropriate drugs and pesticides for livestock. However, like so many institutions in Tanzania, their work and the dissemination of results has been limited due to a shortage of funds.

lower cost strategies for cattle of pure locally indigenous strains, like those kept by the Maasai. These appropriate strategies included:

1) **Immunize Against tick-borne diseases .**
   Many of the common diseases such as ECF have vaccines, but these have often been considered too costly to utilize annually.
2) **Educate farmers about the benefits to be gained from immunization and achieving host resistance to ticks by using relaxed tick control regimes.**
   This message has to come from Extension officers with the support of the local leaders. In addition, the message must be clear, that local breeds kept completely tick free become equally susceptible as non-indigenous breeds.
3) **Institute tick control measures based on sound economic thresholds.**
   No matter what strategy is chosen, it has to be something the people will adopt and accept. Many agro-pastoralists now choose to risk disease rather than spend the money on the acaricides, antibiotics and vaccines. The economics of this choice must be clearly communicated.
4) **Appropriate strategies, such as minimal control in periods of low challenge and strategic control in high season challenges should be encouraged.**
   The Maasai and WaArusha were well aware of the biology of ticks. The local conditions varied from village to village. Local knowledge about the diseases, their vectors, and the environment must all be considered.
5) **Appropriate legislation**
   For many years tick control was thought to be national concern, thus the emphasis on communal dips. This concept has changed in Tanzania, with regard to financial struggles after Ujamaa. This may have had a serious affect on animal health when the dips were shut down. According to (Pegram et al. 1993) farmers attitudes toward tick control are now often completely distorted.
6) **Correct extension messages about both vaccines and control**
   Using local farmers as model farms might be one strategy to convey the message that vaccines and other preventative techniques work and could be cost effective.

The risk associated with investing in oxen can be greatly reduced by adopting strategies to reduce and control disease. The Maasai and WaArusha certainly understand the diseases that are endemic to the region, and the losses are significant (Homewood and Rodgers 1991, Meindertsma and Kessler 1997, Potkanski 1997). Reducing the incidence and cost of the diseases to the agro-pastoral Maasai and WaArusha should be a high priority to increasing agricultural and livestock production.

Table 7.5

Maasai Prevention and Treatments compared to Recommended Veterinary Treatments

Disease	Carrier/Reservoirs	Prevention[75]	Treatments[76]
1. ECF	No known wildlife problems[77], although buffalo harbor ticks that transmit the disease (Raikes 1981).	Traditional tick control, and the use of acaricide dips and sprays	Antibiotics-Addamycin or Oxytetracycline, Terramycin, & local treatments.
2. Trypano-somiasis	Sheep, Cattle, Goats, and many wild ungulates and other animals	Keep livestock out of Tsetse infested areas, keep wildlife out of livestock areas	Berenil & Novidium
3. Foot and Mouth Disease	Sheep, Cattle, Goats, Giraffes, and other wild ungulates, even Elephants	Cell Culture Vaccines Yet, there are many serotypes, so proper treatment requires vaccination against the correct organism.	Local Treatment was wood ashes and salt mixed and rubbed on infected parts. Recommended treatment is to slaughter infected animals, destroy carcasses
4. Anthrax	Soil, Feed, Water, and other animals	Avoiding endemic areas, other animals, and annual vaccine Blanthrax[78]	Novidium
5. Babeoisis	A large variety of wild animals can harbor this organism	Vaccines are available The use of acaricides and vaccines has worked in Australia	Berenil, local herbs (Orbukoi, Engarooji, & Oloponi), Also 10% Oxytetracycline
6. Heartwater	Wildebeest, antelope and wild ungulates may be reservoirs for the disease	Traditional Tick Control, and acaricide dips or sprays	Most said no Treatment available Tetracyclines when administered early,
7. Rinderpest	Buffalo, Wildebeest, Kudu, Eland, Giraffe, Wart hog, Gazelle.	Free Vaccine – provides lifelong immunity, but is sensitive to light, heat and humidity, making it ineffective if handled improperly	No treatment. The Maasai said this was one of the worst, as they knew there was no treatment, yet many didn't vaccinate
8. Anaplasmosis	Many wild ungulates or cloven hoofed ruminant animals.	Vaccines are available, and oxytetracycline injections will provide someimmunity	Oxytetracyclines.
9. MCF	Wildebeest, and sheep and goat form transmitted by gazelle.	Avoid wildebeest calving area, the most common and well known strategy	No treatment - made their cattle blind, and glad hunting companies help kill wildebeest

[75] These preventative measures were taken largely from Fraser and Mays (1986)
[76] The treatments were those provided by the farmers interviewed. This does not mean they are recommended, but these are what the farmers said they were using.
[77] From Homewood and Rogers 1991
[78] Recommended by Jonsson et al. (1993)

7.7 Oxen and the Environment in Monduli District

The use and adoption of oxen has never been a benign technology. For centuries humans have used animals and tools to shape the landscape to suit their needs. For the Maasai and WaArusha the use and adoption of oxen has created opportunities, but also problems. As was pointed out in Chapter 2, some of these conflicts and problems can be predicted. In Monduli District the environmental problems that can be attributed to the use of oxen were not very different than what has been seen in other areas in Tanzania or Africa. These problems included: soil erosion (Christiansson 1986, Blench 1999, Kilemwa 1999), the loss of soil fertility (Ravnborg 1990, Birch-Thomsen 1993, Mung'ong'o 1995), deforestation (Sosovele 1991, Blench 1999), decreased grazing areas (Kjaerby 1983 & 1989, Ravnborg 1990), the loss of soil moisture due to increased water run-off and higher rates of evapotranspiration (Sinclair and Wells 1985, Sinclair and Fryxell 1985, NRC 1992), and also the spread and proliferation of weeds (Sinclair and Fryxell 1985, Kilemwa 1999).

In this study, I simply asked how draft animals have changed the environment. Sixty-seven percent (67%) of the men interviewed said that oxen had not changed the environment. Their answers included such statements as,

> *"There is no change caused by the use of oxen. But oxen have changed the people. People have increased their income by using oxen for growing food. This is done without all the expenses."* [79]

> *"No changes, instead the oxen have brought development to this area."* [80]

> *"No change, because draft animals help people to be strong when they use them."* [81]

[79] Interviewee #124, a WaArusha man from Lolkisale.
[80] Interviewee #19, a Maasai man from Losirwa.
[81] Interviewee #31, a Maasai man from Selela.

But not all the men interviewed who said there were no changes brought by oxen were so positive. Here are a few examples. Again displaying how discussion and semi-structured interviews can sometimes generate the real answer over a simple survey.

> *"The way I see it, oxen have not changed the environment. But farming in general has been very destructive, with the cutting of trees for example."* [82]

> *"No change caused by oxen, because the problem of gullies*(gully erosion*) is not much. The places that have this problem is due to using a tractor."* [83]

There were certain villages that were more prone to cite environmental problems, as they faced many of the environmental challenges and conflicts described earlier. Thirty – three percent (33%) of the farmers said environmental problems were caused by the poor use of oxen. The largest majority came from the villages of Lashaine, Lendikenya, due to their topography and Mbuyuni due to it s shallow soils.

Out of the total number of men interviewed, 22% said soil erosion in their village was due to oxen and related activities. Here are some of their statements,

> *"There is a change, especially in the fields where people use oxen. People are not making ridges, so the soil is washing away. Soil erosion is starting to come."* [84]

> *"In the Shamba* (farm) *the plowed soil becomes soft, which allows it to easily wash away."*[85]

> *"Yes, surely they have changed the environment. In these hilly areas without ridges they get a lot of erosion. So the erosion is due to the amount of water going down the hill, so when oxen pass a certain way, it creates erosion on the paths."*[86]

[82] Interviewee #76, a WaArusha man from Lendikenya
[83] Interviewee #105, a Maasai man from Arkatan
[84] Interviewee #120, a WaArusha man from Lolkisale
[85] Interviewee #63, a WaArusha man from Lashaine
[86] Interviewee #60, a WaArusha man from Lashaine

The remaining men that believed oxen caused problems answered either the problem was a loss of grazing lands (6% of the men interviewed) or that ox farming causes tree cutting and/or a "lack of rain" (the final 6% of the men interviewed).

With regard to a loss of grazing areas, this was the most detailed answer,

> *"The change is that more land is brought under cultivation, more people get food and plow more land. This of course creates problems. People have been complaining because they can no longer shift* (move) *to field areas to graze, which are the wetter areas."* [87]

There were many complaints about the loss of trees, especially in Lashaine and Mbuyuni. Not all of these complaints were focused on oxen or ox farming, but the loss of trees was often blamed for a perceived lack of rain as described in Chapter 5. A WaArusha man from Lashaine said,

> *"There is a change in the environment. The number of trees has decreased and they have also had a climate change. They don't get the rain like they did in the past years."* [88]

Boserup (1965) discussed how most cultures will not adopt more sustainable and often more labor-intensive methods until they are forced to do so. The environment in Monduli certainly seemed to be moving towards a crisis state. Maybe this will be the impetus for change, but as pointed out earlier (Chapters 1 & 2), the crops that were being grown may be inappropriate and unsustainable given any soil conservation methods. Humans have been the cause of this problem. The use of oxen has allowed them to expand their crop base and adopt crops that work well with ox plowing. This has all been done with little regard for the environment. One farmer said that tractors would be better because they don't need to graze. I would disagree, especially if the practices I saw with oxen were simply transferred to larger

[87] Interviewee #26, a Maasai from Selela
[88] Interviewee #51

tractor plowed fields. This issue will be discussed in much more detail in chapters 8, 9 and 10.

7.8 - Is Animal Traction Appropriate for Monduli District?

Animal traction can provide a cheap and effective power source to add to or replace human labor in the agricultural sector. There are multiple paths toward technological and agricultural development (Inns 1994). However skipping the animal traction stage has been shown to be a poor option. Technology is often used to substitute for more expensive factors in the production of any commodity. Where labor, land or capital limit the ability of farmers to expand their agricultural production level, the use of animal traction becomes a viable technology in a nation such as Tanzania. (Rempel 1993).

As noted above there are ample numbers of cattle available for draft use throughout the Monduli district. Overcoming constraints such as disease problems or lack of expertise in controlling erosion can be more difficult to achieve than importing more food, or following other less sustainable development paths (Starkey and Mutagubya 1992, Sosovele 1999b). However, for the long term food security of the people, the adoption of better practices might be worth it.

Across Africa it is essential to alleviate the burden on women, in order to promote their development and education. This has been a major obstacle, but one that has become a priority of not only the people and the government of Tanzania (URT 1997), but also global organizations like the FAO and The World Bank. I met many Maasai women who were very tired and dreamed of a better life. My most memorable interview was one where I interviewed the women of a Maasai *boma*, when their husband was not home.[89] When I showed them pictures of women driving oxen in America they became very interested in how

[89] I would not have done this normally, but I was using a Maasai extension officer who knew the family and the husband.

draft animal power might be used to improve their daily life. One woman who was carrying manure in a basket on her head was particularly interested. When a young woman named Maria (a Pare), participated in a program in Ngulu village in 1998, she was not scorned or pushed aside. She simply said as a single woman that there was a lot she could learn that would improve her life for the future.

There was also a need for increased use of animal traction because the size of most farms in the Monduli precludes the economic use of tractors. There were serious labor constraints in Monduli District due to the seasonality of the rains, the agro-pastoral mode of production and the use of the jembe on the majority of farms. Furthermore, the promotion of draft animal power has been a national priority after numerous failed schemes using other sources of farm power (Starkey and Mutagubya 1992, Starkey et al. 1994, URT 1997).

Animal traction has not been the answer to all Maasai and WaArusha farmer's woes, nor has it been appropriate to all of the diverse regions or ethnic groups that are found in Tanzania. Farmers in regions that specialize in permanent crops and fruits, agro-forestry, or small plots of vegetables may not have any reason to adopt animal power. Yet in the Southern Monduli district these crops are not grown, except on the highest slopes of Monduli Juu and in irrigated fields in Engaruka and Selela. There has been and will continue to be more pressure to grow basic, but higher producing cash and food crops like rice, corn, and beans. These crops are easily integrated into farming systems that include animal power.

The use and expansion of animal traction in Monduli District largely depends on policies that promote the use of animals, given serious consideration of the individual culture, the physical characteristics of the land, land availability, and the appropriateness of the cattle themselves (Starkey and Mutagubya 1992). Where cattle (including oxen) can be fed crop residues or allowed to graze without degrading the natural environment around the farmstead oxen are usually cost effective, provided there is a need for their power. At the same time the

oxen are performing agricultural tasks they can gain weight and grow in value. This provides a value that every Maasai and WaArusha farmer recognized. Most farmers will buy oxen after selling an old pair. The older pair would be sold in their prime, at about 7-8 years old. At this age they have reached their mature weight, their usefulness as oxen is just beginning to slow down. The men interviewed, fully recognize this was the best time to cash in on their investment. With the sale of large oxen, 2-3 pairs of young oxen (about 1-2 years old) can be purchased. This not only increased the value of one's herd, it provided the ever important function of insurance against bad times in the ever changing Tanzanian economy.

Tanzania has ben considered one of the world's poorest nations, with tremendous capacity to do better, given its natural resource base and political stability. Monduli District could be considered very typical of the nation at large. While animal traction could not be the answer to all problems, it can be used to increase agricultural production. Animal Traction is a simple technology that utilizes local resources to improve productivity in both the agricultural and rural transportation sector. To ignore this possibility in the hope of an easier path to development defies all notions of self-reliance and sustainability. Yet to use the technology with complete disregard for the environment and soil conservation practices, will inevitably lead to an environmental disaster. Draft animal adoption, primarily oxen, as a technology, has been widely adopted in this region. This has brought with it many of the challenges that have plagued agriculturists for centuries around the world. Addressing these challenges will be the topics in Chapters 9 & 10.

CHAPTER 8

MAASAI AGRICULTURE IN MONDULI DISTRICT

8.1 – Introduction

I have discussed both agricultural development and Maasai sedentarization in Chapter 2, and the Maasai livestock and agriculture systems I observed in Chapter 3. Chapter 7 describes the agricultural system, and answers many of the questions posed in the research. This chapter will further examine the crops grown, the constraints on the animal traction based production system, and the implications of the system of agriculture that predominates the Southern Monduli District. I will answer many of the questions presented in both Chapter 1 and 2, as well as further explore the indicators of sustainability described in Tables 4.1 and summarized later in Table 10.1. Furthermore, I have highlighted the agricultural system and the challenges the Maasai and WaArusha face with regard to trying to grow crops. In section 8.5 I have presented some economic data to discuss why they may have chosen the animal traction based systems of production with limited use of intensive practices over tractor based more intensive systems.

This study was largely based on the premise that when agriculture was adopted, specifically agriculture with the use of animal traction and plowing, this allows the Maasai to become more integrated into the agricultural economy. They used oxen to expand their cropping area, while at the same time trying to expand their herds. This trend is common all over Sub-Saharan Africa (Christiansson 1986, Jordan 1992, Winrock 1992). Increasing

croplands and intense grazing pressure also restricts grazing land, as was evident on my first bus ride through the region (Kikula et al 1993). The sedentarization of the Maasai in Southern Monduli was not necessarily something that was done because of a loss of their herds. Instead, I believe it has been a process of agricultural extensification due to increasing agricultural encroachment, the increase in human populations and the necessity to protect to their resource base by growing crops, while trying to earn an adequate livelihood in a changing economy.

8.2 - Maasai Agriculture

In March of 1998, traveling by bus along the Great North road from Arusha to Monduli, I saw Maasai and WaArusha planting maize and bean fields with oxen. The fields stretched from the road both north and west toward Monduli, and also south toward Lolkisale, on the Kisongo plains (see figure 5.2). Leaving the more well-watered highlands of Arusha, the landscape change was dramatic, changing from lush green coffee plantations, and vegetable plots shaded by trees, to the vast grasslands of the Maasai steppe. Being early in the morning, there were many herds and flocks of livestock moving slowly across the plains, toward the grazing areas, south of the village of Kisongo. Maasai and WaArusha men and boys were herding the animals. See Table 8.1 for a list of typical agricultural activities by season.

The area was obviously being used by a great number of livestock, most of which came from the higher areas, in West Arumeru and Monduli Mountains. These sloping hills were densely settled by WaArusha and Maasai. Their *bomas* were almost camouflaged on the

Table 8.1

Agricultural Calendar for Monduli Area

Month	Activities
September-October	Dry Season – herds often travel with Morani to find ample grass and water. In Villages such as Lashaine this can be difficult, as families tend to be smaller and there is less labor, and fewer *Morani* to do this job.
November - December	Possible preparation of farms in plains, and sometimes the planting of maize and beans in mountain villages. For the Semi-Arid areas this is the driest time of the year. Without coming rains, the cattle and other livestock can suffer.
January-Febuary	Planting of Maize and Beans in the plains. If there were "good" rains; weeding of maize and beans in mountain villages, and preparation of barley fields (Monduli Juu)
March	Planting also occurs in March and as late as April in some cases, but there is a high risk of the crop never maturing. Weeding beans and Maize occurs in the plains. Milk production is at its highest, as there is usually ample water and grass. The cows are kept closer to the *boma.*
April	Harvesting of beans if they were planted early. Late planting if the rains are late or as in 1998 fields had to be replanted due to flooding. Again grass and water are usually most plentiful during March and April for livestock.
May-June	Weeding, continued sometimes an early harvest. The rains start to taper off. Grass is still plentiful in most areas.
June/July	Harvest of beans. Cooler drier weather settles in for a number of months. Also a time of many celebrations and activities for Maasai. A second planting occurs in irrigated villages such as Selela and Engaruka
August	Harvesting maize on the plains. Typically the coolest month of the year. Grass is beginning to dwindle in more intensively farmed areas.

nearby hills, as the thatched roofs of their homes matched the grasses growing nearby from which they were constructed. However, their conical shapes stood out against the morning sun. The smoke from their cooking fires filled the air, their scent easily distinguished over the diesel smoke on the bus. Most homesteads were surrounded by sisal plants, which were growing in a circle around each *boma*. These were used to control erosion, and acted as a

natural barrier to mark their small homestead plots, as well as offer some protections against predators.

From the village of Kisongo to the turn off toward Monduli, at Meserani (also called *Duka Bofu*), the soil erosion was the worst I have ever seen in any agricultural area. Huge gullies and sparse grass extend a kilometer or more on either side of the road (see Figure 8.1 and 8.2 below). This was my first view of Maasai agriculture. Excited as I was to see the oxen at work, it was obvious that even in 1998, during the year of the El Nino rains, that overgrazing and soil erosion were a serious problem. I had no idea what the local land use issues were, but the lack of grass cover and soil erosion certainly seemed to limit any long term sustainability of the agricultural endeavors of these people (Assmo 1994). It was obvious that they were farming in more arid landscape than nearby Arusha. I was sure that the issues and possible solutions would be soon apparent once I spoke with some farmers.

Talking with Maasai and WaArusha about their agricultural system, it was obvious that they knew the loss of grasslands and the large gullies were an environmental problem. Even people far from Kisongo and West Arumeru understood the seriousness of what they easily saw from the main road. One could not help notice the environmental degradation when traveling to Arusha, the regions most populous and economically vibrant city.

However, many people living in the area felt powerless to change their agricultural or herding practices, in order to improve the landscape or the environment. [1] Given Tanzania's "blurry" land tenure system (Chapter 6), there were few people had any incentive to invest substantial amount of time, cash or labor in environmental conservation measures. This dilemma of environmental deterioration, amidst the loss of grazing lands, and agricultural expansion, will be introduced here from an agricultural perspective, and discussed in the next chapter from a land-use change and more environmental perspective.

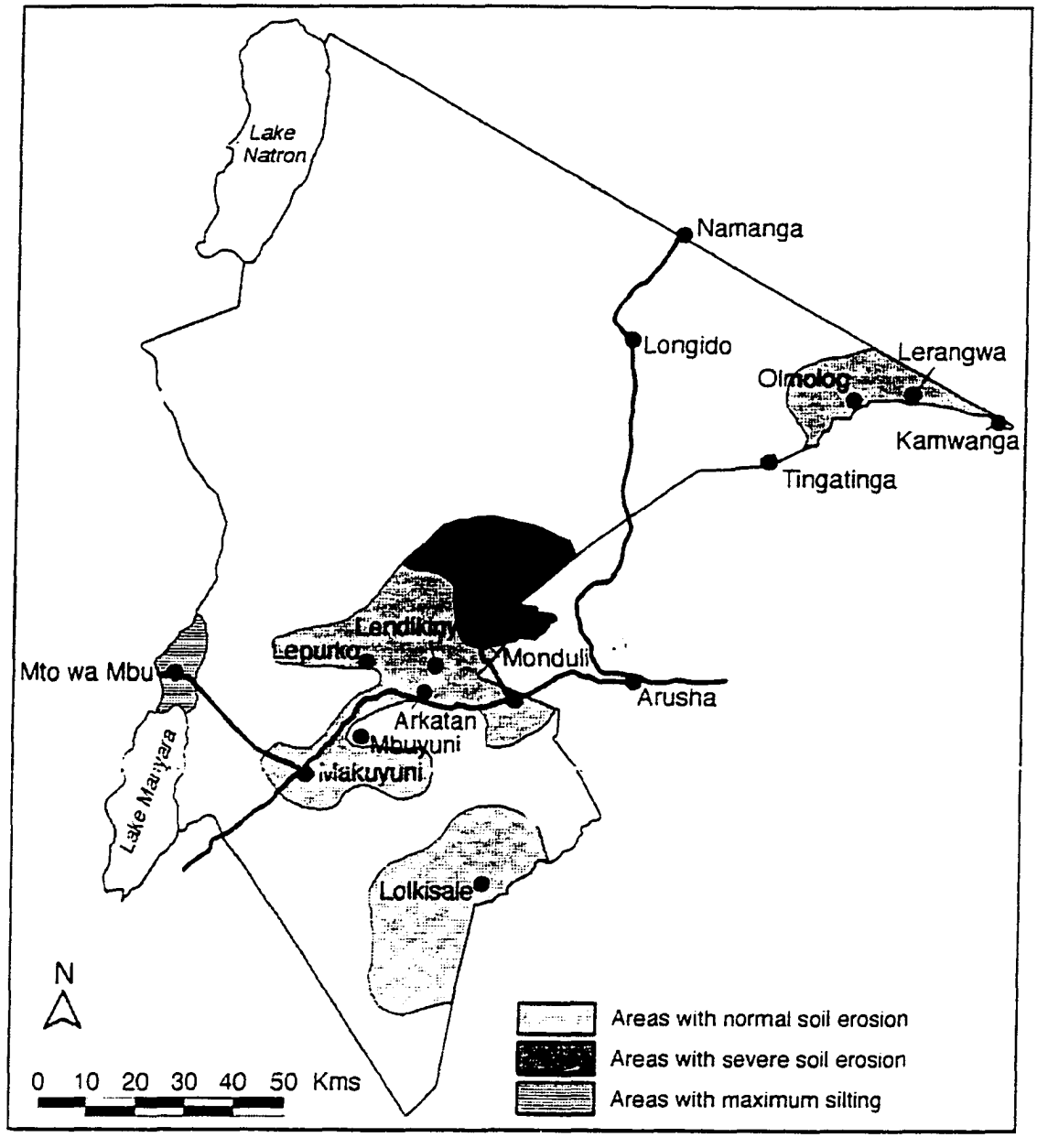

Figure 8.1 – Soil Erosion in Monduli District

From Meindertsma and Kessler 1997

[1] Although they did have numerous ideas which are presented in Chapter 9.

8.3 - Extensive versus Intensive Agricultural Practices

One of the driving forces in the land use dilemma, as presented here and in more detail in later chapters, was that most farmers were simply expanding their farms, or "mining the soil". There was little regard to maintaining long-term soil fertility or soil moisture. This was due to many factors, both as described by the men interviewed, as well as, the literature.

8.3.1 - Advantage of Extensive Land Use Practices

The use of oxen among most of the farmers interviewed in my study was seen as a way to expand the cropland base, as discussed in Chapter 7. The process of agricultural extensification was seen as a way to increase agricultural income and diversify income sources, with minimal investments. As noted in Chapter 7, 74% all farmers interviewed said they had expanded their agricultural fields with the use of oxen. Others cited tractors as the way they have expanded their crop growing operations. This extensive agricultural system was seen as complimentary to livestock raising, as it allowed farmers to grow more crops, as a way to reduce the dependency on purchased foods, through the sale of livestock.

Forty-six percent (46%) of the farmers interviewed expanded their crop fields with few cash costs, by using seeds they had kept from the previous year's harvest, and using no cash inputs such as fertilizer, pesticides or hybrid seeds. This represents a reluctance to grow crops using improved techniques, because of the risk associated with crop growing in many areas of my study. If a harvest, even a small one, could be had with few cash costs, this outweighed the risk involved with spending precious cash on expensive inputs such as tractors, fertilizer, and pesticides (see Table 8.4). Most were not purchasing hybrid seeds, due to the high cost of the seed and the additional high requirements for inputs for hybrid

varieties of maize, was also seen by Shao (1999). Many farmers had stories about using purchased seeds from some companies and stockists who had sold them seed that never germinated. There were also farmers who had not witnessed the increased production, therefore were reluctant to try this technology without some outside assistance to purchase the seeds or the inspiration from some recognized and respected person or group. Finally, given low crop prices at harvest time, as well as, poor storage options, many farmers felt there was little incentive to risk what maize harvest they were getting. Even the possibility of reaping a greater harvest, was outweighed by the higher labor and cash inputs required, due to the possibility of having to sell the harvest at a possible loss.

In all villages, except Selela, Engaruka, and a small part of Losirwa which were using irrigation, the only crops grown were beans, some other legumes (lentils or peas) and maize. One Maasai farmer was growing barley for the Tanzania breweries, and a few farmers grew small plots of finger millet for preparing local alcoholic brews or tobacco for snuff. The primary types of beans grown by Maasai and WaArusha included rosecoco (red and white bean), Canadian (red kidney like bean) red masai (small red bean), katenda (a white bean), soya (a white bean, not a soybean), Choroco and Ngwara (lentils), as well as, cowpeas and chick peas (see Table 9.3).

The advantage of crop raising according to some of the men interviewed, was that if a man had no livestock and no job, a Maasai man could eventually get livestock by growing crops, even with a hand hoe, as land costs nothing [2], and could borrow money to buy seeds.

A young WaArusha man in Arkatan pointed this out by saying,

> *"A person with no livestock, can in 2 years have cattle, goats and other livestock by growing crops."*[3]

[2] Tanzanian farmers can be allocated land for subsistence without any cost to themselves, as the local and national government policies, both support the right of anyone that wants some land for growing their own food to have access to small agricultural plots.
[3] Interviewee # 107

Another WaArusha from Arkatan pointed out another advantage of crop growing.

> *"Growing food helps people keep their livestock. In the past before people did this, they depended only on livestock. Those with no livestock had to stay with someone that had livestock* (in order to have food)."[4]

8.3.2 - Disadvantages of Extensive Systems in Monduli District

While the previous examples point toward the real and perceived benefits of crop growing, there certainly were disadvantages. The main disadvantage of this extensive system of agriculture was the destructiveness to the environment, causing soil erosion and overgrazing in other areas (Christiansson 1986, Assmo 1994). There were few incentives to practice more environmentally friendly and higher yielding methods of agriculture, like crop rotations, manuring, and ridging/contouring fields on the hillside fields (Assmo 1994). There were few farmers who had adopted these improved methods, and thus little or no chance of any informal dissemination of these techniques in the near future. There were no recognized incentives or local regulations to inspire farmers to adopt any of these improved techniques. Finally, the rapid expansion of cropping areas, resulted in a subsequent loss of grazing areas, while at the same time livestock numbers were growing rapidly.

According to McCown et al. (1979:329) the implications of this process of extensification varies.

> *"Where agricultural expansion takes place within seasonally important cropping areas, it is likely to create a snowball effect, for example, a decrease in pasture resources, forcing more pastoralists to cultivate, and thus reducing the pasture resources even further. Conflicts may develop between pastoral and agricultural interests, depending on whether pressure on pasture leads to elimination of marginal pastoral households or to an increase in the pastoral households with agricultural interests."*

[4] Interviewee #105

In the research area, there has been a virtual elimination of households depending entirely on traditional pastoral livestock rearing and its food products. The only place I found pastoralists not growing crops were in the drylands outside Engaruka, where I informally interviewed a few men, who came to water their cattle at the river. While I sought out Maasai who were using oxen for my study[5], my observations and extensive travel throughout the research villages, was testimony to the fact that the only remaining true pastoralists were in the more arid sections of Monduli District which were not part of my research area. What I observed was a process of agricultural adoption, by traditional pastoralists, which has resulted in almost all Maasai and WaArusha now growing at least beans and maize. This trend of agricultural extensification, certainly follows the Boserup's development theory discussed in Chapter 2.

As stated by one Maasai man in Lendikenya, who was surrounded by many young Morani who had spent the night chasing zebras from their fields,

> *"Traditionally at this time of the day the men would have all been out watching the cattle. Today we remain in the shamba (farm). This is the change* (that has been brought about by growing crops)."[6]

Thus in this boma like many others visited, the Maasai were not forced out of livestock raising, but instead had adopted agriculture, as a means to sustain themselves in a changing environment.

8.3.2.a - Herd Mobility

Herd mobility was considered a major problem by 66% of the men interviewed. The expansion of crop fields and homesteads was seen as the cause of this problem. The villages with the most severe problems were Lashaine, Lendikenya (which have the highest

[5] Which was very easy, as all the Maasai and WaArusha I met in my study area, including those met at cattle markets, in village meetings or in other informal settings were all growing crops and all had experience using draft animals.

elevations in my research area), and Lolkisale (which has some of the newest farms crowded around Mt. Lolkisale (See Figure 5.12). The greatest challenge in herd mobility appeared to be in Lashaine, where 88% of the farmers interviewed said herd mobility was a serious problem. In addition, 41% of the farmers in Lashaine, said they could no longer expand their herds, as they have always done in the past, due to a shortage of nearby grazing lands.[7] This was leading, in areas of higher population densities (like nearby Kisongo in the Aruemeru District), to the adoption of a much more sedentary and agriculturally based economy, much like what was predicted by Boserup (1965 & 1981).

One WaArusha from Lashaine summed up the predicament like this,

> *"At first the growing of crops changed my livestock herd* (it grew in size). *But now because of the expansion of agriculture, there is not enough feed for cattle. So now I focus on agriculture. From my profits (recently) I have bought a few donkeys, but not cattle."*[8]

I predict that nearby Lendikenya is likely to follow the same path, being in a well watered and high population area adjacent to Lashaine. A Maasai from Lendikenya pointed out the problem with herd mobility that has resulted from the expansion of agricultural areas.

> *"It is true that the population has increased. Back then people only cultivated about one acre. Now people cultivate 20-30 acres by using oxen or tractors, and it swallows the whole grazing land."*[9]

Engaruka and Selela also faced grazing challenges, but these were different than in Lashaine and Lendikenya which were essentially land locked, with no where else to graze. Both Engaruka and Selela villages have nearby grazing areas, but they were extremely arid and of low potential (see Figure 5.3), with large wildlife populations and high disease

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[6] Interviewee # 68

[7] There continues to be people both in Tanzania and outside it that insist that Maasai are nomadic. Maasai and WaArusha admitted to herd mobility and decreased access to local grazing areas were a major problem. This points to the fact that once they adopt agriculture that they have to stay near the crops to care for them and they are reluctant to wander very far with their herds.

[8] Interviewee #60

incidence. Yet, many pastoral Maasai continue to practice their traditional livelihoods and agriculture in these areas. This may in fact be the classic case of marginalizing the pastoralist, pushing them further into livestock disease prone areas, and decreasing their grazing areas which are discussed later in this chapter, as both are perceived as environmental problems.

8.3.2.b - Crop Failure

Another challenge was the reluctance to intensify agricultural operations due to the risk of crop failure (Coulson 1982). Meindertsma and Kessler (1997) estimated that in semi-arid areas of the Monduli District crop failure was likely in 1 out of 2 years. This was similar to what Lama (1998) found in Simanjiro, where crop failure was typical in 6 out of 10 years. The strategy adopted in Simanjiro was one where the primary reliance was on livestock keeping, but crop growing was practiced when the rains came early, as a way to increase farm income. If the rains failed to come early, the farmers did not plant a crop at all, as the risk was too great. This follows the findings of Hatibu et al. (1995). In sub-humid lands (see figure 5.3), which included many of the highland areas in my research area, the expected crop failure was 1 in 4 years. Meindertsma and Kessler (1997:46) point out that because of this crop failure rate, *"it should be an important factor in motivating farmers to improve crop husbandry management and the use of fertilizers"*

With this last statement, I have to point out that I do not agree that the Maasai should modernize their methods following more European or American agricultural models. However, I did observe a few Maasai farmers who had adopted improved practices. Twenty-one percent (21%) of the Maasai men interviewed were using manure, 5% were planting maize outside the corrals to capture some of the nutrient runoff, and 5% were using some form of crop rotations. The result of their improved, but low cash cost practices were amazing. Their maize and bean crops were substantially higher than that of their neighbors.

[9] Interviewee #68

They adopted strategies that avoided high inputs of labor or outside cash inputs such as commercial fertilizer, based on their strategy of risk avoidance. Adopting more intensive methods in such a high-risk area seemed to be asking for trouble. The expatriate commercial bean farmers discussed in Lama (1998) completely avoid planting any crops unless the climatic conditions were right. The only inputs I could immediately recommend making would be no cost or low cost strategies as mentioned above, or the use of more soil conservation measures, which in the long term would benefit the farmer, provided there was no chance of having the land alienated from them (Assmo 1994).

In this instance I would agree with Raikes (1986:134), where he stated,

> *"Given the opportunities, they (Tanzanian farmers) will usually grasp them (improved practices) with both hands, but the way in which they do so, selectively adapting innovations to their requirements and diversifying into other economic activities other than crops, or the innovation being encouraged, comes into conflict with the notion, common to modernizers, of modern farming, which is supposed to be absolutely better than traditional methods."*

The risks the farmers face go beyond the dependence on costly inputs to which the Maasai and WaArusha have absolutely no control, such as herbicides, insecticides, fertilizers and hybrid seeds, which are all imported into Tanzania. Drought, which frequented the research area was mentioned in every interview. While there was no way to avoid drought there are many strategies of diversifying the farming and livestock operation to reduce the inherent risks. A common response when asked about ways to deal with drought, from a Maasai man in Losirwa was,

> *"For cattle you have to move them to an area with water and grass. For crops simply buying shorter maturing seeds, will help, but if there is not enough food, we do not move, I sell cattle to buy food (maize)."* [10]

[10] Interviewee #15

According to Mong'ong'o (1999), agricultural pests, plant and livestock diseases were factors contributing to unsustainable practices in semi-arid areas. Wildlife was considered a major agricultural pest, particularly in villages nearest the game control areas national park boundaries. Villages that were more densely settled had fewer problems with wildlife causing crop damage.

Avoiding or controlling agricultural pests, like insects, was a serious problem. If avoidance leads to unsustainable practices, it was in part due to a lack of alternative options. Every farmer interviewed mentioned the "army worm" problem in 1999. The government had a national campaign to spray for this problem, but many farmers had already lost a substantial part of their crop. Beans were typically more prone to insect damage, and more commonly sprayed by farmers themselves to minimize losses. Wildlife were considered an agricultural pest in all interviews. Wildlife damage to crops was substantial in most areas, the only exceptions were the densely populated areas, in Engaruka and Lashaine. During the latter part of the cropping season, this wildlife damage was easily observed in crop fields in every village visited. Farms and fields closer to the wildlife parks always had more damage (Toulmin et al. 1992). Risk avoidance was difficult, especially when dealing with elephants. However, there were strategies of dealing with wildlife. This will be discussed later, as wildlife damage and crop losses were major land use change and environmental issues.

Weeds were also a major constraint on crop production. They were also considered an environmental problem, and will be discussed later Chapter 9. Weeding was a major labor requirement on most farms, but there were strategies employed to reduce weeds and the labor necessary to remove them. Sylwander (1994) and Rwelamira & Sylwander (1999) have stated that most of the weeding in Tanzania was done by women. In this study, 68% of the men interviewed admitted to helping their wives do the weeding, and 38% admitted that they also hire laborers if the fields were large and they have the money to do so. Most of the

Maasai men would prefer not to have to weed, but those with few wives and only small children found it impossible to expect a crop without their assistance.

Some of the older or wealthier men commented that only women work in the fields. For example a Maasai man in Arkatan said,

> *"Women are the only ones who work in the field. If the field is large I pay laborers."*[11]

A WaArusha man from Mswakini stated,

> *"Most weeding is done by women, children and laborers. It is rare to see a man in the field weeding."*[12]

While these statements may have been the ideal situation for a Maasai man, the reality was that Maasai and WaArusha men did help their wives if the fields were large and the crop looks promising. Maasai men and *morani* were seen working in the fields in both 1998 and 1999 in all the research villages.

The only farmer interviewed who was using herbicides was one Maasai man spraying weeds in a barley field with a back-pack sprayer. He admitted that his family or laborers did weed in the maize and bean fields.

One strategy to minimize weeds was to minimize fertilizer use. As one Lendikenya WaArusha farmer put it, *"I now weed three times, if I fertilize the weeds become worse."*[13]

Most farmers in my study preferred a low input, low risk approach, even if that meant extremely low yields (see Table 8.4).[14] Farmers in Engaruka, Lashaine, and Mbuyuni complained the most of the decreasing yields. These were also the villages that had been growing crops using extensive methods for some time and were experiencing the depletion of their soil resources (see figures 5.5, 5.7, 5.10, and 5.14). While there was agricultural

[11] Interviewee #104
[12] Interviewee #111
[13] Interviewee #78

intensification going on in much of my research area, I think there were lessons to be learned from the local successes, and local failures before exposing these people to greater risk, by suggesting they adopt more modern concepts and imported high cost commercial inputs.

8.4 - Intensification

While extensification of agriculture was widespread, this could be seen as a move toward more intensive agriculture as explained in Chapter 2. The adoption of new high yielding crop varieties, fertilizers, pesticides, and even the use of oxen can be seen as a step toward more intensive agriculture. However, while intensification could eventually bring higher yields, this has always been more successful in climates and regions with more dependable rainfall, as explained in Chapter 2. There was potential for intensification but this has to be done within the constraints of the environment. The current intensification process and agricultural crop strategies are described below, beginning with a description of the two most common crops in the research area, maize and beans.

8.4.1 – Maize

Maize is the most important food crop in Tanzania grown on about 45% of Tanzania's cultivated land, with most areas having a 3-4 month growing period (Moshi & Marandu 1988). These authors estimated that peasant farmers grow 85% of the maize with less than 10 hectares, many with only 2-3 hectares. These statements were certainly within the realm of what I found in much of my research area. The national average yield was less than 1.5 tons/ha (607 kg/acre). The bulk of the maize was consumed on the farm (Moshi & Marandu 1988), and the Maasai and Warusha in my study were no exception. These authors estimated that maize makes up about 25% of the total calories in Tanzanian diets. This

[14] An example of the economics of this low input approach, from one of the farmers interviewed will be

estimate for the nation was less than what was suggested by others more familiar with the Maasai, as Homewood and Rodgers (1991) who stated grains provided 64% of the dietary energy among Ngorongoro Maasai.

One of the greatest challenges with growing maize in Africa is limited water availability. Redhead (1985:18) said, *"maize is an excellent crop when it sets and yields, but it needs a very specific pattern of rainfall; without this it fails and dies"*. On the right land with sufficient water, fertilizer and insecticides hybrid maize gives magnificent returns to labor (Coulson 1982), however maize was not without other problems. New seeds must be obtained each year for maximum yields and most of these hybrid seeds (sometimes called HYV[15]) come from international companies, that charge higher prices than locally developed hybrids. There was also a great deal of seed that is sold in packages with names such as Cargill, Pannar, and Pioneer, but the seeds are not genuine, and only seed sold through certified dealers or the Extension could be trusted.

An example where this problem was clearly expressed was an older farmer in Arkatan, who pointed out,

> *"Most people prefer to keep their own seed, as some of the companies are selling bad seed. We are all familiar with these bad experiences."* [16]

Another example was a Maasai from Lendikenya,

"Last year I bought Cargill seed, but the seeds turned out to be Catuman."[17]

The most common maize seed used in my research area was a local variety known as Catuman, with 57% of the farmers saying it was one seed of choice. It is a short season variety, taking about three months to mature. Catuman was grown or mentioned by nearly every farmer interviewed. Over the years, the WaArusha and Maasai have developed this

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presented later in this chapter.
[15] HYV stands for High Yielding Varieties
[16] Interviewee #126

local variety, which rarely requires insecticides and produces at least something in all but the driest years.

When asked why he was using Catuman instead of hybrid varieties, one Maasai farmer in Arkatan said,

> *"This year I grew Cargill and got nothing. The men who grew Catuman got a little, I will not use Cargill next year."*[18]

It also grows with little or no fertilizer, but certainly had higher yields when fertility was improved. Using informal plant breeding strategies, primarily, survival of the fittest principles, this maize variety was a short plant, with usually only one small cob per stalk. According to the farmers using Catuman, it was quite tolerant of drought, compared to hybrids.

A WaArusha man from Mswakini compares his Catuman seed to others using hybrids.

> *"Since 1994, I have not bought seed. I still have Catuman seed. I have not changed seeds since 1994, because it is good seed. I get good crops even if the rains are short. I have compared my seed to others that have bought seed, and this one is resistant to drought."*[19]

Catuman was often purposely crossed with hybrids to try to improve the yield.[20] This could work to improve the yields of the local seeds, but most farmers recognized that the yields drop over time when using the same seed year after year.

A Maasai farmer from Lendikenya described this strategy of local crop breeding, as a way to save money, by not having to buy hybrid seeds each year.

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[17] Interviewee #65
[18] Interviewee #104
[19] Interviewee #116
[20] One concern with multinational corporations controlling the genetics of hybrid maize, is the loss of this chance to gain productivity by crossbreeding. The threat, through genetic engineering, of using the "terminator gene", could have had serious consequences for farmers like the Maasai and WaArusha of Northern Tanzania. This technology would not have allowed farmers to breed from the hybrid genetics, by yielding seeds that were

"You can grow a given seed until it does not bear anymore, I then use another variety in my fields to get more production from my seeds."[21]

It had also been developed into a variety known locally as Catumbili, or a Catuman variety that took only 2 months to mature, which was also used in areas frequented by drought. Ilarusa and Kiliguru were other local varieties mentioned by 4% and 6.5% respectively, of the farmers interviewed.

There were numerous hybrid varieties mentioned by farmers, including Pannar, a hybrid from Zimbabwe (4% of the farmers interviewed), and various Pioneer (2.4% of farmers interviewed) and various Cargill varieties (17% of the farmers interviewed). Overall Hybrid seed adoption was virtually identical for both ethnic groups. Of the Maasai men interviewed, 52% were using or had recently used hybrid seeds. The remaining 48% were not using or had not used hybrid seeds in the last 10 years. Among the WaArusha men, 51% were using or had recently used hybrid seeds and 49% had not used hybrid seeds in the last 10 years. I had expected the WaArusha to have a higher rate of adoption, as a group had more experience with crop growing strategies. However, the WaArusha in my study were farming in areas that were largely more arid than the Maasai. Furthermore, the Maasai have benefited from various seed loan/purchase programs through ADDO (Arusha Diocese Development Organization) and other NGO's that may not have been available to the WaArusha (Igoe 2000).

In 1983, three Tanzanian hybrid varieties were released by the National Maize Research Program, these were Staha, Kilima and Kito (Moshi and Marandu 1988). In my research area Staha was used by 1.6% of the farmers interviewed, Kilima was mentioned by 8% of the farmers interviewed and Kitu by 2.5% of the farmers interviewed. Being locally

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infertile. Farmers like the Maasai would likely not know the consequence of this seed until they planted it, and ended up with no crop at all.

produced hybrids, these were significantly cheaper than imported hybrids such as Cargill or Pioneer, which are imported varieties. However, most farmers admitted that the locally developed hybrids were also lower yielding.

Staha was tolerant of the maize streak disease and was recommended for lowland areas. [22] Kito was the second variety introduced, and it was an early maturing variety recommended for the low and mid altitude zones. Kilima was the third variety introduced in 1983. It was recommended for the mid-altitude (900-1500 m) zone (Moshi and Marandu 1988)., Kilima was used more widely by farmers in my research area, compared to the other two locally produced hybrids.

A Maasai man in Losirwa pointed out a strategy using both the old and the new varieties,

> *"I usually use two types of seed. I use Catuman* (a local very short season variety*) and hybrid seeds. The reason I use two types of seeds is because I like to grow them in separate fields, so if there is only a short rain (for the year) I will get Catuman. In a good year, I get both."*[23]

A WaArusha in Lendikenya commented on the difference between growing crops now and twenty years ago,

> *"Today's varieties, the special* (hybrid) *seeds are what I use now. They are good yielders compared to the varieties I was using 10-20 years ago. In those days you did not know what you were planting, but you know now."*[24]

Although there were improved hybrid varieties available, these were only adopted by about 50% of the Maasai and WaArusha agropastoralists in my research area. The reluctance to use these improved varieties was due to the absence of income to buy the seeds (Sano

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[21] Interviewee #66
[22] Most of my research was conducted in more highland areas, above 1000m.
[23] This particular Maasai farmer (Interviewee #19) was one of the most progressive I met. However, his strategy was still one of low risk, as he fully recognized the likelihood of crop failure due to drought.
[24] Interviewee #74

1999). These risks associated with growing improved varieties, included being more sensitive to unreliable rainfall, poor weeding strategies, poor soil fertility (Komba 1992). They also suffered from the reluctance to use commercial fertilizers, as well as, little resistance to local pests (Redhead 1985, Schusky 1989). Sometimes hybrid varieties were not adopted because of color, taste, and other factors. With maize, the most common agricultural food source, its ability to be ground, or mixed with milk using traditional techniques, as well as. its storage properties, greatly influenced the varieties adopted (Shao, 1999). Cargill 4141, which had high yields in the more well watered villages such as Lendikenya, was not used by numerous farmers because it did not grind as well into a meal as other varieties. One of the greatest challenges was finding a reliable source of the seeds. Many of the seeds sold as hybrids, were simply local seeds marketed as hybrids, or local seeds that came from hybrid plants, with the buyer expecting to once again get hybrids, without understanding the genetics and dynamics of hybrid vigor.

In the nearby Arumeru district in the Arusha Region and the Kilimanjaro Region, the adoption of hybrid seeds, commercial fertilizers, and pesticides was very common. Numerous farmers interviewed in these areas in 1996 and 1998, said prior to the adoption of this "Green Revolution" technology they were getting between 750-1000kg/ha. After using hybrid seeds and improved practices the yields from the same fields ranged from 5000-6000 kg/ha. Given 1999 prices for maize of $24 US per 100 kg, this represented a substantial improvement.

As noted above, these improvements came at a cost. First was the purchase of hybrid seeds, fertilizer and pesticides. Their prices were largely dependent on the policies, politics, and global economics that were well out of the realm of the typical Tanzanian farmer (Raikes 1986, Paarlberg 2000). For example, the "green revolution" technologies were encouraged in Iringa, Mbeya, Ruvuma and Rukwa, all major maize producing areas. The result was increased yields, but quickly there was increased deforestation and decreased soil fertility.

Once structural adjustments took place in the 1980's, with decreased subsidies, the local economies collapsed (Sosovele 2000). Second was the need for improved and timely weeding. Weeding was still largely done by hand (Sosovele 1994, Sylwander 1994). Finally, these technologies have not been adopted in much of Sub-Saharan Africa (Goldman 1995, Paarlberg 2000), and they may not be sustainable in Semi-Arid regions (Weiskel 1989, Lal 1993), which was typical of most Maasai areas.

8.4.2 - Beans

Beans are native to South America, and like maize were brought to Africa. They were the only other major crop grown in my research area. Beans were actually better suited to the semi-arid conditions, as they matured faster than did most varieties of maize. Beans in Africa have been grown most often by women, in association with other crops (Voss 1992). However, among the Maasai and WaArusha, beans were often considered a lucrative cash crop to be grown by men. Maize was seen as more of a staple, an important energy source to supplement the large quantities of milk in the diet. However, beans were also recognized as a valuable protein source, for times when milk was not available. Both men and women also recognized its value as a fast growing, relatively drought resistant crop, that could provide food "earlier" than other crops in the seasonal cropping system common to the plains.

There were many varieties of beans seen and tasted during my research in Tanzania. The Maasai and WaAusha farmers were constantly experimenting with beans to see what varieties will grow the best in their area, but also which ones brought the highest price. Some beans like Dengu (chick peas) or Kunde (cow peas) were known to grow fairly well in semi-arid areas, but their price was not as high when marketed. Others like Ngwara grow well, but are not usually eaten by Maasai. See Table 9.3 for a village by village description of the most common varieties.

The most common variety seen in my research area was the "Canadian" bean, which had been introduced by a Canadian development group. Seventy-four percent (74%) of the men interviewed grew this large red kidney type bean. It was the only bean grown in all research villages. Even in more semi-arid areas it was grown because of the high sale price.

The second most common bean was Rosecoco, a red and white kidney shaped bean, grown by 37% of the men interviewed.

Ngwara, was a common legume. It was a small bean, more like a lentil, being black with a white center. [25] It was grown in more arid areas and less fertile areas by 36% of the farmers interviewed. Most often it was intercropped with maize. It was a tall growing plant, that attached itself to the maize, by means of tendrils. The plants remained green after harvest and were known to have high nutritive value for cattle that grazed the crop. It had the distinct disadvantage of being sought after by numerous wild animals that visited the fields, during the drier harvest season.

8.4.3 - Other Crops

The other crops grown in my research area varied from village to village, but many Maasai and WaArusha in villages such as Selela and Engaruka grew vegetables, including tomatoes, onions, and cassava. Most of these were grown as cash crops to be sold in nearby markets. However, farmers in Selela and Engaruka complained of the cost of sending the crops to larger markets, with better prices, such as the market in Mto wa Mbu. There were also tree fruits, such as bananas and papaya, these two were largely a cash crop. A few men in Selela and Losirwa were growing rice in small irrigated plots, this was seen as one of the most costly and labor intensive crops, but also one that brought the highest price. The few Maasai and WaArusha farmers growing rice all admitted to the necessity of using commercial nitrogen fertilizer.

In addition to food crops, many farmers grew small plots of tobacco for use as snuff by the men, and many farms had gourds growing just outside the *"kraals"*, which were used by the women for making containers for water and milk.

A few farmers as mentioned earlier in Chapter 5, grew finger millet for beer, and one Maasai farmer had a large plot of barley, which was grown for the Tanzania Breweries in Arusha. The only other crop mentioned was Sunflowers, but they were not very common, as marketing was a challenge, and most people did not eat the seeds.

8.4.4 - Commercial Fertilizer Use

The use of fertilizers is a sign of agricultural intensification, yet the adoption of commercial fertilizers was virtually non-existent among the farmers interviewed. Only 4% of the farmers admitted using any commercial fertilizer at all. The farmers admitting to using commercial fertilizer were Maasai farmers who had small, but intensively managed plots. These were located in Engaruka, Esilalei and Losirwa. There was no relation at all between the farmers, except that each of them had worked outside their home village, and seemed well aware of the benefits of proper fertilization. Fertilizers were used for growing rice or vegetables in irrigated areas, such as Engaruka and Selela. One Maasai farmer admitted using commercial nitrogen fertilizer on maize and his results were stunning.

As will be described later, cash inputs like fertilizer were seen as increasing the economic risk of the farmer. While hybrid seeds, tractor plowing, fertilizers and pesticide use could certainly yield a more timely and larger harvest, if the rains did not come, there was a tremendous amount of financial risk involved with the cash outlay required for these inputs.

In Monduli, despite decreasing crop yields and rampant soil erosion, there was a continued reluctance to use fertilizer. I have to agree with the 1993 findings of Meindertsma and Kessler (1997) who pointed out in Monduli district that only about 5% of the households

[25] Ngwara looked like a tiny oreo cookie.

use manure as an organic fertilizer and only about 0.3% use commercial fertilizers. They also pointed out the district extension staff claimed, in semi-humid and sub-humid area,s fertilizer use on maize fields has increased to 15%, in 1997, which I feel was much too high an estimate.

Although agriculture is the backbone of Tanzania, the production of commercial fertilizer has failed time and again in Tanzania. A factory in Tanga failed, despite its use of many local materials (Sosovele 2000). Another factory nearer my research area in Minjingu was producing phosphate in the 1960's, but this too failed, and today Tanzania relies entirely on imported fertilizers, which are often out of the reach of most small farmers.

8.4.5 - Manure

Maasai and WaArusha in my study all corralled their livestock each evening at dark. This was done primarily to protect them from predators, such as the leopard, hyena, and lion (Lama 1998). They remained in the corral from dark until dawn, except during the rainy season, when they were sometimes allowed to rest outside the muddy corral. Corralling livestock tends to confine 50% of the nutrients in the manure to an area within the homestead (Homewood 1992). This manure was of little use for the surrounding area, as there are few transportation options and/or there was a reluctance to expend labor for moving what was sometimes considered a useless resource. Some Maasai pointed out that the manure was not good for crops, due to the lack of any vegetative growth inside the corral. Maasai homesteads often have years of manure neatly stockpiled within the corrals. (Homewood 1992, Coppock 1993). This manure was not usually recycled until the boma was abandoned and a new one constructed, at which time the manure became a medium for growth of all sorts of vegetation. One boma in Esilalei with hundreds of

cattle had been in the same location for 30 years. The accumulation of dried and composted manure created a small hill, as the corrals were more than one meter above the surrounding landscape.

Although there was some reluctance to move and utilize all the manure in the kraals, as further evidence of intensification, 60% of the farmers interviewed were using manure on their fields. This manure was most often used only on fields closest to the boma, as transportation options were limited to take manure to fields that were located away from the boma. Most of these farmers admitted that the manure use was limited by the amount of manure that women and children could carry by head-loading. The Maasai tended to use manure less often than WaArusha, as 56% of the Maasai interviewed were not using manure, compared to only 23% of the WaArusha. This was largely due to a sense that their fields were more fertile, and a greater reluctance to use scarce labor for a difficult and tedious job.[26]

In Lendikenya, Arkatan, and Meserani, (Kikula et al. 1993:23) stated that "only maize and beans are grown in these villages, ox ploughs are widely used, and animal manure is applied extensively in the fields." While I agree that only beans and maize were grown and this was done largely with ox plows, the statement about manure was a complete contradiction to what I saw and heard while conducting over 30 interviews in these villages. Manure was not used extensively, except on the small plots adjacent to the boma, or in areas where there was a lot of erosion, as a method of trying to encourage grass or other plants to grow.

[26] Most farmers had to move manure in sacks or pans to the fields by traditional head loading. This was a job not one single man admitted to doing, and was said to be a job for women and children only. Given the many daily chores of a Maasai or WaArusha woman, this was certainly lower on the priority list. Farmers that did have a cart or wheelbarrow were much more likely to have spread manure.

8.4.6 - Pesticides and Maize

Like the use of fertilizers, pesticides were a sign of shifting away from traditional methods and moving toward more intensive practices. As was noted in Chapter 2, it was also a sign of moving toward less sustainable agriculture. The use of herbicides was non-existent except for the one farmer growing barley in Lendikenya. The use of insecticides by individual farmers in this study was not common in maize plots. However, in 1999, the Tanzanian government had a regional campaign to spray all plots, for army worms (*Cirphis unipuncta*) which had plagued the area, at no charge. This was largely a humanitarian effort, as maize is the staple food crop, It was likely that the entire crop in the Northern highlands would have been lost without this effort. I observed many fields that were completely destroyed before the sprays arrived. The use of herbicides by individual farmers was non-existent except on one large farm that was growing barley for the Tanzania Breweries.

8.4.7 - Insecticides on Beans

Insecticide use in bean fields was more common, with 46% of the farmers admitting to having used insecticides on beans. However, only 14% of the farmers interviewed used insecticides on beans annually, another 17% of the farmers used it only if needed, and another 14% said they used it, but not very often. Finally, 54% of the farmers admitted they did not or had not used insecticides. Of the farmers that had not used insecticides at all, 61% of this group were WaArusha and only 22% of the total number of men using insecticides on a regular basis were Maasai. Thus in this study the WaArusha seemed to be bigger users of insecticides. I would speculate that this was due to their greater investment in crops and lesser investment in livestock, as compared to the Maasai. However, the larger Maasai farmers were not reluctant to use insecticides if they felt they were necessary and available to purchase.

8.4.8 - Raising and Training Oxen as an Investment in Intensifying Agriculture

The farmers interviewed purchased or raised young bull calves to be trained as oxen. These animals were typically trained at 2-4 years old and used for 4-6 more years. During this time, they grew in size and weight, becoming the most financially valuable animals in terms of their value when they were sold for beef at the end of their working life. This was not unlike what other cultures have done with regard to raising oxen, as a way of increasing the value of their investment (Conroy 1999), while at the same time getting valuable work from the animals.

8.4.9 - Reserving Pastures

As further testimony to the intensification of agricultural system, 9% of the farmers had reserved pastures near the boma, so that before and during the cropping season their oxen had ample forage. In primarily Engaruka and Selela, oxen were herded to the cropping areas, after the harvest to not only eat the crop aftermath, but also rejuvenate the soils with their urine and feces. Farmers using crop residue (aftermath) for oxen represented 9% of the farmers interviewed. None of these farmers were storing any crop aftermath, they were leaving it in the fields for the oxen to consume at a later date. Some farmers said this was a highly valued use of the oxen, as the manure was a valuable resource in the fields that had been farmed for so long in Engaruka. The farmers that plowed another's field, would often do this without charge in order to get this valuable fertilizer resource.

With regard to reserved grazing areas and agricultural intensification, one Maasai in Selela said,

> *"Because I have few livestock, I normally keep a special grass reserve near my boma for the dry season. After harvesting my crops, I also reserve this for my own animals, especially the oxen. If the crops are not good, I have to move my livestock (to another area)."*[27]

Another Maasai man in Selela similarly said,

> *"This area has really low numbers of livestock. I have to keep a place for the oxen to graze, and it is reserved for the oxen alone. This is so the animals will have feed during the plowing season, and they will be in good health for plowing."* [28]

One WaArusha in Mbuyuni went so far as to say,

> *"When used for plowing oxen have better health than cattle that are not working, because after the harvest, they eat the remaining crop residue."*[29]

This unique statement, follows Rempel's (1993) observations in Mbeya, Tanzania with stall feeding of the oxen to maximize their health during the plowing season. However, most researchers in Sub-Saharan Africa have found the oxen at plowing season were in the poorest condition of the year, thus seriously limiting their productivity (Starkey & Mutagubya 1992, Luziga et al. 1994, Mgaya et al. 1994). The Maasai take the health of their cattle seriously, and recognize the value of feeding the animals that were working, in order to maximize their performance in the field, thereby intensifying their farming system. Few WaArusha mentioned reserved grazing areas for oxen or other stock. While they may have had reserved areas, they were not observed, nor were they mentioned in any of the interviews.

8.4.10 - Fallowing

In Chapter 2, I discussed at length Boserup's (1965) 5 stages of agricultural development, where she used the type of fallowing strategy adopted by farmers to determine the level of agricultural development. There have been numerous critiques of this theory on

[27] Interviewee #25
[28] Interviewee #23
[29] Interviewee #88

the grounds that people do not neatly follow a series of stages, but instead agricultural development is much more complex (Richards 1983, Jorgensen 1993). A society might go through several stages and then move backwards, depending on the market, transportation infrastructure, political situation, and the climate or the soil conditions (Jorgensen 1993). A population may even using several of these stages at one time, in order to diversify both risk and labor.

On the surface the Maasai in southern Monduli seem to have moved from a largely pastoral strategy, with a great deal of flexibility to a more intensive agricultural system. Growing a single crop, in a short or annual fallowing strategy with the use of draft animal power, they do appear to fit neatly into Boserup's chart of agricultural development (See Figure 2.1). However, there was also evidence in my study that some WaArusha were reverting back to longer fallow systems, where there was land to do so, when crop production levels dropped due to low soil fertility.

For example, One WaArusha man from Mbuyuni village said,

> *"People have given up on some cropping areas, so those areas are now being grazed."*[30]

Another WaArusha from Lendikenya answered like this when asked about the fertility of the soil in his crop fields,

> *"There are many of my fields that are fertile, but as you go up the hill, it (the soil) is being washed away. So now part of my fields are not growing crops for 3 years in order to improve the fertility."*[31]

Fallowing was not the norm among any of the farmers interviewed. Most were planting the same crops year after year, without any type of soil amendment and complained about the poor crop yields. Only 9% of the farmers interviewed admitted to having any kind

[30] Interviewee #90
[31] Interviewee #77

of fallowing. This was short fallowing for no more than 2-3 years. Half of these farmers were WaArusha and half were Maasai, no trends could be attributed to one tribe or the other. There was no evidence that they had used fallowing as a strategy in the change from pastoralism to crop farming. Most Maasai do move from time to time, when their homes become infested with fleas, collapse or manure accumulations around the boma become too large. In the past among the Maasai, this move was based on factors other than the need for more fertile land. Most WaArusha had been settled in areas such as Mbuyuni and Mswakini, which meant they did have to spend a considerable amount of time clearing the land of trees and/or stones. They had little flexibility in moving, as they had been assigned plots by the national government 20 years before. Most Maasai, did not have to spend a great deal of effort beyond plowing the initial grass sod in many areas, and the rich volcanic soil in most of the primarily Maasai research villages was relatively stone free.

According to Raikes (1986:110),

> *"Natural fallowing of one form or another was, until quite recently, the standard method of cultivation over much of the country. For decades the population pressure has been reducing the fallow periods in many areas. Villagization drastically curtailed this management practice."*

It is unlikely such traditional practices were used by the Maasai, beyond normal relocations of bomas, for the reasons noted above. Most Maasai I interviewed, admitted to having practiced a more pastoral life in the past, with only very small plots of maize near the boma. Kikula et al. (1993) and Meindertsma and Kessler (1997) pointed out that traditional practices of leaving land fallow followed by short periods of cultivation were no longer being practiced in Monduli, largely due to population pressure. I am not sure it was ever practiced in the sense that Maasai were growing crops of any significance and moving them based on any "traditional practice". Furthermore, the process of villagization was a factor that

encouraged many Maasai to take up agriculture, without any formal instruction on traditional practices.

One young Maasai man interviewed from Arkatan pointed out,

> *"There is no change in this area, because it has been used for agriculture for a long time. Even the colonists grew wheat here. I did not have to cut any trees, just plow the grass."*[32]

I would agree with Kikula et al. (1993) that the rising number of both people and livestock have both limited this practice. This has forced people to extend agriculture into marginal lands and this increased population pressure on marginal land, speeding up the land degradation process (Shao 1996). This lack of fallowing and the overgrazing in semi-arid areas both have made significant contributions to soil degradation (Kikula et al. 1993, Assmo & Eriksson 1994). It has also led to much lower crop yields over time (Boserup 1965).

One Maasai farmer from Engaruka Chini described the situation like this,

> *"In the past there were very few fields. Now there are many fields and a high population (of people), so now the soil condition is not good."*[33]

According to Boserup (1981), fallowing land serves several purposes. It prevents the exhaustion of the soil, reduces weed growth and limits the spread of plant disease. This was evident in this research, from responses to a question about changes in the soils in cropping areas over the last 10-20 years.

One WaArusha from Mbuyuni said,

> *"There is a change in the crop fields now. The land has become tired, so when I grow crops I am not getting such good yields. If I do not plant any crops for 3 years (in a particular field), on the 4th year I can get good crops."*[34]

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[32] Interviewee #104
[33] Interviewee #41
[34] Interviewee #101

These three things could also be accomplished by chemical fertilizers, herbicides and pesticides, but only in places where these are readily available and the farmers willing to adopt them (Boserup1981). Therefore, in Tanzania and other nations, the reduction or loss of fallowing as an agricultural practice, does often result in lower yields, due to increased soil destruction or loss, increased weed growth and the increase in plant disease problems.

8.4.11 – Secondary Cultivation Practices

In the research area most weeding was done by hand. Weeding was necessary to ensure a crop. The competition for nutrients and the speed with which weeds grow can overcome many crop plants, especially beans and corn. Over time soil fertility can be improved through the use of composts, manure, and cover crops, especially legumes (Boserup1981), Even weeding can help return nutrients and prevent erosion if the weeds are used to cover the soil.

However, with the exception of weeding by hand, very few of these practices were being adopted in the research area. The reason for this was pointed out by McCown et al. (1979:321) where he said,

> *"Costs must at least equal returns for any kind of viability and maintenance of the practice." "...It also becomes a matter of weighing the disutility of labor drudgery against the utility of return to labor."*

The typical price for hiring laborers for weeding was U.S. $7/acre. While this seems like a reasonable price, during years with low or no harvests, this cash cost seriously impacted the profitability of the cropping operation. Draft animals pulling a plow do help bury the weeds, thereby improving weed control at planting time, but they do not eliminate the need for weeding (Boserup 1981).

According to Boserup (1981), the adoption of the plow pulled by draft animals is introduced at the intensive bush fallow stage or short fallow stage of agricultural intensification, which was the stage most of the men I interviewed would be in. The use of

oxen was most efficient when there were still sufficient areas of fallow and pasture in which the animals can gather their fodder. Problems or conflicts arose when there was little fallow or natural pasture left for the animals. If they had to be fed on hand produced fodder, the use of draft animals will become less efficient. For this reason, most multi-cropping systems, like those employed by the Chagga on nearby Mt. Meru were largely done without a plow.

I did not discuss labor as a constraint with the farmers that I interviewed, but there were numerous Maasai farms that were seen employing Non-Maasai (*Mswahili*) laborers to do much of the weeding and harvesting, especially on the larger farming operations. I have noted below in Table 8.2 the activities I observed on Maasai and WaArusha farms, describing the gender/age group seen engaged in each activity.

Table 8.2

Observed Agricultural Activities by Gender in the Research Area

Domestic and Agricultural Activities	Gender Seen Engaged in These Activities
Clearing land – For agricultural crops	Men
Leveling, Ridging or Terracing	None
Soil preparation with oxen	Men
Soil preparation with a hand hoe	Women or Laborers
Manure hauling	Women and Children
Planting	Men/Boys driving oxen, Women place seeds
Weeding (to some degree)	Women, Children and Laborers
Watering crops through irrigation	Men
Repair of irrigation	Men or Laborers
Scaring wild animals from fields	Men
Harvesting	Women, Laborers, and Men
Marketing crops	Women
Cooking food & making local beer	Women
Drying and Storing Grains	Women
Cleaning the Home	Women and Girls
Making or Repairing Clothing	Women
Moving firewood	Women
Moving water	Women
Moving building materials with oxen	Men
Building corrals	Men
Home building and repair	Both Men and Women
Pasturing/ feeding domestic animals	Men and Boys
Treating cattle for disease	Men
Treating goats and sheep for disease	Men and Women
Guarding animals	Men
Training donkeys	Women, but men if donkeys used in a yoke
Training Oxen	Men
Making Yokes	Men
Marketing livestock	Men

8.5 - Productivity/Economics of Crop Growing in Lendikenya

I did not conduct a formal survey on the actual yields of farmers I interviewed in the district. Given my time constraints in the field and the lack of records of crop harvested, this would have led to using estimates that were not very accurate based on

farmer recall, especially since each of a man's wives would have harvested her own crops (Kikula et. al 1993). Typically the crop was used for feeding the wife's family, growing crops essentially for subsistence. However, I did conduct one in-depth interview on the nature of crop yields, and it was an interesting case study to understand why there was reluctance among farmers to invest in outside inputs such as fertilizers, hybrid seeds, and tractor based tillage. This farmer was #128 located in Lendikenya. This was a young farmer with only one wife, and a small herd of livestock. I viewed his fields, crops and parts of the harvest in both 1998 and 1999. I have communicated with him since returning to the United States in order to follow up on his yields and prices received for the crops sold. Below are some general statements about typical yields in the village. This does not account all cost for personal labor, and incidentals, such as tools necessary for weeding and harvesting. However, it does provide an interesting example, of how variable crop yields can be and why using oxen and non-cash inputs is considered the least risky form of agriculture (see Table 8.3 below for a summary of the following discussion).

The typical maize yields according to this Maasai farmer were described below,

> *"In Lendikenya* (in the sub-humid zone) *the average yield for hybrid maize in a good year/acre is 18 sacks* (1800 kg/acre), *but it depends on the type of seeds. This would be without any commercial fertilizer and very little manure. Local seeds like Catuman would only produce about 7 sacks* (700 kg/acre) *in a good year. A better local seed might produce 8 sacks in a good year. In poor years, the local seeds produce about 2-3 sacks of maize* (200-300 kg/acre)*."* [35]

When asked about bean yields, the same Maasai man replied,

> *"In a good year in Lendikenya, the fields can produce 15 sacks of beans* (1500 kg/acre). *If it is mixed with maize in a good year, it will produce*

[35] Interviewee #128

about 12 sacks of beans or 1200 kg/acre. In a poor year, it might only produce 2-3 sacks (200-300 kg/acre) *if mixed with maize, and in a bad year when planted alone, it can yield only 6 sacks of beans* (600 kg/acre)."[36]

Meindertsma and Kessler (1997) estimated that yields in Monduli District varied considerably based primarily on annual rainfall (see Table 8.2). The average yield for maize hovers around 400 kg/acre. However, from their work I have displayed the following table to show ranges and potential yields for both beans and maize in Monduli district. Yields were dependent on the climatological zone the crop is being grown in. Lendikenya was in the semi-humid zone. The quotes above and my informants actual yields and ideas about yields both fall well within the chart below.

Table 8.3

Monduli District – Actual and Potential Yields

Climatological Zone	Actual Yield (low mgmt) kg/acre		Potential Yield kg/acre	
	Maize	Beans	Maize	Beans
Semi Arid Lands	200-500	100-300	500	526
Semi-Humid Lands	700-1000	200-400	2000	900
Sub-Humid Lands	1000-1500	300-550	2630	930

adapted from Meindertsma and Kessler 1997.

Below are the 1999 prices, I found for these crops in the Monduli Market, which is the closest large weekly market to the village of Lendikenya.

1999 Bean prices varied between – U.S. $39 or 27,300 Tsh/ 100 kg. sack

1999 Price for maize - 1 sack or 100 kg = U.S. $24 or 16,800 Tsh

[36] Interviewee #128

8.5.1 - High Input/High Yields – Results in a high rainfall year

Using the prices above and the information gathered during my research and following up with farmer #128, I have put together the following crop production scenario. The prices and yields are real, but they represent only one particular farmer in one year. No two years are alike, as rainfall and other factors can drastically influence production.

Farmer #128 cropping expenses using intensive practices on 3 acres

Plowing with tractor	U.S. $42.85 or	30,000 Tsh
Maize seed – 30 kg.	U.S. $64 or	45,000 Tsh
Laborers to prepare the new field	U.S. $69 or	48,000 Tsh
Weeding labor	U.S. $20 or	14,000 Tsh
Rosecoco bean seeds 200 kg. were not purchased, but could be valued at	U.S. $86	or 60,000 Tsh
TOTAL CASH EXPENSES	***US $281.85***	

Crop Yield and Income from 3 acres

1999 harvest was 30 sacks of maize and 20 sacks of beans from 3 acres.

GROSS INCOME	**U.S. $1500**
NET INCOME	***U.S. $1218.15***

Given the high cash costs of this deal, this was a particularly good year. It is the kind of year that a young man looks forward to. There will be plenty of food for the growing family, enough for purchasing livestock, and plenty of cash left over for meeting other

financial obligations such as school fees, and uniforms, as well as, other household essentials like tea, sugar, and clothing. These expenses were estimated to be US $242, for the typical Maasai household in Monduli, by Meindertsma and Kessler (1997).

The farmer himself had little personal labor invested, until harvest time. Again an ideal for a Maasai man. This reflects the high end of what Meindertsma and Kessler (1997) pointed out was possible in Semi-Humid lands, such as Lendikenya. Average wages were not much more than $43/month in Arusha, and were less in rural areas. Thus, the acquisition of land in well-watered areas, with little or no regard for conservation measures or inputs such as manure or fertilizer, could lead to a tidy profit, at least in the short-term.

8.5.2 - High Input – Low Yields

However, the profits described above were not always the case, as is described below when drought struck the crops the next year (see also Table 8.4 for a financial comparison of possible outcomes using different production strategies). Droughts are experienced one out of every 3 or 4 years in much of Monduli District (Meindertsma and Kessler 1997) and they cause severe food shortages.

For Interviewee #128, his actual 2000 harvest was only 6 sacks of maize and 8 sacks of beans on the same 3 acres. Using the same expenses this led to a gross income of U.S. $429 or 300,300 Tsh, and a net income of only U.S. $147 or 103,000 Tsh. This net income is before subtracting the cash expenses for the household (U.S. $242) and meeting the minimum grain needs which Meindertsma and Kessler estimated to be 10 sacks of maize and 5 sacks of beans, valued at another (U.S. $435). Subtracting both cash needs and subsistence food needs, this was a very poor year, resulting in a financial loss of (U.S. $530 or 371,000 Tsh). In years with poor rainfall, this low return quickly offsets the higher yields of the previous year. In a year like this livestock will have to be sold, or

the young man will have to find employment off the farm. In this particular case he already had a paying job and a business. Most young men were not so lucky in Lendikenya.

8.5.3 - The Alternate- Catuman Maize /Animal Traction Model

The majority of respondents in my research area used oxen and a great many continued to use local maize seeds, such as Catuman. This system almost always yielded something, without the risk of spending valuable cash or selling livestock. Many farmers hedged their risk by planting both local varieties and hybrid maize, in order to possibly benefit from "good rains". In the examples below I show what could happen in good years and bad years using the production information from Table 8.2. While the farmers adopting this strategy will not have the high income level of the farmer adopting the high input approach in a good year, in bad years they would still be ahead, and averaged over many years in this challenging environment it was a less risky production system.

Here was one of many examples of why this model works.

> *"I prefer to use Catuman instead of others, like the longer maturing varieties. This is because it is well suited to this area which is prone to drought, at least I can get a good yield."* [37]

Using the Catuman Maize-Animal Traction Model during years with adequate rainfall for maize and bean production, (see Table 8.4) there were very different results. If a Maasai or WaArusha farmer in semi-humid Monduli kept his own maize seed (a local variety), then used oxen for plowing, and family labor for preparing the fields, the potential high yield under this low management approach, in a semi-humid area might be 10 sacks of maize per acre with poor rains (from Table 8.3). The same farmer could expect 4 sacks of beans/acre in this poor year when planted with the maize. This could yield the farmer with 3

[37] Interviewee #98, a WaArusha man from Mbuyuni

acres, a total of 30 sacks of maize and 12 sacks of beans. This would then yield a gross income of U.S. $1188 or 831,600 Tsh. If the typical household needs for grain were again valued at U.S. $435, this would leave U.S. $753 or 527,000 Tsh. to meet other cash needs. Again using U.S. $242 for average household cash needs (from Meindertsma and Kessler 1997), this approach could yield U.S. $511 in cash, which would be enough for the young man to purchase numerous cattle, possibly build a house with a tin roof, or buy oxen, a plow and numerous goats and sheep. This low input crop production strategy, would feed the family and provide for all their immediate cash needs, and provide a substantial income for improving one's financial situation. Again, a model of success for the young Maasai man, while also substantially reducing his risk, which I will explain in my final example below.

This next example will portray the possible production and cash situation under the Catuman-Animal Traction Model during a low rainfall year. If a Maasai farmer in semi-humid Monduli again kept his own maize seed (a local variety), again used oxen for plowing, and family labor for preparing the fields, the potential low yield in a semi-humid area might be 7 sacks per acre with poor rains (from Table 8.3). The same farmer could expect 2 sacks of beans/acre in this poor year when planted with the maize. This could yield the farmer with 3 acres, a total of 21 sacks of maize and 6 sacks of beans. This would yield a gross income of U.S. $738 or 516,000 Tsh. If the typical household needs for grain were again valued at U.S. $435, this would leave U.S. $303 to meet other cash needs. Again using U.S. $242 for average household cash needs (from Meindertsma and Kessler 1997), this approach could yield U.S. $61 in cash, which would be enough for the young man to purchase one heifer that year. This low input crop production strategy, would feed the family and provide for all their immediate cash needs, without having to sell livestock or borrow from neighbors. Unlike the interviewee #128, in my first example, who had large cash outlays, and few livestock to spare, this second model offers an alternative low risk approach to agriculture. Most Maasai

and WaArusha men understood that drought year can completely ruin a young man's hope for making money on the farm. This I believe was the reason many Maasai and WaArusha men resisted the cash costs associated with fertilizers, pesticides, hybrid seeds, and the improved management necessary to allow them to yield to their potential.

The following table highlights the examples presented above. This is meant for illustrative purposes, and uses only Interviewee #128, in the High Input-High Output strategy in a "good weather year". The other examples are based on costs from the research and production levels from Table 8.3, in the sub-humid zone. This is not a cost-benefit analysis.

Table 8.4

Possible Maize/Bean Crop Strategies – Lendikenya, Tanzania

Comparing Animal Traction Based Agriculture to Tractor Hiring By Maasai

Assuming 3 acres like the previous examples, and average rainfall in "good weather years"

Model	Inputs	Output	Net Income	Avg. Cash [38] + Grain Needs	Cash for left Other uses
High Input HighYield Good Weather	$282	$1500	$1218	$242 +$435	$541
High Input Low Yield Poor Weather	$282	$429	$147	$242 + $435	- $530
Animal Traction-Low Input/ Mgmt. Good Weather	$0	$1188	$1188	$242 + $435	$511
Animal Traction-Low Input/Mgmt. Poor Weather	$0	$738	$738	$242 + $435	$61

8.5.4 – The Unknowns in the Economic Example

Of course in both examples, there are a lot of unknowns. I did not account for opportunity costs, and there is no such thing as zero input in reality. However, for the Maasai and WaArusha, family labor was not given a value (so I did not include it in either model), nor was there a value assigned to other non-cash inputs.

Growing crops using any strategy subjects a farmer to substantial risk. In Monduli District there were inherent risks that farmers in other areas do not face. The nearby National Parks and game reserves mean that a herd of elephants or zebra might come through the fields at harvest time.

According to a Maasai man from Losirwa,

> *"The difference between crop yields in the past and now, is that in the past crops yielded more. In addition there were no problems with wild animals, but now there are so many problems with wildlife eating crops."* [39]

Losirwa, like Mswakini is located just outside a National Park, where animals frequently migrate to or from. This creates a major conflict, which is likely to increase as agriculture expands in these traditional wildlife migration routes.

According to one WaArusha man from Mswakini, just outside Tarangire National park, the wildlife problems are severe.

> *"There are many zebra, ostrich, wart hogs, elephants and gazelle. The elephants and zebra are the worst. Elephants come to the boma and even take a whole sack of maize away to eat. A person can grow 4 acres of crops and only harvest 1 acre because of wildlife."* [40]

The entire crop could be wiped out by insects or a severe drought could prevent the recently planted crops from germinating. Yet, even in these instances, the farmer with minimal cash costs would likely be ahead. He will not be in debt, without a crop, as might

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[38] From Meindertsma and Kessler 1997
[39] Interviewee #16, a Maasai from Esilalei

someone that hires a tractor and pays for hybrid seeds and fertilizer. If the farmer in the Catuman-Animal Traction Model, has to sell livestock, they would more likely have the livestock to sell. A frequent complaint about the use of tractors was their high cost, and having to sell livestock to pay for this service. Maasai and WaArusha farmers have been quick to avoid a strategy that leads to a loss of livestock by choice, as was noted in Chapter 7.

The livestock, including the oxen become a key component to making this system work in a highly unpredictable and risky environment. The scenario if there was to be good weather with the Catuman-Animal Traction Model, showed similar returns to the high-input/high-yield approach. This was done while at the same time minimizing cash risks. Reducing risk and improving the chance of building a herd and one's financial situation was the approach most of the farmers in the research area preferred.

I must agree with McCown et al. (1979:299) when they stated,

> *"(Where) average crop yields are low and the risk of crop failure is high due to inadequate rainfall, (and) high evaporation rates, under this system people have relied in Africa on domestic grazing animal."*

Farmers adopting the Animal Traction - Catuman Maize model, were doing so as a matter of economics. As pointed out in Chapter 3, farmers do not typically make choices irrationally. The Maasai and WaArusha in Monduli grow crops because in good years they can really make money. In poor years they will get by, as long as, they have their livestock. However, the greater challenge will be in both scenarios, grazing lands are disappearing, and the crop yields are stagnating and will continue to drop, without the added benefits of soil conservation measures, manure use or crop rotations, irregardless of rainfall. This being due to poor fertility, low organic matter, and poor water holding capacity.

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[40] Interviewee #108, a WaArusha man

8.6 – Decreasing Yields

Many farmers complained of decreasing yields as well as other environmental problems. I will address the environmental problems and how they have impacted land-use change in Chapter 9. However, Table 9.1 summarizes both the perception of yields based on the number of men reporting that yields were decreasing or increasing. The answers to my questions about yield seemed to be largely a result of how long agricultural activities had been going on in a particular area. Villages, such as Engaruka, Lashaine, and Mbuyuni, which have been more densely settled and farmed for longer periods of time were reporting lower yields. This is not surprising given their management strategies, which did not include regular fertilization, crop rotation or soil conservation measures.

As previously stated, I did not collect specific data on actual yields.[41] Yet, it was obvious that these farmers were sincere, as their crops did not look as robust as fields seen in Selela, Lendikenya, and Esilalei. In these villages, farmers not only reported few problems with low yield, but a higher proportion reported increased yields by adopting strategies such as planting both local and hybrid varieties of maize. The soil had not been in crop production as long, for the time being they were reaping the benefits of a fertile and largely virgin crop land.

Farmers in Mbuyuni typically answered my questions about yields in this way,

> *"There is a change. When I first came here (about 1978) I was getting good crops. But now the harvest is decreasing. When I first came here there was also enough grass for the cattle, but not now."* [42]

Another Mbuyuni man said this,

> *"There is a change. In the past we could get 5 sacks of maize per acre, now we only get 2 sacks per acre. The reason is that the soil has become tired."*[43]

[41] Kikula et al. 1993 also attempted to get information in this area on crop yields and found it very difficult to get reliable data, as much of the crop is consumed and continually used for food as it matures.
[42] Interviewee #100, a WaArusha man

Similarly farmers in Lashaine frequently described lowered yields like this,

> *"When I was a young boy, you could grow a small field, and you would get a lot of crops. Now when you grow in the same place your crops are less."*[44]

An interesting trend can be seen on Table 9.1, as the same villages, which had a larger portion of the men reporting lower yields also reported soil erosion as an environmental problem, with the exception of Engaruka. The same villages of Engaruka, Lashaine, and Mbuyuni, also had the most restricted environment for grazing as can be seen on Table 4.1. These villages I will argue in the next chapter will face some of the greatest challenges with regard to social conflict, and environmental destruction. The village of Lendikenya is well on its way to facing similar to the three villages mentioned above, as about half of its farmers reported crop yields to be decreasing, and severe gully erosion as a major environmental problem.

Here are some examples of the soil fertility and soil erosion problems in the more densely settled parts of that village.

One Maasai man stated the problem with the soil like this,

> *"It has changed. In the past the soil was rather black, but today the soil is reddish. We believe it is no longer fertile. You plant seeds and they do not grow nicely."*[45]

A WaArusha man in the same village said,

> *"Today the soil is very poor in the fields, because there is a lot of erosion taking the soil away the topsoil, which leaves only the poor soil below. There are a lot of gullies in the fields. There is also a great increase in the population. People are passing by with cattle, which also causes erosion."*

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[43] Interviewee #84, a WaArusha man
[44] Interviewee #51, a WaArusha man
[45] Interviewee #72

Some Maasai in contrast to many of the WaArusha farmers that have been working the land for a shorter period of time had fewer complaints about low yields. They were a bit more optimistic about crop growing as a successful strategy in increasing their income. In part this I believe had to do with the fertility of the soil and the fact that they had not been farming as long, especially in villages such as Selela, Esilalei and Losirwa. Here are a few examples of their optimism and excitement about high yields.

A typical answer from a Maasai man in Losirwa was,

> *"There is no difference it all depends on the rainfall"* [46]

A Maasai man in Selela said,

> *"In my case, I was not farming that long ago, it is the same with others. There is more farming now with higher yields."* [47]

And a Maasai man from Esilalei adds,

> *"The difference between the crops which I grew in the past and the crops I am growing now, is that in the past few people were growing crops. Now many are growing crops. There were few people* (Maasai) *in the past running these activities, but for now there are many people running these activities, so they are getting more crops."*

As a final example of how a Maasai man in Losirwa viewed crop yields,

> *"I am now getting more crops, which provides enough for my family, and I can sell crops to solve all my financial needs. I can buy all that I need."* [48]

8.7 Summary

Both the Maasai and WaArusha were convinced that agriculture was the best way "to bring them development". All of the men interviewed said that both crop growing and livestock were necessary, as it was the only way they could generate income, unless they left their farm, which no farmer said he was going to do. Although a number of them (like Lama

[46] Interviewee #18
[47] Interviewee #33
[48] Interviewee #16

1998) said they were educating their sons for the future. I asked about the future of wildlife as an income source. Most men admitted that it can bring income to the village or help build school and health facilities through cost sharing by hunting companies and lodges (Honey 1999) and direct aid by Tanzania National Parks Authority (TANAPA). However, they were quick to point out that it does not benefit the individual. For the near future, it seems that agriculture will continue to grow in importance, and addressing the environmental and food security issues that surround agriculture in this area needs to be a priority.

Some other general observations were that the WaArusha were under more pressure to make crops work, and they had more frequent complaints about the difficult and often risky life of an agro-pastoralist on the plains. This I believe was due to their lower numbers of livestock and the fact that villages such as Lashaine, Mbuyuni and Mswakini had fewer areas for grazing compared to the predominantly Maasai villages like Losirwa, Esilalei and Arkatan. The Maasai seemed to more often be gone from the home and farm, off tending livestock, or visiting the cattle market. The Maasai were also the only people I saw supervising laborers in the field.[49] The typical activities observed and discussed in my research area, during the course of the year are displayed in Table 8.2.

Both Maasai and WaArusha appeared to adopt many of the same strategies described by Kjaerby (1983) for both crops and livestock, whereby there has been a gradual process of agricultural intensification, beginning with pure pastoralism and moving toward a more intensive system of agro-pastoralism. This change, including the use of oxen, came with environmental and cultural challenges which I highlight in Chapter 9. However Kjaerby did not conduct his study in the midst of one of Tanzania's major wildlife corridors. In his study the adoption of agriculture by pastoralists brought about similar land use changes and environmental challenges, but not in such a high profile area nor with a people as well known

and represented as the Maasai (Igoe 2000). These land use changes, environmental challenges, and wildlife conflicts, which have all arisen because of a rapidly expanding agriculture, I believe largely due to the adoption of oxen, will be discussed in Chapters 9 and 10.

[49] This trend of Maasai hiring other ethnic groups for labor in Monduli was also noted by Kikula et al. 1993.

CHAPTER 9

LAND USE CHANGE

9.1 - Introduction

This chapter will highlight the factors that have led to land-use change in the research area. It will also summarize and pull together how the indicators described in earlier chapters (see Table 4.1 and Table 10.1) point to the lack of sustainability with the current agricultural system, through a presentation of data from the men interviewed. This will help provide the examples to discuss the overriding answers to the questions posed in the earlier chapters of this study. Finally, the wildlife in the area (as described in general in Chapter 5) will be brought into the discussion. The presence of large numbers of wildlife outside protected areas, indicate the success of the system's ability to accommodate multiple uses of the landscape, but I will argue here and in Chapter 10, that this may not be the case for long.

Agro-pastoralism is a well-known strategy for subsistence farmers in Tanzania, and the use of oxen in this process of transformation has also been well documented (Stahl 1994, Mung'ong'o 1995, Meertens et al. 1996). However the short-term effect of their adoption on the land in most cases has not been desirable (Kjaerby 1983, Johansson and Westman 1992, Christiansson et al. 1993). As stated in Chapter 7, this does not have to be the case, but unfortunately the initial adoption of oxen has often come with little regard to soil conservation or the maintenance of soil fertility or adequate ground cover (Boserup 1981).

In this chapter, the perceived environmental problems by the men interviewed are presented below. These ideas document both trends and local concerns. Grassland fires and tree cutting top the list, with livestock overgrazing and soil erosion being cited as the next most critical problems. Interestingly, the fire and tree cutting were both activities that were controlled by the local village leaders, and involve fines when violated. Interestingly overgrazing and soil erosion, as likely more critical environmental problems, do not have any formal regulations.

Agriculture and agricultural development have been a major factor leading to this change (Gulliver 1961,Yeager and Miller 1986, Lama 1998). Land tenure and government policies, such as villagization (as described in Chapter 6), have had a huge impact on the change in the local environment (Kikula 1997). The widespread adoption of animal traction or oxen by Maasai in this area has also sped up the expansion of agricultural lands (Chapter 7, Lama 1998, Igoe 2000). Both, in turn, have limited the number and size of grazing areas. In essence, this has created a self-imposed conflict for the agro-pastoralists. They want to expand their herds, while at the same time, grow crops and expand their crop fields to support their livestock endeavors on a limited land base.

Land-use change in Monduli District cannot be discussed, without also examining the wildlife that share much of the land, and live exclusively in other former grazing areas, now known as National Parks. The wildlife areas have been created to conserve some of Africa's most unique landscapes and large wildlife populations. However, this too has led to environmental change outside the parks, as the relocated people struggle to make up for the lost resources like water and grass, which many of the men I interviewed can still remember having access to.

9.2 - Land Use Change in Monduli District

Land-use change has occurred all over Tanzania. Long before the colonial control of Tanzania the landscape has often changed and been controlled by different ethnic groups (Spear and Waller 1993, Kjekshus 1996, Maddox et al. 1996). This was sometimes the result of war; other times it was the result of disease or famine (Ford 1971, Waller 1985, Galaty 1991). The Maasai have also been landscape change agents, as they have often used techniques such as fire, to manage their landscape (Yeager and Miller 1986). Jacobs (1980) discussed how the unique abundance of wildlife that so characterizes Maasailand today might actually be the direct result of pastoral practices, such as those by the Maasai.

Yet, the land use change occurring in Monduli District has not been the result of one factor like disease, famine or war. It was a combination of factors, which still includes disease of cattle (as mentioned in Chapter 7), and occasional famines or food shortages (Meindertsma and Kessler 1997). However, the rapidly growing agricultural population, the conversion of pastoralists like the Maasai to agro-pastoralists, and the expansion of wildlife areas and all the accompanying tourist development that goes along with wildlife viewing have together created this dilemma. In Monduli District, throughout the time that I was conducting this research, many new tourist facilities, new local curio markets, and new cultural tourism programs were built or initiated. Some of these were in part the result of policies that encouraged the local people to benefit from wildlife and tourism (URT 1998), but at the same time they added to the pressure on the surrounding agricultural and grazing lands.

The Kisongo Maasai have long occupied an easily identifiable stretch of land from the base of Mt. Meru west to the Great Rift Wall. Today the path of the Great North Road, that begins in Arusha and leads to Lake Manyara National Park, The Rift Wall, and onto the

Ngorongoro Crater and the Serengeti, crosses this landscape. This land was not desirable for growing crops as it was not as well watered, nor did it have many permanent water sources. During the wet season the Maasai would traditionally enter the lower plains and water their cattle in seasonal rivers and ponds. As the weather dried the surrounding landscape, they traditionally moved to more well watered sections closer to the highlands of Monduli (such as Lashaine or Lendikenya), or nearer to lake Manyara or the Tarangire River (Igoe 2000). The Maasai were masters of surviving in this arid and semi-arid climate. They used livestock as a tool to harvest the native forage, which when combined with their labor of controlling the animal's movements, and protecting them from predators and thieves, allowed them to prosper (Sandford 1983, Sperling and Galaty 1990, Ndagala 1992, Winrock, 1992). The fact that this land was theirs for so long was not so much a part of their ability to defend it, but more of the function of it being a less desirable place to live and even less reliable as a place to grow crops (Russell 1972). Only Maasai and wildlife could survive in such a place was a frequent response from early colonial administrators (Galaty 1991, Spear 1997, Igoe 2000).

This land, once thought to be only habitable by pastoralists, has been subject to intense agricultural and tourist development. According to Yeager and Miller (1986:57), "*The most pressing ecological issue in Northern Tanzania districts involves the unmitigated human and livestock pressures on the available land.*" This most recent land-use change has come about over the last 40 or 50 years, with the most intense development due to the movement of many WaArusha out of the Arumeru district and the "villagization" of both the Maasai and WaArusha in the late 1970's, as described in Chapter 6. However, the forced evacuation of many Maasai out of areas such as Tarangire and other wildlife reserves have also added to this land use change.

Land-use change is a complex issue. Land tenure and government policies as previously described in Chapter 6 have had a great impact on the landscape. The adoption of

agriculture or in some cases, forced adoption of agriculture also transformed this landscape. Resettling the people, encouraging agriculture in pastoral areas, most often the critical areas best suited to dry season grazing, and providing the technical assistance to encourage subsistence agriculture and agro-pastoralism have also created this land-use change.

The Maasai and WaArusha's cultural adherence to cattle and livestock, as a form of wealth and security, have also shaped the land, as livestock compete with agriculture for space in the more well watered parts of the district. In Chapter 3, I presented information about Maasai livestock and food consumption, in the research area. Compared to the Ngorongoro Maasai, the Maasai and WaArusha in the research area had many more options with regard to food and crop choices. They also had greater food security. They were in a much better position to grow their own food or participate in other income producing activities compared to the Ngorongoro Maasai. This was largely due to having village control over the land they use, but at current rates of population growth and increasing pressure on dwindling lands, this situation may be changing.

According to McCabe et al. (1992:358) the Maasai in the Ngorongoro Conservation Area,

> "*...Cannot supplement their income or subsistence with agriculture, and that there is very little income derived from outside sources, it is easy to understand the plight (The Ngorongoro Maasai) see themselves in.*"

This restriction, while implemented for the benefit of the environment within the Ngorongoro Conservation Area, has created great hardship among these people and a deep resentment for the wildlife that seem to have more rights than the people. It also highlights a tactic, which has been used before, to force pastoralists out of both the Serengeti and Tarangire National Parks (Igoe 2000, Neumann 2000). A tactic, which some men in my interviews mentioned. Taylor et al. (1996) gathered quotes from the people in the Ngorongoro area, called "*Voices From Ngorongoro*". This was at a time when a new

management plan was being drafted for the area. Here are a few examples of how land-use conflict can escalate.

> *"The NCAA hasn't helped us. And if you look way back, our livestock problems were less severe. We can't eat grass like cows. Since cultivation was banned they haven't known what we are eating. They only care what the wildlife eat. They banned cultivation because they needed more pastures for wildlife."*[1]

Another Maasai recorded by Taylor et al (1996:7), named Ole Moinga Olonyokie, said,

> *"We approve of absolutely nothing in this plan. This is our land. The maps used to say Maasailand, not United Nations land. No one can be disinherited from the soil and trees of his birth. We are not interested in relief food. It is neither enough, nor sustainable. They only smear a little oil on your lips, then they let you go out and die. What we demand for the health of our children is subsistence cultivation..."*

Finally, while none of the Maasai I interviewed lived in the Ngorongoro Conservation Area, many had spoken of taking their cattle there in times of severe drought. The well-watered highlands were well known as an excellent dry season grazing area. For some Maasai in villages such as Esilalei, Losirwa, Selela, Engaruka, and even Lendikenya this area was a draw when the lowlands experienced drought. This highlights the advantage of multi-use landscapes which Western (1997) proposed as a solution to Maasai – wildlife land use conflicts near Amboseli in nearby Kenya.

Monduli District is surrounded by National Parks, the Ngorongoro Conservation Area, and much of the remaining open land in the district were considered Game Control Areas (see Figure 1.1 and Figure 6.1). The multiple use concept of Game Controlled Areas has benefited the wildlife by allowing them to move between the parks, as well as, the livestock which graze in close proximity to wildlife near villages such as Selela, Esilalei,

[1] From Taylor et al. 1996, quoting a *Morani (page 4)*.

Mbuyuni and Mswakini. These lands managed as both grazing and wildlife areas, were however, adding to the land use conflict, as agriculture creeps into their fringes.

In Lendikenya one WaArusha man discussed how things were changing,

> *"The land for grazing has become very narrow. Because there were areas we used to graze, but today the village government has given it to people to live (on) and grow crops. People are being born every day, but the land remains the same. Cattle have to go farther to find grass now."*[2]

9.3 – Land Degradation

Land degradation is considered the decline in the capacity of land to produce. Yet, land degradation can mean many things to different people (Abel 1993). (Belshaw et al. 1991, Kikula 1997, Kikula 1999) pointed out the subtle and obvious indicators that different people will notice with regard to degraded land, and at what stage of degradation the land was in. According to (Boesen et al. 1999) a barren and eroded landscape should be regarded as a result of the degradation process, being part of a continuum of change. In this research area, each of the villages were in various stages of degradation. The Maasai and WaArusha men interviewed provided both ideas and examples of this degradation. Many believed the lower crop yields were simply due to less rain, which I will address later in section 9.4.5 in this chapter. The perception of degradation varied from the loss of crop and forage productivity, cover, and vigor, to a shift in the botanical composition and a loss of native species of both plants and animals. These factors can be considered indicators of land degradation on this continuum of change. These will all be addressed in this chapter in the context of the perception of their severity and what to do about them, from the perspective of the farmers who were living through this land use change.

The development of indicators of land degradation as related to agriculture is an important research problem that has not received due attention. There has not been adequate

research to determine the social, economic, biological, microbiological, and physical indicators as to ascertain the stage at which the land is in, in terms of recovery or degradation (Belshaw et al. 1991, Kikula 1993). While this study was not designed to determine such indicators specifically, the evidence presented in this case study offers ample ideas for further inquiry and research, as the landscape is rapidly changing in Southern Monduli District. The ideas also provide evidence of the sustainability of the current agricultural system based on animal traction.

Quite often the above mentioned indicators are interconnected and a specific area or village may manifest them all or just a few. Such indicators are sometimes common knowledge to the local farmer or herdsman, but often have not been documented and evaluated by "the technician" (Boesen et al. 1999). It was my hope to not only explore the use of oxen and the crops grown by the Maasai and WaArusha, but to also get a sense of what the issues were with regard to environmental degradation. In the interviews I finally began to address a systems approach of exploring indigenous knowledge, with regard to these indicators.

The possible solutions to land degradation lie within land management strategies, which include appropriate land tenure policies and appropriate soil conservation measures. Belshaw et al. (1991) pointed out the great cost of environmental rehabilitation, in comparison to prevention in dryland ecosystems. While some areas in the Southern Monduli District were severely degraded and in need of rehabilitation, other areas were not so severely degraded, that further degradation could not be prevented. Prevention of land degradation is a much more effective strategy than dealing with problems through rehabilitation like those seen in nearby Kondoa (Christiansson et al. 1993, Mung'ong'o 1995, Lindberg 1996). Yet, implementing these prevention measures requires understanding the social aspects of land-

[2] Interviewee #74

use and indigenous knowledge in resource management. There is also the need for evaluation of any implemented measures and readjustment of policies based on such feedback. All of these factors have a bearing on sustainable agriculture, which has yet to be addressed, in many critical areas in Tanzania (Boesen et al. 1999).

In part it was my hope that through discussions and interviews about agriculture, livestock keeping, oxen and land-use change that I might be able to better understand what the Maasai and WaArusha were facing and how further degradation might be prevented.

Lambrecht (1972:726) stated,

> *"Until recently man in tropical Africa lived in equilibrium with his environment, as a hunter-gatherer or semi-nomadic pastoralist. Presently with the introduction of cash crops and a modern means of farming and husbandry, the precarious energy cycles of the shallow African soils are in danger of rapid depletion. The abuse of this land is not due so much to industrialization, as to the misuse of agricultural land and overgrazing of grassland by domestic stock."*

While I am not sure man lived in equilibrium (Swift 1995), I do agree with both Lambrecht (1972) and Lama (1998) that the introduction of cash crops and modern means of farming have created many of the problems seen in the research area. However, there have been many other causes of this rapid land degradation. As discussed in Chapter 6, insecure land tenure has certainly been a factor, as was the Colonial legacy of "taking land", and establishing protected areas, but also the "Westernization" of the people. The unplanned use of land, without regard to agricultural potential has also been a major problem (WCST et al. 1996). Many villages have committees that designate areas for grazing or crops, but the norm was that any man that requests land in a village for subsistence crops was entitled to be allocated a small plot (Lama 1998, Sosovele 2000). The cumulative effect of the expansion of small subsistence plots, in former grazing areas could be seen throughout much of the research area. For example, there were now many small farms and plots for agriculture that

blocked traditional paths to watering and grazing areas, increasing erosion on the few remaining areas where livestock could be moved. Unfortunately there have been many other examples in Africa, where misguided "Western Aid" has led to severe land degradation and ecological disaster, by establishing water holes and encouraging settlement in areas that were best suited to migratory pastoralism (Sinclair and Fryxell 1979, Arcese and Sinclair 1997, Lama 1998).

Kikula et al. (1993) and Meindertsma and Kessler (1997) portrayed the area surrounding Monduli Mountain as severely degraded. [3] My observations in Chapter 5 and 8 would certainly concur. The scarcity of arable land has forced many small farmers up the slopes, which was obvious during my interviews. This process of degradation of the drier lands, close to more well watered areas has been described before.

According to Stahl (1992:69),

> *"Degradation is now a common phenomenon all over Africa, also in the high potential, well watered highlands. But the process is most visible in the drylands, where the relentless removal of vegetation has ripped up large wounds in the landscape. The most vulnerable parts are the semi-arid areas bordering rainfed agricultural areas."*

The most severe soil erosion in the research area was in Arkatan, Lashaine and Lendikenya. These villages were located on the lower slopes of the Monduli Mountains, which match exactly Stahl's description above. In addition to the geographical characteristics that make these villages prone to visible degradation, there was also a scarcity of land particularly in Arkatan and Lashaine villages. The scarcity of land in these villages has been a problem for some time, and was frequently cited by interviewees as a major problem. Much of this land scarcity was due to the adjacent military lands, the nearby military training school (Kikula et al. 1993), and the agricultural expansion of its inhabitants, as well as the

[3] Kikula et al. (1993) created maps of this degradation in Lashaine.

immigration of people, and rapid population growth in Monduli town, the district headquarters.

9.4 – Environmental Problems, The People's Perspective

The following table summarizes what the men interviewed perceived as the most pressing environmental problems in the research area. All of the headings in the columns are directly related to land-use change, even drought, as I will explain later. From this data, I have presented my findings as a discussion based on the interviews, as well as, observations and additional referenced sources familiar with the research area, the Maasai or the degradation of drylands in Africa.

Table 9.1
Perceived Environmental Problems

Village	Total # Interviews/ village	Fire	Tree Cutting	Livestock over grazing	Erosion	Drought	Weeds	No Soil Conserv.	Lack of Pasture
Arkatan	8	5	0	2	2	2	0	0	0
Engaruka	12	3	5	8		8	0	1	1
Esilalei	10	10	0	1	0	0	0	0	0
Lashaine	17	2	7	7	10	4	1	1	0
Lendikenya	18	6	5	14	13	1	12	0	0
Lolkisale	5	5	5	0	0	0	0	0	0
Losirwa	10	7	1	0	0	1	0	0	0
Mbuyuni	20	14	13	4	1	3	0	0	0
Mswakini	12	12	7	0	1	1	0	0	0
Selela	13	12	2	0	7	0	0	0	0
Total	125	76	45	36	34	20	4	2	1
% of Total	100	61	36	28.8	27	16	13.6	1.5	0.8

9.4.1 - Fire

With nearly 2/3 of the men interviewed discussing fire as a major environmental problem, this seems to be a real change from traditional Maasai grassland management strategies. It stems in part from district regulations that now control burning grassland and tree cutting. Most villages require a permit, and those caught lighting fires were fined. These

fines were cash or livestock payments to the village. Cash fines varied considerably for having starting a grass fire, from $30 in Selela to $430 US in Esilalei.

A number of villagers from Mswakini pointed out that the fine was an ox. As stated by one villager,

> *"The person caught setting a fire must pay an ox as a fine. The ox will be slaughtered and all the people (in the village) will get meat."* [4]

According to one Maasai elder in Esilalei,

> *"If you are caught causing a fire, it is a 300,000 Tsh ($430 US) fine or 3 years in jail if you are caught."*[5]

Many of the Maasai and WaArusha blame "honey hunters" for starting fires. These were men, supposedly of unknown origin, who come and light fires to chase bees away from their hives in order to get the honey, which was later sold. However, if they were being fined a goat or a cow, they were obviously local people. Other men blamed boys or the military for starting fires. [6] The primary concern was that fires destroy not only the essential remaining grasslands, but also the crops that were growing in the fields and near the homes as well. With so many people living in some areas, the fires could destroy huge investments in fields, which had not been as big an issue in the past.

9.4.2 - Tree Cutting

The cutting of trees was cited as the second largest environmental problem in the research area. The trees were seen as necessary to maintaining the soil moisture (although most respondents said it was to prevent droughts). This was also of concern, because their have been village regulations that control charcoal cutting, a commercial enterprise that

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[4] Interviewee #110
[5] Interviewee #1
[6] One afternoon, while returning to Arusha, I did see a large grassland fire on military land. Its cause apparently was unknown.

supports the huge and rapidly growing population in nearby Arusha. With the exception of Engaruka, Lolkisale, and the highlands of Lendikenya and Lashaine, most of these trees were no more than thorny acacia trees and "*esilalei*" bushes.[7]

The men interviewed in Lolkisale pointed out that they have a village environmental officer, whose job it was to take care of the environment and bring people in to pay fines. [8] Cutting trees for building materials supposedly required a permit, and charcoal makers were not allowed to get permits. Even so, each day Land Rovers heavily loaded with charcoal were seen coming out of Lolkisale or Simanjiro, on their way to Arusha, where the charcoal makers or marketers would sell their product.

In addition, many people cited charcoal making as a source of the fires, as these unattended mounds which burn for days, could get out of control and burn the nearby bush and grasslands.

The Maasai and WaArusha in rural areas use firewood, and rarely go to the effort to make or buy charcoal for themselves. But even this use of firewood, with an increasing population density was observed to have an effect on trees. Many Maasai said they did not cut the trees, but only the branches. There was ample evidence of this practice, but what often happens was that first the branches were cut off, then the tree dies. Eventually a few months or a year later the tree was cut down, because it was dead. The first person only removed the branches; the second person did not kill the tree but only removed a dead one.

Agricultural extensification was also seen as a major threat to tree growth. Numerous men interviewed mentioned that when they first settled areas in Lendikenya, Mswakini and Mbuyuni it was "like the bush". It was all trees and wild animals. Once they settled the area in the 1960's and 1970's they began a process of slowly clearing the land for homes, corrals,

[7] Even the village of Esilalei is named after the small thorny esilalei bush that grows all over this area
[8] He was often seen patrolling the village in his "uniform", which was a faded and worn military outfit.

crop fields, and their livestock ate many of the smaller trees and bushes. Now they complain of drought, the loss of trees and the need to control tree cutting. Yet to walk through any village you see women and children carry firewood to their *bomas*, you see and smell smoke coming from every *boma*, and men hauling poles and thorn bushes back to the boma with oxen.

A WaArusha man from Mbuyuni stated,

> *"Yes, (there is a change in the environment), because in the past there were many trees, it was like a forest. Now (with fewer trees) they have a drought without rain."*[9]

Tree cutting was supposed to be strictly controlled. However, even in Engaruka, the dryland oasis where the trees help protect the river, I observed forest clearing going on. The expansion of crop fields into the small pockets of remaining forest in this small oasis seemed to be an environmental disaster waiting to happen. In fact, this same process may have been the cause of the abandonment of the Msonjo people centuries ago, as described by Sutton (1993). In Engaruka, the villagers see the cutting of trees as a major problem. Now that the fields have expanded, this has come at the cost of tree removal, greater water use through irrigation, and likely a higher rate of evaporation.

According to one Maasai farmer in Engaruka,

> *"There is no solution for a drought, but our second problem is with the river. It is not good to cut trees near the source of the water. It will "finish" the water. Some people understand this; others are still cutting trees. Maybe people cutting trees should be jailed. If people continue to cut trees, this problem of water will be worse, the place will become like a desert."*[10]

[9] Interviewee #84
[10] Interviewee #39

9.4.3 - Livestock Overgrazing/Lack of Pasture

In Table 9.1, the responses from the research were interpreted and put in different columns based on the specific response, yet livestock overgrazing and a lack of pasture were largely one in the same. No one with a lack of pasture was trying to reduce their herds, so most areas with a lack of pasture were also over-grazed. However, combining these columns likely does not do justice to the number of men that complained of problems with herd mobility and overgrazing. When asked about herd mobility, as a separate question in the same interview, 70% of the men interviewed had serious concerns. The most serious concerns were in the more densely settled areas like Engaruka and Lashaine, but even Mbuyuni and Mswakini had many men identifying decreased herd mobility as a negative land use change. The responses with regard to herd mobility differed considerably, but they often took on a degree of seriousness not seen in other questions.

One Maasai man in Lendikenya stated,

> *"There is a problem, when I came here in 1975 there are places I used (for grazing) that I can no longer use, because of new houses and agriculture. Even the nearby military base was in the past an area that could be used by pastoralists, now even that cannot be used."*[11]

A WaArusha from Mswakini stated,

> *"When my father came here for the first time, there were places used for grazing that they cannot use now because of crop fields and bomas. The only place left are those that are rocky or poor areas for crops. They are not the best places for grass."*[12]

Even so, the threat of reduced herd mobility or dwindling grazing lands was not always considered a serious problem.

[11] Interviewee #82
[12] Interviewee #118

Many WaArusha in Mbuyuni made statements similar to this,

> *"Some areas I was using as a boy now have bomas and agricultural fields, but they do not have a lack of grazing areas, as the land is still large."* [13]

A WaArusha man from Mswakini stated,

> *"There is a problem, but it is not serious, as the land for grazing is still large. Still there are some areas lost to the crop fields that we were grazing in the past."* [14]

However, even in Mbuyuni this indicated the changing landscape, and the moving of livestock to ever more marginal areas. In Mswakini, expanding crop fields at the expense of grazing areas meant more likely damage by wildlife coming out of Tarangire National Park.

Most men realized the lack of pasture was a major constraint on animal numbers. Even so, large livestock numbers were still favored by all interviewees. As noted in Chapter 3, the Maasai and WaArusha are cattle keepers. They see cattle as an investment for their future. Investing in agriculture was often a means to diversify ones income to maintain and improve one's livestock holdings. As long as livestock continue to increase in villages with few common grazing areas, combined with insecure land tenure systems, and the scarcity of grazing areas, the conflicts over livestock traveling to the remaining grazing areas are will likely continue to escalate. Nearby the Meru and Chagga people have adopted more sedentary methods of cattle keeping, but at this time it goes against everything the Maasai live for.

I was asked, how cattle are kept in America, by an interviewee. When I cited examples of intensive dairy and beef cattle operations. I was told I was like a Chagga. "*You bring the food and water to the cattle and you take their manure back to the fields. Cattle like*

[13] Interviewee #98
[14] Interviewee #114

to find their own food, and they spread their own manure. Why do you create this work for yourself?"

The Maasai were right. Cattle do like to find their own food and we were making work for ourselves. However, in Monduli District the current grazing system is not working as it has in the past. In villages like Lashaine, Engaruka, and Lendikenya these same men may soon be keeping cattle like the Chagga, which they scorn at today. The problem in most of Monduli District, however, was that cattle could not survive in corrals because there was not readily available water, like there was in mountain villages. During the dry seasons some areas had no grass or water within miles, and there were few transportation options to inexpensively take feed and water to animals that were confined. Although, in nearby Babati district this has been done to some degree (Johansson and Westman 1992).

One Maasai interviewed in Lendikenya stated his ideas with regard to the random expansion of cropping areas and the increasing conflicts over livestock and erosion problems.

> "*With crop growing, the Ministry of Agriculture should be close to the people or there should be a village extension officer* (to administer new croplands). *For livestock, this is hard to control. We have Sepeko, which is* (a grazing area), *for everyone. There becomes competition to see who has the most cattle. If everyone had their own estate, they would control their herds. The government should intervene. If there were maximum herd sizes the erosion would be reduced.*" [15]

In Lashaine, one of the most severely eroded villages in my study, with very few public grazing areas, some WaArusha admitted they could no longer increase the size of their herds. This has been a real cultural blow for cattle keepers. One WaArusha farmer admitted,

> "*Because of this problem* (too many livestock and gully erosion), *most people are not increasing their livestock. If you have 10 cows you don't increase them. The solution is that the government should provide new areas for them, so that they can move.*" [16]

[15] Interviewee #74
[16] Interviewee #48

Unfortunately the grazing areas in Monduli District that were most conducive to agriculture were disappearing. Lolkisale was one example of an area that has only recently been settled but the expansion of cropping areas has been particularly rapid. Here was what one WaArusha man in Lolkisale said with regard to herd mobility,

> *"It has been six years since I have had my cattle at my boma. They had to move elsewhere because of the lack of grass in this area."* [17]

What will happen in the long run in places like Lashaine and Lolkisale? My guess is the adoption of more intensive systems of agriculture, such as the commercial bean production seen in Simanjiro (Lama 1998). There will also be continued abandonment of pastoral livestock keeping, despite pastoralism being an ecologically sound and highly adapted strategy for life in the savanna (Campbell 1984 and Western and Finch 1986, Western 1997).

In the irrigated village of Engaruka, a Msonjo man, who was well known for his agricultural skills and adoption of more intensive methods, described the intensity of the agricultural situation like this,

> *"In the past we had places for grazing, but when people started using oxen, those grazing areas became crop fields. We cannot graze there now."* [18]

Boserup (1990:49) also described this process,

> *"The advantage* (of using plows and oxen) *is largest at medium densities* (of settlement)." *When the use of fire has been abandoned (for clearing) and there are still sufficient areas of fallow and pasture in which domestic animals can gather their fodder. Fertilization and fodder become acute problems, when annual cropping and multicropping is applied, and there is little, if any, fallow and natural pasture for draft animals and other domestic animals."*

Boserup's statement may be an indicator of the future for Maasai, at least in the higher elevations with adequate water and grass nearby. It also seems to have been the

[17] Interviewee #125

impetus for the earlier WaArusha movement into better watered areas of Maasailand, as they had been forced to use more manual labor for an adequate harvest or abandon their small hillside farms.

In Selela, a Maasai pointed out the change in herd mobility and a loss of grazing areas,

> *"The change has come about because of the expansion of agricultural crops. Since 1993 a new grazing area was allocated. However, the big issue is the almost total loss of grazing areas in this sub-village* (Nadosoito) *because of the expansion of crops."*[19]

This expansion of agriculture throughout the district has led to both the increased pressure on dwindling grazing areas, and the increased conflict with wildlife that now compete with livestock for grazing in some dry season grazing areas near water sources like Selela, which lies just outside the Ngorongoro Conservation Area. This conflict has led to overgrazing and many of the environmental problems like soil erosion, which were increasing in the area. In Engaruka, one Maasai man complained,

> *"Now we have to use the hillside for grazing* (a steep section of the rift wall forming the border of the Ngorongoro Conservation Area) *because in the past we were grazing where there are now crops."* [20]

Similarly one Maasai man practicing agriculture using irrigation in Selela said,

> *"Pastoral people are complaining, because they can no longer shift to field areas* (for grazing, now used for agriculture), *that are wetter."* [21]

Finally, in Lendikenya a Maasai man stated,

> *"It is true that the population has increased. Back then people only cultivated about one acre, but now people cultivate 20-30 acres by tractor or oxen, and it swallows the whole grazing land."* [22]

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[18] Interviewee #36
[19] Interviewee #21
[20] Interviewee #46
[21] Interviewee #26
[22] Interviewee #68

The only village that seemed to be the exception was Mbuyuni, with regard to herd mobility. Referring to the earlier village description in Chapter 5, Mbuyuni had stony soil and sparse vegetation (see Figure 5.5). It was also the most drought prone village in the research area (with the exception of irrigated Engaruka). Responses about livestock overgrazing and lack of pasture were not nearly as common as other villages, when asked about herd mobility or environmental problems.

A typical response from the WaArusha living there was,

> *"We still have large grazing areas, there is no problem with herd mobility, the large grazing area has many stones, so agriculture is difficult."*[23]

Or as stated by another WaArusha man from Mbuyuni,

> *"No problem (with herd mobility) as we have more grazing areas now, as some people have left due to the drought."*[24]

The lack of pasture is a difficult situation for people like the Maasai and WaArusha that have such a deep attachment to their livestock. However, examples of environmental degradation in nearby Babati (Newman and Ronnberg 1992, Johansson and Westman 1992) and Kondoa (Christiansson et al. 1993, Mung'ong'o 1995, Lindberg 1996) ought to provide some insight into the impending problems. These districts followed much the same sequence of events with regard to a shift from pastoralism to agro-pastoralism, as was observed in the lower Monduli District. This change has left people with few choices, but reducing their herds and adopting more intensive methods, including agroforestry.

One frequently cited technique in Africa to reduce the environmental degradation due to overgrazing has been to force the pastoralists to reduce their herds, called destocking. It

[23] Interviewee #97
[24] Interviewee #90

was used in nearby Kondoa, and included not only reducing animal numbers, but totally evicting them (Christiansson et al. 1993, Mung'ong'o 1995). This was not something Maasai liked to discuss, as it represented a policy that went against everything their culture stands for.

Abel (1993:173) pointed out.

> *"Pastoralists perceive their worst problems as being drought and insufficient animal numbers. Most pastoralists try to promote rapid increases in animal numbers between droughts, and few attempt to limit animal numbers voluntarily."*

In addition Abel (1993:174) said,

> *"Pastoralists have not cooperated in de-stocking for a number of reasons. One is security against drought, The fear that fewer animals will not support the family, thirdly pastoralists often do not accept the fact that their pastures are degrading, and finally, that the poor would become poorer by destocking, where as the rich do not want to lose their power and status, as wealthy cattle owners."*

He goes on to make the point that *"destocking does not extend the life of the soil significantly."* While destocking alone will not likely extend the life of the soil, some of the successes in Kondoa pointed to the fact, that it did allow the planted trees to grow, and many of the denuded areas to grow vegetation (Christiansson 1993). One of the many problems with destocking was that overgrazing simply shifted to other areas, such as Mvumi in Dodoma District.

Very few of the men interviewed volunteered the concept of destocking as a solution to overgrazing and other environmental problems, although a few mentioned this concept.

In Lendikenya, a WaArusha man when asked, about the major environmental problems in this village said,

> "(Too) *many cattle, we are overstocked and hence this causes serious soil erosion*"

When asked what is the possible solution, his reply was,

> *"I don't see a solution. Maybe the leaders could visit and educate us. Otherwise if I tell someone to destock, they will think I am jealous* (of their animal numbers). *It is a difficult situation."* [25]

When asked about the major environmental problems a Maasai man in Lendikenya similarly replied,

> *"Cattle are a major problem because they are traveling on one path, wearing it down like a furrow, when it rains you get gullies. The solution, "There is no clear solution. To talk of destocking is not liked. To talk of this to village leaders, they would consider you the enemy."* [26]

The lack of adequate pasture and overgrazing was also linked to soil erosion in a number of ways. With decreased grazing areas there was increased grazing pressure on existing pastures. In years with good rainfall, there was minimal migration of the local herds, which led to increased animal traffic in nearby grazing areas. Often the grazing areas were not eroded, but rather to paths leading to them were, since the Maasai and WaArusha move their cattle daily to and from the boma to grazing and watering areas. This constant trekking, as noted in the quote above, leads to soil erosion and conflicts over crop destruction, and grazing rights. I discussed this with Maasai, and they asked if we had the same problems in the United States. When I replied that the cattle do not have to trek back and forth, because they are left on the rangeland year round, this brought great laughter and disbelief. They quickly said that all their cattle would either be stolen or eaten by wildlife by the end of the first day on their own

The Maasai and WaArusha in this area were not wandering nomads nor were they migratory pastoralists, as noted in Chapter 3. They were agro-pastoralists, who lived in permanent homes. Only during the most severe droughts will they move their cattle to areas

[25] Interviewee #77
[26] Interviewee #72

with more water and grass.[27] This was accomplished by having the *morani* set up temporary bomas, where the animals would still be moved to and from this "new" corral daily. In areas like Mswakini and Mbuyuni, where the WaArusha have been provided with water troughs and ponds, this has led to increased animal traffic and severe erosion in those areas.

Finally, the utilization of crop residues for grazing was quite common, as was the personal reserves for calves and sick animals near the individual's boma. This differed from zero grazing, where the animals were housed and the feed brought to them. Crop residues were consumed in the fields by livestock and the personal reserves were often carefully managed. In addition, some villages also had exclusive access to certain grazing areas. For example, the Manyara Ranch in Esilalei, for residents of that village, as well as villagers from Makuyuni and Mswakini. "Sepeko" was a special grazing reserve for herds in Arkatan and Lendikenya. However, these areas were not always enough to overcome the intense pressure that falls on existing grazing lands in drought years, when true Maasai pastoralists or other agro-pastoralists from drier areas move into the higher rainfall areas to graze their animals, as frequently happens near Mto wa Mbu.

9.4.4 - Soil Erosion

Overgrazing was directly related to soil erosion and other soil deterioration problems. It reduced the productivity of both the pasture and the crop fields as soil chemical and physical properties were degraded. Poor crop management techniques also increased soil erosion and soil compaction (Boserup 1981), and in many cases these were readily observed as mentioned in Chapters 5, 7, and 8. Also as noted in Chapter 8, soil erosion was severe in some areas that are intensively farmed and will likely increase in severity in other areas as agriculture creeps out into the more marginal areas.

[27]Kikula et al. (1993:22) refer to the Maasai and WaArusha agricultural system in this area as "pasto-Agriculturalism", whereby agriculture is resorted to as a subsidiary compliment to pastoralism.

In this study the change from pastoralism to agriculture or crop growing (using both oxen and tractors) was recognized by 33% of the Maasai and WaArusha men interviewed in Monduli District, as a primary cause of soil erosion. When asked if draft animals had changed the environment in their village, 6.5% of the men interviewed said agriculture and the use of draft animals had decreased the grazing area. This increased the pressure on existing grazing areas. Although, as pointed out in the previous section, 70% of all the men interviewed recognized a reduction in herd mobility, even if they did not consider it an environmental problem. Increased pressure on the land by a rapidly growing population, practicing agriculture without soil conservation measures, and constantly trying to increase their livestock numbers, had definitely resulted in soil erosion.

A WaArusha man from Lendikenya commented,

> *"Today the soil is very poor in the fields because there is a lot of erosion taking away the topsoil, which leaves only the poor soil. There are a lot of gullies in the shambas* (farms)...(The problems are caused by) *Unplanned farming, people who are not using ridges, plowing and planting up and down the hills, and people not planting trees in the ridges. These are all a problem. Livestock is also unplanned. You can keep as many as you like, so large that their numbers also cause erosion."* [28]

Another Maasai in Lendikenya similarly stated,

> *"The main environmental problems in this village are short rains, the burning of grass, and agricultural expansion with oxen. Livestock are* (also) *becoming more numerous and the land is now overgrazed.* (As a result) *we have more erosion and gullies."*[29]

In addition to the overgrazing problem throughout the Southern Monduli District, land was being cleared that is unsuitable for cropping, mainly in the semi-arid lands. On most of these existing croplands there were signs of erosion. This included both water erosion causing gullies and wind erosion. Both increase soil loss and the reduction of potentially

[28] Interviewee #74
[29] Interviewee #66

arable land. In the research area very little has been done to remedy this problem (Meindertsma and Kessler 1997).

In Lashaine, one WaArusha farmer said this, with regard to soil erosion,

> *"There is a change in the local environment. Because there are so many crop fields and the livestock are concentrated in a small area, this intensive land use is causing erosion."*[30]

Gullies were the most devastating form of erosion in the Monduli district. They were common in both Lashaine and Lendikenya. Gullies were found on overgrazed pastureland, on farmland with poor farm management, and along roads constructed without adequate drainage facilities (Assmo and Eriksson 1994). Continuous monocropping reduces soil fertility, results in lower yields, decreases vegetative cover and increases the risk of soil erosion and gullies. Population pressure does not by itself degrade land resources, but it creates a situation that requires good land management to enhance sustainable production (Assmo and Eriksson 1994, Mung'ung'o 1995). Overgrazing can totally deplete the vegetation cover, which was essential to preventing soil erosion. Excessive trampling of the soil surface by animals decreases the infiltration capacity of rainfall, thereby exposing the area to erosion and total land degradation. The same holds true for uncontrolled burning, as in the past many Tanzanian farmers including the Maasai burned grasslands as a weed and tick control measure (Ford 1971).

A WaArusha man from Arkatan commented on soil erosion's effect on waterholes,

> *"Most of the dams (ponds) are filling with soil because many crop fields have erosion. In the past we did not have that problem. Also people are always fighting when cattle eat maize and beans near the paths where they have to pass."*[31]

[30] Interviewee #51
[31] Interviewee #106

The process of sedentarization among the Maasai in Monduli has led to destructive land use. There is constant pressure to extend cropping areas into more arid lands (Kikula et al. 1993, Assmo and Eriksson 1994). This contradicts what Homewood and Rodgers (1991) found among the Ngorongoro Maasai, who were not allowed to practice crop growing. Given the causes of soil erosion above, combined with a rainfall pattern where the majority of the annual rainfall falls in the month of April, the slope of the land, as well as, soil types near the volcanic mountains; Lashaine, Arkatan, and Lendikenya villages were all in jeopardy of suffering from more erosion in the near future (see Figure 5.5).

Lashaine, Arkatan and Lendikenya villages were traditionally dry season grazing areas. The change to crop land has led to increased overgrazing, because the Maasai have often been reluctant to sell or reduce their herds once they adopt agriculture and put more land under the plow (Ndagala 1992a, Campbell 1993). As mentioned in Chapter 7, as agriculture increased, livestock numbers have grown. Most of the Maasai and WaArusha in my research area claimed that the advantage of crop growing is the ability to buy more livestock. This agrees with Kjaerby's (1983) findings. Furthermore, the lack of soil conservation measures, continued farming right near the huge gullies, and traveling in and out of them with cattle herds does little to reduce the destructive nature of soil erosion and gully formation (see Figure 9.1). The daily trekking of cattle to and from the boma, while a cultural norm for East Africa, by itself causes great destruction, when the grazing pressure is high. Fourteen and a half percent (14.5%) of the Maasai and WaArusha interviewed commented on this practice especially in Lashaine, Lendikenya and Arkatan.

In Lashaine, one WaArusha man commented,

> *"Livestock cause problems. Overgrazing, because the (grazing) area is small. It is not enough for grazing. So, many of the paths used by livestock now have erosion."*[32]

[32] Interviewee #48

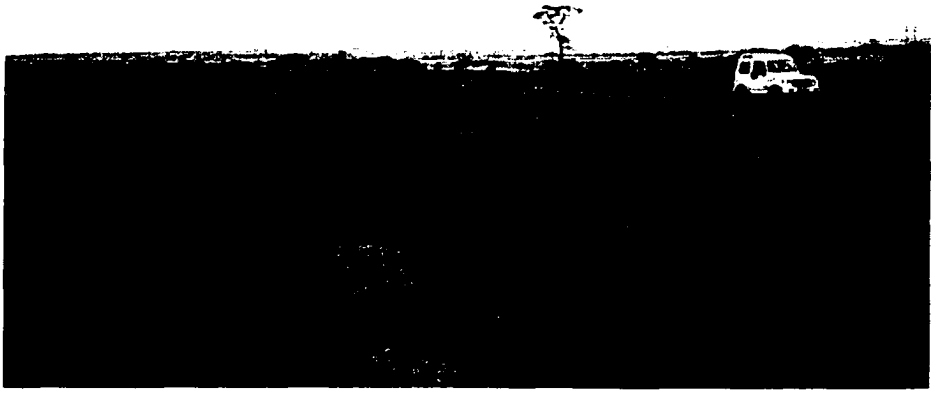

Figure 9.1 – Soil Erosion Along Cattle Paths - Lashaine

In Lendikenya, a WaArusha man similarly stated,

"We are farmers and livestock keepers, but everyone has to take their cattle to water. Because everyone passes the same way it causes erosion and gullies...The only solution to this problem is to have as many ponds as possible."[33]

In Arkatan, another WaArusha man made a related noteworthy comment,

"There is a problem of soil erosion. This is due to cattle passing in the same place for a long time. They only have a few paths from the bomas to the grazing areas. They have learned the disadvantage of using only one path. The cattle that are taken to market near the road also cause soil erosion."[34]

My prediction is that the villages of Lendikenya, Lashaine, and possibly Arkatan have all the characteristics of an ecological disaster waiting to happen. The result, if nothing is done soon may be like the well-known "*Kondoa Eroded Area*". This environmental disaster also resulted largely from increased settlement on fragile hillsides, with unrestricted

[33] Interviewee #78

crop growing and overgrazing (Christiansson et al. 1993, Mung'ong'o 1995). The only differences were, that the rainfall was higher and more intense in Monduli district, the population pressure might be greater, and it was just off one of Tanzania's few cross-country paved roads, where it could be more readily observed.

One WaArusha farmer interviewed in Lashaine, simply answered my question about the environment in the village with,

"This will be a desert, if nothing is done soon."[35]

To remedy the soil degradation problem, the only solution would be to adopt more intensive methods of soil conservation and fertility enhancement (Belshaw et al. 1991, Assmo and Eriksson 1994, Christiansson et al. 1993). If ignored the soil will continue to deteriorate. Resuming long fallow periods seems to be out of the question, as few areas have this option. Farmers in other areas might adopt short fallow periods for agricultural purposes, if the land base allowed this.

Below are Anderson and Grove's (1987:7) comments on the failure of soil conservation programs in the past, and the colonial solution of removing people in critical areas in the name of conservation, did not seem to be the solution for the current dilemma in Monduli District.

> *"Where measures have been introduced that relate directly to systems of land husbandry, such as soil conservation programmes and resettlement schemes of the late colonial government, these have been inspired by European notions of the improvement of rural Africa and often imposed upon a reluctant population. The exclusion or the social control of people has been the pragmatic guiding principle if not the original motivation of these policies of conservation."*

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[34] Interviewee #106
[35] Interviewee #63, A WaArusha

Figure 9.2 – Gully Erosion and Vegetation Loss in Lashaine

Despite well documented history of Tanzanian's resisting compulsory soil conservation measures, especially when they were imposed by the colonial government (Assmo and Eriksson 1994, Eele et al. 1994), there has been a need for improved soil conservation measures in this region (Kikula et al. 1993, Assmo and Eriksson 1994). There was also a definite need for a stronger and better-supported extension service, participating both in research and outreach activities related to reducing soil erosion. Many nearby ethnic groups, such as the Chagga, Pare and Meru and even the WaArusha use soil conservation measures and have done so in the past. However, the challenges of integrating soil conservation with agro-pastoralism, reflect back to Boserup, who said that change will not be made without a strong impetus to do so. The agro-pastoralist's life, with its high labor requirement for herding and the lack of secure land tenure, as well as, possible crop failure

due to drought, all provide a strong resistance to the labor and investment required for good soil conservation measures.

Figure 9.3 - The Author Showing the Depth of the Gully Erosion in Figure 9.2

Soil erosion alone can lead to higher evapotranspiration and lowered ground water, as well as, increased run-off due to the lack of vegetative cover (Christiansson et al. 1993). The problem of "*increased droughts*", if attributed to both tree cutting and soil erosion, might be the way to convince people of the seriousness of this problem and the need for drastic self imposed measures like those seen above in dealing with tree cutting and burning grasslands.

9.4.5 - Drought, Decreasing Rainfall or Soil Moisture Loss?

"God must bring us rain. Drought is like death, no one can avoid it"[36]

Water and rain are limiting factors to profitable crop growing. With the exception of Selela and Engaruka where the men interviewed were using irrigation, all other villages

[36] A statement by Interviewee #38, a Maasai man in Engaruka.

relied entirely on rainfall for crop production. Drought was frequently cited by the men interviewed as a major reason for crop failure. Given the frequency of droughts that have been seen in the past, this would indicate, despite complaints by Maasai and WaArusha farmers in my interviews, that farmers in the region should expect inadequate rainfall much of the time. To illustrate I have used the table below to indicate the frequency and duration of droughts in Monduli district since the 1930's.

Table 9.2

Drought Frequency in Monduli District

Period	Duration in Years	Interval in Years
1933-1935	3	
1948-1950	3	12
1953-1956	4	2
1964-1967	4	7
1973-1976	4	5
1983-1987	5	6
1991-1994	4	3

From Meindertsma and Kessler (1997)

During interviews, when men were asked about the environment and crop growing, this often led to drought being cited as a major environmental problem. A number of men provided their perspectives on the years that were considered particularly good or bad with regard to rainfall. With no written records, this feedback from the old men in my study was amazingly similar to the table below by Meindertsma and Kessler (1997).

An elderly WaArusha man from Mbuyuni seemed to have a good recollection of the droughts that occurred in his lifetime, his words closely resemble Meindertsma and Kessler's (1997) data presented above.

> *"During the 1960's there were some droughts. In 1968 there was good rains, and the same in 1970, and 1977-1978. 1980, 1984, 1985, 1986 there were (also) good rains. In 1988 and 1989 it was not bad. In 1990 the rains were great. In 1991-1995 they were a little bad. In 1996 they were very bad (this disagreed with two other answers). In 1998 there was too much*

water, and no food, and in 1999 the problem was the army worm. The crops (this year) are not good."[37]

A Maasai man in Losirwa pointed out more recently,

"1985, 1986, 1987 were all good crop years. In 1995 – there was only short rain(s) - crops (were) not good. In 1996 and 1997 they had good crops, 1998 there was El Nino, so there was too much water, and in 1999 the year may not be so good, as the rains were short."[38]

When asked about the difference between crops now and those that were grown 10-20 years ago or changes in the soil condition, the most frequent response in all the interviews was,

"In the past the elders were getting more crops compared to now. They had enough rain, but now there is a shortage of rain."[39]

This common statement indicates not only decreasing yields over time, as discussed in earlier chapters, but also the larger problem of decreasing soil moisture.

The men interviewed in the villages of Mbuyuni, Mswakini were quick to point out that rainfall was decreasing. Their point being that when they first came to this area (about the time of Jacob's research in the early 1960's) there was more rainfall. Jacobs (1965:132), however, claimed that with the exception of the area around Mt. Meru and the highlands near Monduli town, the annual rainfall was only 256 mm-564 mm/year. He specifically pointed out, that despite sometimes getting more than 500mm per year, there was a high probability that they will receive less. He claimed "*the Maasai themselves assert (as well as the European Residents) that it is only once in every 6-7 years that rain falls evenly throughout the countryside*".

Jacob's observations during the early 1960's certainly concurred with Meindertsma and Kessler (1997), as well as the National Environment Management Council (1993) who

[37] Interviewee #90, a WaArusha man
[38] Interviewee #12

thirty years later point out that rainfall in the highlands spreading out from Monduli, have a 30-year average of just under 900 mm/year. Rainfall quickly drops to 400-500 mm/year in the lower sections of the rift valley or Maasai steppe, within 35 km of the mountains, which would include most of my research area, except Lendikenya, Lashaine, and Arkatan.

Meindertsma and Kessler (1997) go on to point out that crops fail one out of every three or four years in most of these Semi-arid areas which average 500-700 mm of rain/year (see Figure 5.4). Viewing the maps by (DOS 1961) the probability of rainfall exceeding 250-500 mm (Esilalei, Losirwa, Selela and Engaruka) and 500-760 mm (in all of my other research villages) was 4/5 years in much of my research area. Despite what many of my interviewees said, especially the WaArusha who kept repeating, "*rainfall is decreasing*." This does not seem to actually be the case. Given this 40-year-old data, rainfall amounts do not seem to have actually changed.

What was more likely to be happening was a higher evapotranspiration rate, with the removal of natural vegetation, especially trees and bushes (Meindertsma and Kessler 1997, NRC 1992). Semi-arid areas normally have a high evapotranspiration rate, exceeding rainfall in at least 9 months of the year (Hatibu et al.1995), without removing the vegetation. Meindertsma and Kessler (1997) noted that with the exception of the month of April, all other months have a rate of water evaporation, which exceeds rainfall throughout the lower elevations of Monduli district. Given the significant amount of bare soil exposed for much of the year in most crop growing areas, this would further compound the problem of evapotranspiration on water availability for crops.

According to Stiles (1981:372),

> *"Once vegetation is removed by overgrazing, fire, the felling of trees and bush for firewood and boma construction, hydrologic and soil deterioration set in. Rain is not absorbed as readily into the barren or*

[39] A statement from one of my interviews

sparsely vegetated land, and moisture evaporates more quickly from it; rainwater runs off the surface, taking with it the topsoil, containing nutritive organic matter. Eroded soils continue to degenerate, from one season to the next, the area's water table falls, as less rainfall soaks in, and the springs, streams and lakes dry up."

This theory would also seem to agree with many respondents in my own research who said that the cutting of trees has reduced the rainfall in their crop fields, as noted earlier in the section 9.4.2.

The responses from some interviews are below, when asked about the changes in the local environment. I had not asked about the cutting of trees or rainfall, but these answers were very typical. A total of 28% of the men interviewed had similar responses.

"When I first came here, this area had plenty of trees. But people cut them down to make large fields. At that time they got good rainfall. So maybe this is the cause of poor rainfall."[40]

"When I first came here there were many trees. It was like the bush. At that time we were getting good rain. Now with the loss of the trees, we don't get the good rain like the past years."[41]

The WaArusha in general complained a great deal more about the lack of water than did the Maasai. The failure of a pipeline that came from the mountains near Mbuyuni was mentioned numerous times. Some of the WaArusha in Mbuyuni looked down upon Lake Manyara and said what they need is a pipeline from the lake. They would then have enough water for their families, crops and livestock. As we discussed this further, and looked at the huge land area that this village covered, it seemed obvious to me that you could completely drain the lake and still not have enough water. The highland areas, from which many of these WaArusha came, were areas that have been traditionally irrigated, with complex irrigation channels running down the mountains. This efficient and highly technical form of technology

[40] Interviewee #97 – A WaArusha
[41] Interviewee #96 – A WaArusha

has not easily been adapted or transferred to drier areas. When irrigation has been transferred to areas similar to Mbuyuni, the results have usually been devastating, with siltation, salinization, and increases in disease such as malaria and dysentery[42] (Dyson-Hudson 1980, Schusky 1989, Ezaza, 1991).

One solution to alleviate the loss of livestock and ease the burden on local families due to water shortages has been to dig ponds. Kikula et al. (1993) pointed out the many ponds (often called *dams* or *lambo* in Swahili) that have been excavated out of the landscape just off the Great North Road (running from Arusha to Makuyuni and Mto wa Mbu). According to Kikula et al. 1993 and I must agree with their observations, that while these have provided water during the dry season, they have also disfigured the landscape, and created a focal point for soil erosion, siltation. Their usefulness may be short lived if they fill in.

One of the WaArusha men I interviewed in Mbuyuni similarly attributed the siltation of ponds to the use of oxen. When I asked how oxen have changed the environment in this village, his response was,

> *"There is a change. In the past we had a pond, where we could get water. But when people started agriculture the dam (pond) filled in with soil from the highlands."*[43]

In Sub-Saharan Africa, the sustainability of man-made water sources has generally not very good (Darling and Farvar 1972, Sandford 1983, Sinclair and Fryxell 1985). Most of these sources suffer from poor to non-existent maintenance, silting from soil erosion in nearby crop fields, livestock trampling the edges of these man-made ponds and the complete

[42] Given that nearby Lake Manyara is the largest water body and it is very alkaline, the soils would likely suffer from a severe pH increase and other problems related to changing the mineral composition of these higher lands. The surface water in small canals also often becomes an open sewer and environment for mosquitoes to proliferate.

[43] Interviewee #90, from Mbuyuni

denuding of the surrounding landscape. Most of these water sources were also designed specifically for human and livestock use and do not alleviate or eliminate the challenges with growing crops in semi-arid zones. Being Tanzania's most prominent food crop, as well as the most popular grain among the Maasai, the long-term prospects for growing maize in much of my research area does not seem very bright.

Drought was considered a major problem. Although all the evidence I examined showed that general rainfall patterns and amounts of rain have changed little in the last 40 years, droughts were considered an environmental problem. Maybe my interpretation of drought was different than the men interviewed, or possibly they knew they had created this "drought condition". What has obviously changed was the expectation of growing annual crops (like maize) in an area that has largely been a pastoral area, because it could not support annual crops.

There was little that could be done immediately to alleviate this problem. Doing a better job of retaining rainwater when it came could be an option (Falkenmark 1989). This was mentioned indirectly in my study, when farmers mentioned curbing tree cutting activities, and trying to increase the ground cover. Both of these are difficult to manage, as the same people that complain about tree cutting were cutting trees to build new homes, corrals, and to burn as fuel. The ground cover problem will not be easily overcome, without new strategies of intercropping with either legumes or forages that could be somehow used as a forage source. However, if this also prevents other environmental problems, such as soil erosion, it might be the cheapest and most effective way to encourage environmental protection (Belshaw et al. 1991).

9.4.5a - Timing of Rain as an Indicator of Crop Success

The rainfall pattern in Northern Tanzania was something the men I interviewed have learned to live with. Despite the complaints of decreasing rainfall, they had developed a

strategy to deal with the often inconsistent and unreliable rainfall. The following statement summarized what I heard many times in the interviews.

> *"In the years with short rains, I prefer to grow beans, and I will mix the maize and beans in the same field if there is not enough rain, as to always get something from my fields."* [44]

Hatibu et al. (1995) pointed out that there has been a considerable amount of data that confirm that when the rains were early, there will often be more rainfall for the year. This provided a good estimate of the probable condition of the years' crop. His ideas related directly to what the Maasai and WaArusha strategies were with regard to what type of crop to plant and investment to make regarding seed choices. Most farmers looked forward to early rains and planted longer season and higher yielding varieties if rains were early.

A few examples of these strategies from my research are quoted below:

> "(Seed choices) *depend on the rainfall for the year, as in this area* (Losirwa) *they normally use* (maize) *seeds that mature in a short time. In Esilalei and Kisongo they can grow seeds that take 4 months to mature, but here we usually grow the local Catuman* (maize variety) *that takes only 3 months to mature."*[45]

> "*Rainfall is a big factor in seed choices* (for maize). *If there is long rain, I use seeds that take 4 months to mature, otherwise he uses seeds Catuman or Catumbili* (both local varieties that take 70-90 days to mature)."[46]

9.4.6 - Weeds

The presence of weeds in both crop fields and grazing areas were mentioned frequently in discussions and field walks with Maasai and WaArusha farmers. The Maasai were quick to point out that over time the weed problems in their fields have become worse. They also frequently took me to the fields to point out weeds that had moved into their grazing areas. These "new weeds" were frequently cited as a major problem. In some cases

[44] Interviewee #32 – A Maasai

the perennial grasses had been replaced by annual weeds, which moved into the fields due to both the proximity of agriculture, and the bare soil exposed by constant overgrazing. The three most common weeds in crop fields were *Digitaria scolarum*, a small thorny weed found primarily in bean and lentil fields[47] and *Solanum spp.*, a tall weed with seedpods that are sometimes eaten, and a type of pigweed or *Amaranthus spp.*

At the time of independence in Tanzania Ruthenberg (1964:185) noted the same problem with weeds in ox ploughed fields. Little seems to have changed since. He said,

> *"A cardinal problem is weed control. In Sukumaland in places where ox ploughs are used, the yields per acre have been reduced, sometimes to such an extent that despite the fact more land has been planted, the yields per farmer are not greater than before, when they used only the hoe on less land."*

Unlike the WaArusha in Lolkisale, Mbuyuni and Mswakini who complained about the rain and lack of trees, the Maasai of Lendikenya seemed to still have plenty of both. These Maasai were seeing the results of 20 years of extensive agricultural activities. Most of the men complained about weeds. Many of the Maasai men complained that it was the seeds that they had purchased that "brought" these weeds. This was very unlikely as the seeds for maize and beans are quite large and were hand planted in rows. It would be more likely if the seeds were completely foreign that they came from tractors that moved from one field to the next. It could have also been a transition from perennial to annual grass and broadleaf weeds that had not been seen before. Due to a minimal weeding strategy these weeds quickly take hold in agricultural fields.

In Lendikenya a Maasai man, pointed out the situation like this,

> *"When I opened up this land for agriculture there were only the native local grasses. When the fields were plowed, the old grasses*

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[45] Interviewee #16
[46] Interviewee #31, A Maasai from Selela
[47] This weed of the three was considered the most troublesome because it was very thorny and difficult to remove when weeding by hand, while wearing traditional Maasai shoes and clothing.

disappeared, and new plants and weeds have come which are the result of agriculture." [48]

Another Lendikenya man similarly said,

"Before crop farming there was natural vegetation. Then you end up with a lot of weeds. These weeds were not here before. They are not found in purely grazing areas. They have become more and more each year."[49]

Finally, a Maasai in the same village added,

"There are a lot of new weeds in the field, and the former vegetation cannot be reestablished."[50]

Kikula et al. (1993) noted that in Monduli in addition to the challenges of soil erosion, and inadequate pastureland, weeds such as *Solanum incunum* (called Endulelei in Maa) are indicators of environmental degradation resulting from overgrazing. Although Western (1997) found in Amboseli that *Solanum sp.* were one of a group of secondary plants that grow as the grassland begins to revert to acacia bush, due either to overgrazing or drought. I saw these same weeds in Engaruka juu that were about a meter tall.

In either case, Western (1997:260) said,

"The plant community changes from woodland to grassland, for example driven by rainfall flux, elephants, human activity, and a host of secondary forces, affecting its animal occupants in turn."

In addition to weed problems, a lot of the complaints by Maasai and WaArusha revolved around the loss of the native vegetation. As Sinclair (1985) stated, the most palatable perennial plants were the first to be overgrazed. These were then replaced by the less palatable and shallower rooted annual grasses, which usually fail to reach the water table. Once these were grazed down, they were then replaced by weeds, legumes, or bushes, which

[48] Interviewee #67
[49] Interviewee #72
[50] Interviewee #73

were even less palatable, leading to a complete change of the ecology of the grassland. Western (1997:260) pointed out that "*this may actually be a natural succession, but in the meantime livestock and other wild ungulates suffer tremendously.*"

Table 9.3 (below) summarizes this discussion of environmental problems by village. Each village did have its own unique environment, yet there was a definite trend of increasing soil erosion, decreasing soil fertility and/or perceived drought. . This table provides not only a summary of the ideas discussed with the interviewees, but also my own observations and interpretations, with regard to road infrastructure, crop potential and water availability.

9. 5 - Land Use and Wildlife Conflicts

I was not in the field to conduct research on wildlife, or wildlife conflicts. Even so, I soon learned that in Northern Tanzania, and especially where I chose to conduct my research, one cannot study land-use, without seeing the conflict between agriculture and the wildlife that tried to share and move through the landscape. This conflict largely involved the Maasai and WaArusha agro-pastoralists trying to protect crops from wildlife damage during the harvest season, but some of the older men, mentioned not being able to graze in some of the areas (National Parks) that were designated exclusively for wildlife.

Table 9.3

Research Village - Agriculture/ Environmental Problems Summary

Village	Yields % of men reporting	Crop Potential And possible conflicts	Water Availability	Primary Bean Varieties	Road Infrastructure	Environment Problems % of men reporting
Arkatan	12.5% down 12.5% up	Good, with better soil conservation practices	Semi-Humid zone, nearby lake and ponds.	Rosecoco Canadian	Excellent, as it is located on the Great North Rd.	Fire 63% Erosion 25% Rain 25%
Engaruka	75% down 8% up	Good, but expansion is severely limited	Semi-Humid zone, Irrigation from river.	Ngwara	Seasonally floods, fair to poor otherwise	Trees[51] 42% Rain 75% Fire 25%
Esilalei	30% down 40% up	Fair-Good, but this will increase the conflict w/ wildlife	Semi Arid zone but lake close for livestock	Canadian Red Masai	Good, as it is bisected by a major roadway.	Fire 100% Salinization observation
Lashaine	65% down	Fair/ w immediate soil conservation practices	Semi-Humid zone & village tap for people	Rosecoco Canadian	Easy access to Monduli and the Great North Road	Erosion 60% Trees 41% Rain 24% Fire 12%
Lendiken-ya	33% down 39% up	Good, if soil conservation Practices are used.	Semi-Humid zone, but rainfall higher elevations better	Rosecoco Canadian Red Masai	Fair-Good Seasonally for local roads	Severe Gully Erosion 88% Fire 33% Rain 5%
Lolkisale	20% down 20% up	Better for beans, due to lower rainfall	Semi-Humid, near Mt. Lolkisale.	Rosecoco, Soya Masai Red, Canadian	Poor-Good Seasonally river floods road.	Trees 100% Fire 100%
Losirwa	0% down 30% up	Better for beans given lower rainfall	Semi Arid, nearby river	Canadian Soya	Good – paved road nearby.	Fire 70% Trees 10%
Mbuyuni	65% down 5% up	Stony better for beans, due to low rainfall, Poorest grazing area.	Semi-Arid, poor soil-water holding capacity. A few ponds.	Canadian Ngwara Chick Peas Choroco	Good – paved road, nearby, well drained soils	Fire 70% Trees 65% Erosion 15% Rain 15%
Mswakini	25% down 17% up	Sandy, better for beans, due to low rainfall. Big wildlife conflict area.	Semi-Arid zone, Numerous water Troughs built by TANAPA.	Choroco Canadian Ngwara Cowpeas	Fair-Good Seasonal flooding and fine soils	Fire 100% Trees 58% Rain 8% Wildlife 8%
Selela	8% down 31% up	Good, but limited expansion potential	Semi-Arid zone, nearby river for irrigation and Livestock	Canadian Ngwara Soya	Fair –Good seasonal flooding	Fire 92% Rain 54% Trees 15%

Some wildlife problems were more or less village specific. As noted in Table 9.3 above, Mswakini residents were one of the only people that called wildlife an environmental problem. They were also the only village to suffer from frequent "raids" by elephants. The other village specific problems were outlined in Chapter 5. Most men simply referred to the

[51] The problem is that too many trees are being cut, which many people feel has affected the amount of rainfall, but more likely as suggested earlier, it is the available soil water or water table that is decreasing.

wildlife as agricultural pests. [52] The densely settled villages, such as Lashaine and Engaruka had fewer problems with wildlife, especially zebras compared to the more sparsely populated areas, such as the Lendikenya or Esilalei. The men interviewed in Mbuyuni and Mswakini, both located near Tarangire National Park, spoke at length about severity of wildlife problems in their crop fields.

The animals causing the most severe crop damage were zebras (*Equus burchelli*), which roamed far and often moved in at night, usually targeting maize fields. Wart hogs (*Phacochoerus aethiopicus*) were considered the next most troublesome animal. Porcupines (*Hystrix cristata)* were ranked third. Bush pigs (*Potamochoerus porcus*) were frequently cited as damaging fields, although due to their nocturnal behavior, I never observed any in the fields.

Other wildlife were more common, closer to the National Parks, such as Cape buffalo (*Syncerus caffer*), elephants (*Loxodonta africana*) and ostriches (*Struthio camelus*). Ostriches were said to walk down the rows of beans, picking only the ripened pods. While wildebeest were often seen near the fields, they rarely bothered the crops, compared to other animals. Near the forests, such as Engaruka, Selela and Lolkisale, vervet monkeys (*Cercopithecus aethiops*) and olive baboons (*Papio annubis*) were a severe problem.

Here is how a Maasai man from Selela answered a question about what wildlife were damaging his crops,

> "*Zebra, Buffalo, Wart Hogs, Porcupine, Hyena, Monkeys and Elephants. All the wild animals are eating my crops, especially elephants, monkeys and buffalo, at a spot just below the Rift Wall* (at the edge of the border with the Ngorongoro Conservation Area)." [53]

[52] I had not originally asked about wildlife problems, but when asking about agricultural pests, wildlife were often the first thing mentioned. I later integrated a question about wildlife into each of the interviews.
[53] Interviewee #28

A Maasai man in Lendikenya similarly stated,

> "(This is a) *very serious problem. Last night most shambas were attacked. Zebra is the number one problem, wart hogs, wild pigs, porcupines, antelope in beans and even hares."*

When asked what he does to protect his crop, his response was,

> *"They* (the morani) *guard the whole night. They have fires and wire around the fields, they spear anything they find in the fields."* [54]

Below is a table that summarizes the responses about the types of wildlife causing damage in crops in each of the research villages. The residents of Esilalei and Losirwa were not asked about wildlife, but their comments in early interviews persuaded me to include this question in later interviews. Therefore, those numbers are not as accurate as the other villages. Giraffes (*Giraffa camelopardalis*) were mentioned only in Engaruka and Selela. There was a herd that I saw numerous times living between the two villages. They supposedly only came into the fields during drought years, and primarily ate ngwara, a small leguminous lentil. Also hyenas were a surprise. I always inquired about whether they were in the fields or actually eating the maize. I was told over and over, they eat the maize. The hyenas were thought to be Striped Hyenas (*Hyaena hyaena*), and one Maasai boy took me to a den to show me one he had killed that was caught near a crop field. Although a couple of men were adamant that Spotted Hyenas (*Crocuta crocuta*) also raided fields.

I took a book called Collins -Safari Guides - Larger Animals of East Africa, by David Hosking and Martin B. Withers, with great pictures to each interview. This was to be sure the animal we discussed were the ones the men described. I was especially concerned about the wild pigs vs. wart hogs, and the various species of smaller grazing ungulates. The guide proved helpful, as translations of animal species from Maa, to Swahili and then English could sometimes be difficult.

The species listed in the chart below by scientific name were:

1) Common Zebra (*Equus burchelli*)
2) Wart Hog (*Phacochoerus aethiopicus*)
3) Crested Porcupine (*Hystrix cristata*)
4) Bush Pig (*Potamochoerus porcus*)
5) Small Ungulates – included Impala (*Aepyceros melampus*), Thompson's Gazelle (*Gazella thomsoni*), Eland, mentioned twice (*Taurotragus oryx*), Kudu was mentioned six times, but the men and I could not decide if it was the greater (*Tragelaphus strepsiceros*) or the lesser Kudu (*Tragelaphus imberis*). The Kudu were mentioned in both Mbuyuni and Mswakini.
6) Monkeys and Baboons – Vervet Monkeys (Cercopithicus mitis) and Olive Baboon (*Papio anubis*)
7) Cape Buffalo (*Syncerus caffer*)
8) Elephant (*Loxodonta africana*)
9) Ostrich (*Struthio camelus*)
10) Striped Hyena (*Hyaena hyaena*)

Table 9.4

Wildlife Damaging Crop Fields by Village

Village	Zebra #1	Wart Hog #2	Porcupine #3	Wild Pig #4	Gazelle, etc.[55] #5	Monkey & Baboon #6	Buffalo #7	Elephant #8	Ostrich #9	Hyena #10
Arkatan	6	-0-	2	-0-	-0-	-0-	-0-	-0-	1	-0-
Engaruka	9	9	3	1	1	5	4	-0-	-0-	1
Esilalei	2	2	2	2	-0-	-0-	-0-	-0-	-0-	2
Lashaine	5	9	5	6	5	3	-0-	-0-	-0-	-0-
Lendikenya	18	13	13	12	4	4	5	-0-	2	1
Lolkisale	-0-	5	5	4	1	7	3	1	-0-	-0-
Losirwa	3	5	3	4	1	1	1	-0-	1	2
Mbuyuni	18	17	14	-0-	6	2	-0-	2	1	-0-
Mswakini	12	11	8	-0-	6	-0-	-0-	12	6	1
Selela	8	6	6	5	3	7	8	2	-0-	6
Total#	**81**	**77**	**61**	**31**	**28**	**29**	**21**	**15**	**11**	**13**

There were a few complaints about predators taking livestock, but my questions focused on crop loss. During visits to cattle markets in Meserani and Mto wa Mbu there were

[54] Interviewee #65

ample opportunities to hear about and even see the results of wildlife conflict. One week, there was talk of a boy that shot an elephant with his small bow and arrow. The elephant tried to run him down, but instead killed his younger sister who could not run as fast. This was later reported in the newspaper. Another example, was a man who caught a hyena trying to take a small goat or sheep from his boma. He took the animal on, with only a knife, and almost lost his hand as a result. The wildlife conflict was real. In the crop fields it was often more like a battlefield. The Maasai or WaArusha against their enemy, the wildlife.

Here are the words of a WaArusha man in Lendikenya when asked what wildlife were eating his crops,

> "*Zebra, wildebeest eat the leaves, buffalo, monkeys, and porcupine.* (when asked what he does to prevent this, his response was), *Make fences*[56], *at night you chase them and kill them, and burn manure to chase the wild animals from your crops.*" [57]

During the height of the harvest season, boys and men could be seen coming back from the fields in the morning after having spent the night chasing wildlife, such as zebras from the fields. During a number of the interviews in Lendikenya at the height of the harvest season, while interviewing the *mwenye boma* (elder male), the *morani* were sound asleep outside the hut, with their spears nearby, which the man being interviewed said had been used to chase the animals the night before.

An example from one interview in Lendikenya was as follows,

> "*These days we are not sleeping. You see that spear* (leaning against the hut) *that was used to chase the animals* (Zebra was what he was referring to) *last night.*"

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[55] While most men described specific species such as Thompson Gazelle, Eland, Impala or Kudu, I have grouped them together. Most were considered primarily a pest of bean fields.
[56] These fences are usually just strings of sisal twine, help up by small sticks acting as posts. On the twine cans, plastic or discarded clothing are attached. This "fence" acts as both an alarm for the *morani* that are waiting in the fields and a scarecrow to possibly scare the animals.
[57] Interviewee #64

9.5.1 - Wildlife and Maasai

The World Bank (1995) pointed out that in the past 30 years there has been a large increase in agricultural output throughout the world. In Sub-Saharan Africa this was done with a 47% expansion of agricultural land, far more than the 16% it took in other developing nations. Because of this trend, the natural reserves have been shrinking and were under intense pressure at their borders. Many of these natural reserves were pastoral areas, and the land that has been targeted for "buffer zones" were often actively used as pastoral or agro-pastoral grazing areas (Arhem 1986, Sinclair and Arcese 1995, Western 1997, African Wildlfie Foundation 2000).

Anderson and Grove (1987:3) point this out in a modern context below,

> *"Most government conservation and rural economic development programs in Africa have been applied without an awareness of the broader social implications they embody. This has been largely due to the prominent role of specialists in designing those schemes – most commonly biologists in the case of measures for the protection of species and the preservation of habitats, and economists in the case of rural development projects. The objectives of these programs have been very narrowly conceived academic or ideological preoccupations of the specialists concerned, and to be framed and dominated by European views of the need for and nature of conservation or rural development."*

Centralized government control, national parks, game reserves and/or conservation areas have displaced thousands of people. Land that was once considered worthless and left to the Maasai has increased in value. People, mostly Maasai that live on the margins of these areas are resentful of their loss of land, water and grazing areas (Ole Saitoti 1978, Western 1997). Some people have asked if the wildlife were more important than themselves (Taylor et al. 1996). Over the years relationships between the park administrators and neighboring communities have deteriorated, as land use pressure and populations explode (Neumann 1995b).

The amazing thing about the traditional Maasai pastoralist strategy was that because the focus was on using grasslands only during daylight hours, the wildlife could share the resource during the day, while avoiding the herders, and virtually have a free reign over the grasslands at night. However, once agriculture has been adopted, the landscape not only changes, with regard to soil and plant species, but the Maasai tolerance of wildlife also changes. Thus in the past, with regard to the sustainability of both the people (living in much lower densities) and the wildlife, the pastoral strategy was more tolerant of wildlife.

However, according to Goldman (1995:299),

> *"There are inherent contradictions when trying to focus on preservation of land as an undisturbed natural ecosystem and at the same time discuss sustainability with regard to the use of natural resources by human populations for agriculture. It is not possible, for example, simultaneously to practice agriculture and to preserve a truly undisturbed ecosystem on the same landscape"*

Lamprey (1983) suggested that pastoralists often destabilize and degrade these potentially equilibrial African ecosystems, through overstocking and overgrazing.[58] Many other authors contrast his point of view[59], calling the Maasai both rational and their pastoral system, largely sustainable, until the development of wildlife parks, agricultural encroachment, and numerous failed development schemes interfered with their traditional pastoral system (Talbot 1972, Raikes 1981,Campbell, 1984 Western and Flinch 1986).

Homewood and Rodgers (1991:196-197) support the Maasai presence today stating,

> *"The situation in the Amboseli ecosystem, Simanjiro Plains and Loliondo Game Control Areas all suggest that wildlife conservation areas throughout Maasailand are dependent on Maasai pastoralist rangelands as buffer zones for the survival of migratory or seasonally dispersing wildlife populations."*

[58] His work being based on grazing system where there is an annual rainfall of 500-1000 mm in Tanzania.
[59] Dyson-Hudson (1980) and Swift (1995) say that these dryland systems are not equilibrial to begin with.

In contrast to Lamprey (1983), Sinclair and Fryxell (1985:992) point out (and with whom I agree),

> "*Migration is an ecologically stable strategy and is the common element when domestic and wild ungulates are compared. Migration allows the vegetation to recover from grazing each year, cnd a larger number of cattle and people to live on the land, compared to more sedentary systems.*" In fact, using the disaster of the Sahel as an example, they point out it "*...broke down because of short-sighted and misinformed intervention through development aid projects. It was exacerbated by three events, 1) rapid human population growth (3% annually), widespread overgrazing, soil erosion and desert encroachment, and lastly agricultural practices that emphasized short term profit, at the expense of longer term sustainable yield.*"

The discussion of any additional "equilibrial savanna ecosystems", without people, will not likely be well received by people that have called this savanna their home for generations. This is especially true when these people are hungry and poor. Yeager and Miller (1986:125) said, "*In the official Tanzanian view, any effort to restore ecological harmony, must begin with an attempt to square food availability with population growth and distribution.*" However, it is the change in land use among the Maasai in the Southern Monduli District that will continue to be a real area of contention, as the land moves from grassland to cropping areas.

In nearby Babati District, Johansson et al. (1993:7) pointed out the essence of this dilemma,

> "*The presence of wildlife in the pastoral area* (of nearby Babati district) *presents a land use conflict as the wildlife are viewed as a tourist attraction which has little value or no benefit whatsoever to the local inhabitants. The situation is even worse with cultivators, as wildlife have destroyed crops.*"

When asked how the local environment changed with regard to biodiversity, in one of my interviews, the reply by one 26 year old WaArusha man in Lashaine was this,

> "*Cutting of trees, when they are trying to prepare fields* (has changed things). *In the past there were many wild animals here, but now the animals*

have disappeared. I even saw a Rhinoceros here as a boy, but now you cannot even find a Dik Dik." [60]

Another WaArusha man in Lashaine stated,

"The agriculture here has caused things that were here to disappear. In the past there were many more (wild) animals. Now they have run away. The cutting of trees is also a change, but the crops are necessary for the people." [61]

9.5.2 – Elephant Conflicts - Amboseli vs. Mswakini

Amboseli National Park, located on the North side of Mount Kilimanjaro, just north of the Tanzanian border is an area that has long been a stronghold of both the Maasai and a fairly stable elephant population. In recent years there have been increasing conflicts over the land both inside and outside the park. Cynthia Moss (African Wildlife News –2000:1), a well-known elephant researcher working in Amboseli, points out that in 1972, Amboseli and its basin swamps became a National Park. [62]

"The Maasai who have always shared the whole range with the wildlife were asked to abandon these swamps, restrict their movements and still allow wildlife to move onto their remaining lands."

About this same time land was allocated into large group ranches, outside the park, by the Kenyan Government and according to Moss,

"The realities of this restriction of their former territory, and of modern life, have continued to urge the Maasai toward agriculture. They have been forced into farming by the park, rapidly growing populations, and the lack of arable land in other areas. Thus the Maasai turned to farming to supplement their diet and their income. We knew as soon as they (Maasai) became agriculturists they would come into direct and acute conflict with the elephants (African Wildlife News 2000:4)."

African Wildlife News (2000) concurs with Homewood and Rodgers (1991), that as the elephant population grows in Amboseli, it is important that the elephants have lands to

[60] Interviewee #59
[61] Interviewee #61
[62] This land-use change and conflict with the Maasai is presented by Western (1997) in a book called In the Dust of Kilimanjaro.

migrate to, in order to reduce the pressure on the Amboseli system. If elephants spend considerable amounts of time outside the park, including on group ranches, these become important elephant feeding areas and corridors to other sources of food, water and shelter.

R. Michael Wright, the president of African Wildlife Foundation (African Wildlife News 2000:2) said,

> *"When the elephants range farther, it is welcome news for the park and the growing number of Maasai-owned tourism related businesses...as we secure 'friendly' range outside the park for elephants, that relieves the pressure on the park itself...The downside is greater potential for conflict between elephants and humans."*

In Amboseli, waterholes were a common trouble spot (Lindsay 1987, Peluso 1993), and outside the park elephants depend on the same waterholes used by local people and their animals. This had led to the death of animals, killed by elephants and people being injured as well (African Wildlife News 2000). Similar problems were heard in my interviews just outside Tarangire National Park, in the village of Mswakini. The elephants were notorious for taking crops from the *boma*, after they had been harvested. They would often kill livestock and destroy property in this process.

Here was just one of many examples of the wildlife conflict in Mswakini,

> *"Wildlife prefer to eat maize. Elephants, zebra, gazelle, wart hog and porcupine are all problems. Elephants and Zebra are the worst. You can try to chase them by beating tins and making noise, but that is it. They come to the boma and they can push over a house like this big one we are near, and then they take out the sacks of maize and eat it."* [63]

Yet despite being relocated to this area, this man and others have no recourse.

According to African Wildlife News (2000:5) they have taken actions for easing these tensions in Amboseli by:

1) *Paying consolation fees to livestock owners, whose stock has been killed by elephants.*
2) *Documenting all reported human-elephant conflicts in the area*
3) *Surveying waterholes outside the park*

[63] Interviewee #117

4) *Mapping neighborhoods so that natural resource management and conflict resolution can take place at the local level.*
5) *Targeting Morani as a special age group. They have often become the ones to take retribution on elephants that have injured or killed livestock. They have been involved in conservation activities and appear excited about starting a cultural boma.*

In Longido and West Kilimanjaro in Tanzania the following programs have been initiated in order to reduce tensions between the Maasai and Elephants, which migrate out of Amboseli (African Wildlife News 2000:5):

1) *Sponsor conservation training for morani who tend cattle*
2) *Help villages organize themselves and set up management structures to implement wildlife structures, as well as conduct training in leadership, negotiation, game scouting and fund management.*
3) *Assist communities identify and characterize resources, assess markets and evaluate potential partnerships.*
4) *Broker agreements between communities and private companies.*

While these ideas seem to meet many of the needs of both the Maasai and the wildlife, this has not been the case throughout Tanzania. In Mswakini, the WaArusha men interviewed in this study said they received no individual benefits from wildlife or the tourists. They have been provided with water troughs (which the residents say the elephants also prefer to use over natural sources), and TANAPA (Tanzania National Parks) has also helped them build 2 new schools. At the time of the interviews a commercial safari company was planning on helping the village build a dispensary. However, in every interview, the point was emphasized that while wildlife could "bring some development" to the village, but it was agriculture and livestock that brought development to the individual.

One man in the village during an interview made this great summary,

> "Agriculture and livestock can help us get development. Wildlife is also a good way (to get development), but we need more benefits from wildlife. We need to have the government help us deal with the wildlife. We also need to benefit from the tourists who spend so much money right nearby." [64]

[64] Interviewee #119

9.5.3 - The Future of Wildlife in a Changing Landscape

National parks and wildlife areas were not isolated islands of wildlife, but part of a greater ecological environment (see Figures 1.1 and 6.1). The wildlife and the wildlife parks were threatened by what happens outside their boundaries (Sinclair and Arcese 1995, Western 1997, Igoe 1999). This was particularly true in Maasailand, where so many parks and boundaries come close together (Arhem 1986) (see also Figures 1.1 and 6.1). Add to this landscape the expatriate farms commercially exploiting huge tracts of land, and the great concentrations of local farmers interspersed throughout, and there becomes a real dilemma for the local people and the wildlife (Lama 1998, Igoe 2000). In the case of the Maasai, they have been limited to where they can graze, and were often prohibited from using the best grasslands or watering areas, which have been reserved for wildlife. This places increasing pressure on less suitable lands for grazing, and when those lands were converted to cropping areas, the chance of long term success seemed minimal.

Tanzania's government recognizes the importance of conservation (WSCT et al. 1996, URT 1998) including National parks, game reserves, forest protection, and soil conservation. However, simply recognizing this importance is different than being successful at maintaining its long-term value for all stakeholders. If future programs fail to involve the participation and cooperation of the rural people whose lives will be altered, the environment will continue to deteriorate for both man and the wildlife (Anderson and Grove 1987, WCST et al. 1996, Morindat 1997, URT 1998).

In a presentation to Hilary Rodham Clinton during her 1997 trip to Tanzania, Patrick Bergin, of the African Wildlife Foundation spoke to this issue of wildlife conflict, corridors and local people.

> *"The single largest issue for Tanzanian Conservation at this time is the fate of the wildlife and wild areas outside the national parks and other*

protected areas, and of essential wildlife corridors, which allow animals to move between them.

Many parks in Africa are already complete ecological islands in a sea of surrounding agricultural and industrial landscapes. Indeed, many of Africa's national parks are completely fenced in.

However, I believe that a park is like a finger. It you tie a very tight string around it and cut the flow of nutrients in and out, it will eventually die. The uniqueness of Tanzania's wildlife stems in a large part from the fact that the parks and reserves are not fenced in and are part of larger ecosystems. In order to be able to maintain this situation, however, Tanzania urgently needs to work with communities and local government authorities in areas outside the parks and reserves, and to assist these communities by giving them legal rights, technical knowledge, and the economic incentive to maintain wildlife as one form of land use in their area."

There has been some initiative in the area of community conservation in Tanzania (Sinclair and Arcese 1995, Igoe 1999, Neumann 2000). For example, Inyuat-e-Maa works closely with the African Wildlife Foundation in training its field staff in both Participatory Rural Appraisal (PRA) techniques and emphasize the potential benefits from wildlife (Igoe 2000, Neumann 2000). Yet such activities and ideas have not captured the attention of the masses. This wildlife dilemma has been long standing (Ole Saitoti 1978, Homewood and Rodgers 1987b, McCabe et al. 1992), and began with the initial reserves set aside by colonial governments (Homewood and Rodgers 1991, Western 1997, Neumann 2000). Most of the older men I interviewed were well aware of what they had lost and still hold some resentment.

The younger generation seemed to be more conducive to new ideas that may benefit them, the landscape and the wildlife. There are certainly examples of successful community conservation in Tanzania, where local people have managed Wildlife Management Area. These include the Serengeti Conservation Project, AWAMI-Mbiki in Morogoro, and DFI, working in Mbomipa in Iringa (Sosovele 2000). Western (1997) describes how the Maasai have always considered the wildlife their second cattle, and perhaps by benefiting from the

presence of wildlife this status might be restored. However, wildlife in my study were not viewed as sacred or more valuable than the crops the men were growing or the livestock they were raising. The Maasai and WaArusha are not satisfied with the presence of wildlife on their land for a number of reasons. Wildlife are competitors for their crops, carriers of diseases transmitted to their animals and are a liability all the way around (Yeager and Miller 1986, Taylor et al. 1996).

I think the following words from Ole Saitoti (1978:20) still largely hold true today,

> "*From a realistic point of view, the animals have been parasites to the Maasai, and the Maasai the hosts.*"

9.6 – Summary

The challenge of dealing with land use change and development is in some ways similar throughout the world. There will be more people and there will be less and less available land. In regions most conducive to human development, the best land has always the first to be developed and has also the first to be degraded. It is a simple process, but without simple remedies. I chose to study this topic because in Uganda in 1995, I learned that there was no one "simple recipe" for successful and sustainable agriculture. You cannot increase the number of oxen, and expect agricultural productivity to rise, without understanding the ramifications and possible side effects. I wanted to explore what those ramifications were. In this case study, I have learned a lot about the agro-pastoral agricultural system and the effects of its adoption.

Monduli District faces many of the land use problems similar to nearby districts like Babati, Hanang, or Kondoa. These areas have adopted remedies to address land use degradation. In light of the land's deterioration in Monduli, one would think these ideas would be quickly transferred. However, cultures like the Maasai have been resistant to

change, and although every culture evolves, their rate of change is different. Every region of the world is different. The soils differ, the climate differs, and the rate of degradation differs. In addition, the multiple demands on the land differ. In this area, the biodiversity and ecology has special global value.

In essence it was the wildlife that made this case study area unique. Compared to nearby Kondoa, Hanang or Babati Districts, there were more possible conflicts with any change in the land-use system. While the Maasai have been praised for their ability to live in harmony with wildlife, this image and ideal seems to be deteriorating. It was not because of the Maasai, but largely because of many factors previously discussed that were outside their control. The Maasai have not been a static culture (Spear and Waller 1993a). They have not waited to be fed and cared for when their many lands were taken from them (Taylor et al. 1996, Potkanski 1997). They have adapted to the loss of grazing areas in their landscape, by successfully adopting crop production. Yet, this success may soon force them to face a whole new set of dilemmas, one without land to graze their cattle and one where they will have to continue to protect their crops from the inevitable increase in wildlife-crop conflicts.

In the research area, a tactic like "destocking" would likely further reduce open areas, encourage more intensive land use, and restrict the "corridors" for wildlife, particularly from Tarangire National Park to Lake Manyara and the Ngorongoro Conservation Area. Raikes 1986 said, destocking has caused more harm than good, and Dejenes et al. (1997), point out other shortfalls, like malnutrition which result from no milk for human consumption. So even with a simple problem, the solutions and options differ, due to specific circumstances.

Ole Saitoti (1978:14) said,

> *"One cannot separate the Maasai from their cattle and it would be true for anyone to say without cattle there will be no Maasai."*

Campbell (1993:269) more recently described the situation like this,

"While cattle may still represent the core of being Maasai, it is access to land upon which to graze them, that now defines participation in cattle raising."

Yet, what happens when the Maasai have no more land to graze their cattle? What happens when the "*droughts*" never go away and soil "*becomes like a desert*?" How then are these environmental problems going to be solved?

One WaArusha man in Mbuyuni said,

"The solution, (is) to educate people about the disadvantages of cutting trees, also for soil erosion, and to educate the people not to have such large herds. But this won't succeed, because people won't understand." [65]

While the people might not understand, it is my hope in the following chapter to discuss ideas that might help address this land use challenge, within the context of the current agricultural system.

[65] Interviewee #87

CHAPTER 10

FINAL DISCUSSION AND RECOMMENDATIONS

10.1 - Introduction

The challenge of dealing with land use change and development is in some ways similar throughout the world. There are more people and over time there is less available land. In regions most conducive to human development, the best land has always been the first to be developed and usually the first to be degraded. It is a simple process, but without simple remedies. I chose to study this topic because as I described in Chapter 1, in Uganda in 1995, I learned that there is no one "simple recipe" for successful and sustainable agriculture. You cannot increase the number of oxen, and expect agricultural productivity to rise, without understanding the ramifications and possible side effects. I wanted to explore what those ramifications were. Conducting this case study, I learned a lot about the agro-pastoral agricultural system and the effects of the widespread adoption of oxen.

Raikes (1981:89) discussed the environmental challenges posed in Chapter 9, with regard to East Africa's agriculture over 20 years ago, while posing the question that I will try to answer in this chapter.

> *"There is no doubt that overgrazing is a serious problem in parts of East Africa, as evidenced by the bare pastures, gully erosion and periodic large scale losses from starvation and associated diseases. Nor can there be any doubt that this is related in part to the fact that the cattle population of East Africa has more than doubled during the current century. But this leaves a host of unanswered questions, including the most important of all – what is to be done about it?"*

Throughout this dissertation I have presented data on the Maasai and WaArusha agricultural system in the research area. I documented in time, both a way of life and an agricultural system. My goal was to explore the sustainability of this agricultural system, and how oxen have impacted this system. Part of what I have accomplished is a case describing how people and agriculture create land use change. I did not create a case study on all the possible factors leading to this land-use change. All one has to do is read Boserup (1965, 1981, & 1990), to learn that this is far more to this dilemma than I have covered. Each factor, both those I have highlighted in this study, and those I did not explore are intricately interwoven with the others. It is a complex system, which I have tried to describe, at least in part throughout this text.

In each of the previous chapters I have compared my findings to both theoretical and applied work that came before my own. I have contrasted some ideas and cases, but more often highlighted those findings, cases and ideas that were similar to what I have presented. The land use change issue in Africa and Tanzania was by no means new (McCown et al. 1979, Raikes 1981, Kjaerby 1983, Spear & Waller 1993 and Western 1997). I have presented data, which differ little from the theories presented in Chapter 2. The data in Chapters 6 and 8, differ little from what other researchers have found with regard to the development and sedentarization of pastoralists, and the challenges they quickly face as agro-pastoralists on the same land.

My field work and interviews presented in earlier chapters, in combination with the data I found in other published sources, provides a compelling argument to indicate from the systems perspective, the declining sustainability of the current agricultural system using animal traction in the Monduli District. I was not convinced that animal traction was appropriate for all farmers in Tanzania. My earlier visits to the Tanga, Kilimanjaro and

Arumeru areas showed that hillside farms and small plots were not conducive to widespread animal traction.[1] As stated earlier animal traction is not a benign technology, but one that must be adopted with care, and with the goal of intensifying the agricultural system, while trying to maintain the integrity of the system, using indicators of sustainability described by Holmberg et al. (1991), in Chapter 4 as a guide.

My findings showed that the Maasai in the lower Monduli District were not using animal traction in combination with important soil conservation measures. They have not integrated their livestock and crop systems, in a mutually beneficial and complimentary way. There has been a great loss of natural biodiversity, carrying capacity, and natural soil fertility. In fact, diversity in agricultural systems, like natural diversity, provides a great deal of resilience to both the humans managing the agricultural system and the plants and animals that live within it (Goldman 1995). The loss of this diversity, as I have presented it, points to disaster, or severe conflict in coming drought years, when the grasslands cannot support the animals that were living on it (Mfgale 2000, Guy 2000, UN Integrated Information Network 2000b).

It will not be likely that agriculture or oxen will disappear in this area. Given the many surrounding areas that have been exclusively designated for wildlife, there were few remaining options, for the Maasai and WaArusha agro-pastoralists. For this reason, the rehabilitation and prevention of further degradation to the land have become necessary. There are many possible options and there are many examples and cases where other authors have addressed these very issues (Kjaerby 1983, Yeager and Miller 1986, Anderson and Grove 1987, Ndagala 1992c, Kikula et al. 1993, Sinclair and Arcese

[1] Similar to statements by Boserup 1965 & 1981.

1995, Lindberg 1997, Western 1997, Mung'ung'o 1995 & 1999, Lama 1998). These options and examples will be explored in this chapter, with some new ideas of my own.

10.2 – Review of Previous Chapters

Throughout this dissertation I presented data on the Maasai and WaArusha agricultural system in the research area. I have documented in time, both a way of life and an agricultural system. My goal was to explore the sustainability of this agricultural system, and how oxen have impacted this system. Part of what I have accomplished is a case describing how land use change has been impacted by many factors. Each factor was intricately interwoven with the others. I have described the complexity of the system throughout this text. Here I have brought back together the major themes of each of the preceding chapters, in an effort to bring these complex issues together, before presenting my final ideas and recommendations.

Chapter 1 provided the background as to how and why I came to study the Maasai. My initial research questions are described. These were not my final research questions, but were the questions that shaped the early part of my study in 1998. My preliminary findings are described in Appendix 1, based largely on these questions. This early feedback was used to later formulate my actual research questions conducted in the interview process, based on indicators of sustainability described in later chapters.

In Chapter 2, I outlined the process of agricultural intensification, as well as, pastoral sedentarization and development. These processes point toward common and fairly well known agricultural development theories. Boserup's (1967) theories certainly apply in nearby areas like Kondoa and Babati (see Chapter 9), where the environmental change has forced many people to reexamine and restructure their agricultural production system. Sustainability

was a key concept presented in that chapter, and it has guided much of the discussion each of the following chapters and is the major focus of this final chapter.

In Chapter 3, I presented the Maasai and WaArusha people and how their culture, livestock and food preferences were all supported by their current agricultural system. This was not intended to be a complete cultural lesson, but rather a highlight of the unique cultural traditions that had an impact on the issues I studied. Furthermore, the cultural context was necessary, because of the Maasai adherence to their cattle and other livestock, which has created a situation where the adoption of agriculture was a major driving force in their use of oxen and expansion of their agricultural holdings. This chapter also presented information describing the people, addressing some of the indicators related to people as part of the farming system (see Table 10.1).

Chapter 4 was a description of the research process, my research techniques in the field and my explanation of how I examined the concept of sustainability in the semi-structured interviews. Here I also presented little data, yet the ideas presented by the people interviewed have all shaped my conclusions described in this chapter. In chapter 4, I also describe in more detail, how and why I studied the people, agriculture and land use change among the Maasai and WaArusha agro-pastoralists of Monduli District. The concept of sustainability in this chapter, moves from a theoretical sense, and is used to develop indicators of agricultural sustainability at the farm and regional level. These indicators became the basis for my interviews. How these indicators were put into practice, in evaluating the sustainability of the animal traction based agro-pastoral system, were then described. Finally, I highlighted the research methods used in the field to gather data for this case study and how they were processed and evaluated.

In Chapter 5, I described the research area, including its geography and rainfall. Each village was also described in detail. These villages, where interviews were conducted, were

highlighted with general descriptions of the geography, agriculture and land use conflicts. These descriptions were complimented by figures that presented much of the same information in a two-dimensional context. I could not present the villages without also presenting some data. Therefore Chapter 5 provided answers to numerous questions presented in Table 4.1 (also see Table 10.1), primarily indicators in the categories of people, institutions and geography. This area was unique, not only because of its geography, but also because of its proximity to many wildlife areas (see Figures 1.1 and 6.1). The wildlife problem and other agricultural issues were somewhat village specific, as some villages faced higher concentrations of wildlife, therefore more conflict than others. Wild animals were largely considered agricultural pests by the people interviewed.

In Chapter 6, development policies and land tenure were explained to portray the complexity of being an agro-pastoralist in Northern Tanzania. I highlighted some of the reasons people find few incentives to conserve natural resources or practice more sustainable forms of agriculture. Insecure land tenure is known around the world to be one cause of environmental degradation and the adoption of unsustainable agricultural practices. The land tenure situation was particularly troublesome for the Maasai, as they depend on large common grazing areas for their livestock, even after adopting agriculture. With little long term security, the Maasai have seen these common areas dwindle, while at the same time have few incentives to expend the time and labor necessary to conserve their soil and natural vegetation. I also presented some of the other conflicts that have largely arisen out of insecure land tenure, including the possibility of physical violence. This was a chapter largely based on the literature, but I did present the data I collected on land tenure, addressing the indicators in Table 4.1 and 10.1, such as population pressure and education. In retrospect I would have spent a lot more time in each interview discussing land tenure, as it was central to many issues I did not understand while in the field.

In Chapter 7, I portrayed the use of oxen in Tanzania's history, but also their more recent adoption by the agro-pastoralist Maasai and WaArusha. The Maasai and WaArusha in the research area were strong supporters of draft animals, both for food security and economic well being. This unique and fairly recent change, among the Maasai, represents the adoption of a technology that has allowed the rapid expansion of the current agricultural system described in Chapter 8. The data presented in chapter 7 described the livestock system components related to sustainability, as well as, answering many questions about the overall sustainability of the farming system (see Table 10.1).

Chapter 8, was an in-depth look at the Maasai-WaArusha agricultural system, which in many ways resembled the maize dominated system seen in other areas (Kjaerby 1983, Johansson and Westman 1992, and Meertens et al. 1996). The trends, challenges, crops and practices in the research area as well as, some of the reasons less intensive methods of agriculture have been adopted, made up the bulk of this chapter. There was also data on gender issues, and an economic model, describing the choices the farmers make in crop production strategies. The questions posed in Table 4.1 were answered with regard to the farming system (see Table 10.1).

Finally, in Chapter 9, I pulled together many of the factors presented in previous chapters that lead to land degradation and an agricultural system that does not seem able to sustain itself given the present practices and norms. I have pointed out that the environmental problems in the research area were not unique. In fact, they have been common throughout Tanzania and much of Africa. However, when examined in light of the indicators of sustainability (presented in Chapters 2 and 4) the current trend points toward an agricultural system in need of repair and rehabilitation. When combined with the unique biodiversity and habitat that the system lies in, this process of land degradation is especially important for the nation and the wildlife that share this area.

Wildlife were not originally part of this study. However, when questions were asked about crop pests, wildlife were often cited as the number one problem. Wildlife also came up when the men being interviewed were asked about biodiversity, which was one of my indicators of sustainable agriculture, as presented in Chapter 9. I could have easily made this entire dissertation about the wildlife dilemma, but that will have to be someone else's project. Even so, wildlife makes this case study area unique, compared to nearby Kondoa, Hanang or Babati Districts, and must be considered, as they certainly impact land use change.

The Maasai in the past have been praised for their ability to live harmony with the wildlife, but this image and ideal has rapidly deteriorated (Taylor et al. 1996, McCabe et al. 1992, African Wildlife News 2000). This has not been only because of the Maasai, but because of many of the previously described factors that were outside their control, such as land grabbing for conservation and agriculture, land tenure, agricultural development policies. The Maasai have been a changing culture (Rigby 1992, Spear and Waller 1993, Igoe 2000). They have not waited to be fed and cared for when their many lands were taken from them (Homewood and Rodgers 1991, URT 1994). They have adapted to the loss of grazing areas in their landscape, by successfully adopting agriculture.

Waller (1993:20) said,

> *"With the tragic irony, the 'true' (ie. traditional) Maasai are now those who are being marginalized as a pastoral protelariat, and the future would appear to belong to those agricultural Maasai...."*

Yet, the Maasai success with agriculture may soon force them to face a whole new set of dilemmas. They may be without land to graze their cattle. They will have to feed a rapidly growing population and they will have to protect their crops from the inevitable increase in wildlife crop conflicts (Ndagala 1996, Coombe 2000).

In this final chapter, I will describe how my field work and the resulting case study provide a compelling argument, indicating from a local systems perspective, the declining

sustainability of the current agricultural system using animal traction in the Monduli District. I will also offer numerous ideas from both the published works and my own perspective how the issue of agricultural sustainability might be addressed in Monduli District.

Table 10.1

Directory of Indicators for Assessing the Sustainability of Maasai Agriculture

Chapter(s)	System Component Measured	Indicator	Variables/Answers
Chapters 7, 8, & 9	People	Local Perception of DAP	Very Good
Chapters 3, 7, & 8	People	Indigenous Knowledge	Herding, Disease, Crops
Chapters 7 & 8	People	Access to Tools etc.	Yes, but carts were needed
Chapters 5, 6, 8, 9	People	Population Pressure	High
Chapters 3,5,7, 8, 9	People	Access to Jobs/Labor	Yes
Chapters 3,5,7, & 8	People	Relative Wealth	Varied tremendously
Chapter 6 & 8	People	Land Tenure	Insecure to Unknown
Chapters 2, 3, 8, 9	People	History/Culture	Pastoralism vs Agriculture
Chapters 3, 7, & 8	People	Women opportunities	Yes/Some
Chapter 7	Institutions	Animal Traction Policies	National Support
Chapters 7 & 8	Institutions	Prices/Marketing	Free Market
Chapters 5 & 9	Institutions	Transport Infrastructure	Good to Poor
Chapters 3,5,6,7,8,9	Institutions	Education – all of people	Yes, schools, extension, NGO's
Chapters 7, 8 & 9	Institutions	Research	Little or no Evidence of this
Chapters 5 & 8	Geography	Rainfall	Semi-Arid to Sub-Humid
Chapter 5	Geography	Climate	Tropical – Bi-Modal
Chapters 5,7, 8, & 9	Geography	Land Capability/Potential	Varies with each village
Chapters 5, 8, & 9	Geography	Water Availability	Varies with each village
Chapters 5 & 8	Geography	Soil Types	Volcanic fertile to stony
Chapters 5, 8 & 9	Geography	Proportion Ground Cover	Not Measured – Qualitative
Chapters 5, 8 & 9	Geography	Soil/Gully Erosion	Visible Erosion – YES
Chapters 7 & 8	Farming System	Cropping System	Intensive vs. Extensive
Chapters 3, 5, 7 & 8	Farming System	Mixed Crop/Livestock	Yes, all had some livestock
Chapters 5, 7 & 8	Farming System	Intensive Agriculture	Crops, Rotation, Inputs
Chapters 2,5,7,8 &9	Farming System	Extensive Agriculture	Land Clearing, Fallow sys.
Chapters 3 & 7	Farming System	Cattle & Other Livestock	Ownership desired by all, but will share oxen
Chapters 3,5,7,8, 9	Farming System	Grazing Area(s)	Most often common areas, but there are some reserves and crop use
Chapters 5 & 8	Farming System	Land Use Change	Pasture vs. Crop Type
Chapters 5, 7 & 8	Farming System	Farm size	Varied considerably
Chapter 5, 7, 8 & 9	Farming System	Soil Conservation	Little soil conservation
Chapters 2,3,5,8 9	Farming System	Farming Marginal Areas	Yes in most villages
Chapter 10 – here	Farming System	Crop Storage	Very few Granaries
Chapters 5 & 8	Farming System	Commercial Fertilizer Use	Largely NO
Chapter 8	Farming System	Pesticide Use	Yes (beans)/ No sometimes
Chapter 8	Farming System	Seed Selection	Both Hybrid and Local Varieties
Chapter 7 & 8	Farming System	Manure/Organic Crops	No Manure
Chapters 5, 7,8 & 9	Farming System	Yields	Both Increasing/Decreasing
Chapters 7, 8, & 9	Livestock	Forage/Feed	Graze only quality dropping
Chapter 7	Livestock	Disease problems	Listed in Tables – Chap. 7
Chapter 7	Livestock	Access to Vet. Supplies	Disease is a major issue
Chapter 7	Livestock	Oxen	5-40 years, depends on tribe
Chapter 7	Livestock	Oxen	WaArusha and others
Chapter 7	Livestock	Oxen	Plowing primarily
Chapters 5 & 9	Environment	Perception Local Environment	Big Problems
Chapters 5 & 9	Environment	Biodiversity	Weeds & Wildlife
Chapters 5, 8, & 9	Environment	Drought	Likely low soil moisture

10.3 – Is Animal Traction a Sustainable Agricultural Practice?

This was the primary research question presented in Chapter 1, and the question that guided all the subsequent chapters in the building of this case. The simple answer is no. As described above in section 10.1 and portrayed above in Table 10.1, the current use of oxen by the Maasai is not sustainable, using the list of indicators developed and the sustainability principles presented in Chapters 2 and 4. The use of oxen has been profitable. It has also been more sustainable than the use of tractors (see section 7.5.6). However, given the current agricultural practices and crop growing strategies described in Chapter 8, oxen were being largely used for extensification in a system of land exploitation. Their use has complicating the grazing dilemma, and the profits and benefits of having and using oxen, so happily discussed by the men interviewed, have in fact, added to their current dilemma of "overgrazing".

Now before I continue describing oxen as the problem. The greater problem, as put by one of my respondents, "*...is not the oxen, but it is the people using them*". Oxen do not degrade the land, people do. Therefore, oxen have added to the quality of life for many people in the research area. They have sustained people, when other technologies have failed. They have helped people survive the ever changing political and land tenure situation in Tanzania. Oxen have offered a readily available agricultural power source for development. In essence, the oxen have helped "bring development". However, in light of the theories described in Chapter 2, by Boserup (1965, 1981, and 1990) the Maasai with their oxen were facing a critical moment in their own history. They no longer had new land to exploit. They were facing decreasing crop yields and decreasing soil fertility, as well as rapidly rising human and livestock populations. The only real option would be for the Maasai and

WaArusha to intensify their agricultural system (Boserup 1965 & 1981, Goldman 1995, Meertens et al. 1996).

As described by a Maasai in Selela, agriculture seems to be where the future lies in Monduli, even among pastoralists because,

"People sell cattle to buy a shamba, but no-one sells a shamba to buy cows."[2]

It is within this context that I will offer some ideas for the future, and cases where this intensification has benefited people in nearby districts. However, in Southern Monduli District the land tenure, wildlife issue and cultural importance of cattle have compounded this problem. The use of animal traction must be adopted with care, and with the goal of intensifying the agricultural system, while at the same time trying to maintain the indicators of sustainability described by Holmberg et al. (1991).

Lynam and Herdt (1992:215) say that,

> *"Technologies have to increase the profit or the farmers perceived welfare before they will be adopted, and thereby have an opportunity to contribute to system sustainability."*

Oxen have increased agricultural profitability, as evidenced by both their widespread adoption and the comments from the men interviewed as presented in Chapter 7. Now the key will be getting Maasai and WaArusha farmers to integrate other practices such as the use of legumes, manure, and improved livestock management practices, and more appropriate crops, in order to sustain the agricultural system.

The Maasai were not using animal traction in combination with important soil conservation measures and were not integrating their livestock and crop systems. In fact, diversity in their agricultural system would provide resilience to both the humans managing the agricultural system and the plants and animals that live within it (Goldman 1995, Western

[2] Interviewee #33

1994). Maintaining diversity, including the use of livestock, will be essential due to the highly unpredictable rainfall in this region. However, this diversity must also provide a stable income and adequate food for the people, if it will be sustainable in economic or ecological terms.

10.4 - Participatory Rural Appraisal and Development

Participatory Rural Appraisal (PRA) is a field technique that has enabled rural people to share, enhance, and analyze their knowledge, life and conditions. Most often a PRA employs multidisciplinary teams (Barrow 1997). Like my own work the PRA seeks to produce qualitative data that are extremely detailed, acutely site and culturally specific. It is a tool or technique that furnishes information about the environmental resources from a human based experience. It often begins with focus group discussions, mapping and simulation exercises, possibly integrating itself into the design and application of a more formal household survey (Gammage 1997). Its advantages over top-down approaches are that the communities are engaged in the planning process, and they often see tangible results in a shorter time (Thomas-Slayter 1992).

In sustainable development, people have been more likely to support efforts if they were kept informed and involved (Burkey 1993). Barrow (1997) pointed out that an impact assessment, using participatory techniques has a lot to offer sustainable development initiatives. Yet, it requires planners and decision makers to be more careful, as it empowers local people, who gain confidence and skills by participation (Barrow 1997). The use of open ended, multidisciplinary, farmer centered discussions is a dynamic process. When applied to agricultural technology development, it can offer a more holistic view of the system. It uses the experience of the people to identify limiting factors, opportunities, and threats to the adoption and successful use of the technology. Given the lack of historical data on Africa's

agricultural systems, participatory approaches can also shed a great deal of light on the impact of history on land use change and may offer new ideas on how to improve the land tenure situation (Shower 1994).

The need for understanding farmer's needs and constraints is important. It would therefore seem most appropriate that the local extension officer, who is most often familiar with local customs, agricultural systems, disease problems and local languages be trained in participatory techniques and farming systems approach to research and extension (Starkey et al. 1994). In addition, Oakley (1988) states it may be more important that the extension officer become more of a facilitator, who tries to help people tackle their own problems.

There is a definite need for not only participatory methods, but also regional or geographic focus that explores beyond the farmer's individual needs, to the constraints of the region. Oakley (1988) called this recognizing indigenous heterogeneity. This could also be called the case study approach, where local economic, social, and environmental conditions are given special consideration. Understanding a target audience's level of knowledge, attitude and normal practices are important to developing appropriate strategies for the dissemination of a technology or reshaping ideas about its use (Adhikarya 1995).
To take this to another level, it could also mean looking beyond the needs of individuals, to what the "people" need, based on soil types, farming systems, and transportation options (Starkey and Mutagubya 1992).

While this type of thinking could be interpreted as antagonistic to participatory planning, it doesn't necessarily have to be so. This approach could improve the delivery of programs to farmers who need it most, or to areas where it will be most appropriate. Experience in Tanzania and in other African nations has shown that once a critical mass of people have adopted the technology, it can spread rapidly (Starkey and Mutagubya 1992). The government, NGO's, local agriculturists, and the people themselves have to all work

together to make sure that a technology like animal traction comes with the knowledge to use it wisely. The people and the local institutions, like the extension service, should be working together to bring about the most long lasting and widespread impact of improved methods of animal traction use, provided there are incentives for both parties.

As described above, there were components of my work, which used similar techniques to the PRA. However, there was much that was not shared with me (because I did not ask or live long enough with the people). There was even more that I do not understand about the Maasai and WaArusha culture and life. PRA allows local people to participate in the planning and implementation of the technology or program. PRA helps people share information and seeks to build support and consensus. It forces stakeholders to rethink priorities, reset goals, and re-chart a course of action in response to new insights or technology (Hardi and Zdan 1997). It was my hope that this case study may provide some new insight, if not for the Maasai, then for the people who will be working with them on issues such as resource management or land tenure in the near future.

Before presenting my ideas on how to address the challenges facing the sustainability of the agricultural system, I want to make it clear that these ideas are largely my own, except where otherwise noted. Ideally, under a more participatory model, I should have presented these findings to the people, and asked them to critique my ideas before writing this summary. As I so often stated in the field when interviewing farmers, I was not under contract for any forthcoming development project, nor was I employed by an NGO. I was working on my own to explore these issues. Given the importance of participation of the local people, my recommendations should never be adopted without careful consideration and discussion by and with the local people. The most successful development programs must involve the people if they are to be adopted at all. My research involved the people, and in some ways was participatory, in that I was soliciting ideas and answers to my questions

from the people. It was however, more of a rapid appraisal, as the ideas I present here have not been seen by the local people, and these ideas reflect only my own limited experience and opinions.

In the final sections of this dissertation I have offered ideas on how some of the specific sustainability issues might be addressed. I hope to generate discussion and interest in this work by sending my work directly to the people I worked with, including the farmers, NGO leaders, and extension staff. I will be sending 10 copies of this full document to interested people and NGO's in Monduli District. My plan is to print a condensed version of this dissertation (in Swahili) and send it back to Tanzania for the farmers that wanted to see my results. In 1999 I promised 25-30 men that I would do this.[3] They wanted to know what I had learned and what I would suggest for the future.

The Maasai have been considered a very intelligent people with a great degree of knowledge about their environment. They have always lived close to the land, in the past have used many sustainable practices, and they have a great deal of knowledge about their environment and the challenges of living within its constraints. During this research they enjoyed talking and learning about new perspectives and ways of doing things. I have met a number of researchers that have used PRA with the Maasai (Morinadat 1997). They said it was a successful and appreciated technique. To ignore the experiences and ideas of the Maasai would be a grave mistake in development program.

10.5 - The Environmental Challenges

In the previous chapter, the perception that fire and tree cutting were expressed as the most severe problems in most of the villages. There was little to dispute, as there were specific rules that each village had with regard to the people caught breaking these local

[3] The condensed version will have to be translated into Swahili, as the list I have are people that asked for this in Swahili.

ordinances. The fines were taken seriously, especially with regard to fires. Tree cutting was a more challenging issue as described in Chapter 9. The rules were adopted locally, because of the recognized problems people faced when the grass fires got out of control, or when all the trees were cut. This adoption and local enforcement of rules served as a good model for many of the other environmental problems. In these section I will briefly readdress each of the major environmental problems, other than fire and tree cutting.

10.5.1-Livestock Overgrazing and The Lack of Pasture

The issue of over grazing, as described in Chapter 9, was a situation that was likely to get worse. This was due to increasing pressure from larger livestock herds, the rapidly growing population, the expansion of agricultural lands, increased numbers of wildlife (Ndagala 1998), and the land tenure situation.

Ruthenberg (1964:185-186) more than 35 years ago noted this situation in Tanzania, and offered the following advice,

> *"The plough works more land and reduces the grazing land available...Farmers using the plough will invest their profits chiefly in more cattle. Less grazing due to ploughing, plus more livestock through purchases will result in overgrazing and soil erosion. Hence the rational use of oxen also requires a change in land tenure, and in particular, a rational method of organizing the use of the grazing land."*

Keeping oxen, has been considered by some a burden on the landscape (McCown et al. 1979). The use of tractors has been promoted as a way to decrease grazing pressure, even though tractors have proved to be less profitable and less attractive to poor farmers that cannot afford them (Kjaerby 1983, Starkey and Mutagubya 1992, Sarris 1993). Oxen used as described in Chapter 7, were a renewable resource that served the dual function of both work and meat animals (Lindstrom 1986). In all cases, unless they died prematurely, oxen were to be sold at their peak value and size, to be replaced by younger animals (Conroy 1999). Therefore, they were not kept merely for maintaining animal numbers, but rather oxen were

gaining value, while being used for work. To suggest eliminating oxen, and replace their power with tractors would be ridiculous, because given the cultural norm of investing profits in cattle, fewer cattle would not likely be kept by the Maasai or WaArusha if they were given even free tractor services.

Destocking was also not a viable alternative, particularly for the Maasai. It has proven time after time in Africa to be a poor choice in reducing environmental degradation and poverty among pastoralists (Rigby 1981,Goldschmidt 1981, Dejenes et al. 1997). Among the Maasai in particular this would likely escalate the social and physical conflict between both people and wildlife. In the Kondoa area, destocking created a situation of malnutrition for many households that had previously depended upon animal products as a protein source. Furthermore it increased the burden on women, who had to carry fodder, water, and clean the stables, as cattle rearing has always been largely a male activity (Dejenes et al. 1997). In Kondoa it also created a shortage of manure, at a time when the intensification of agriculture was being actively promoted (Dejenes et al. 1997).

Even so, Sinclair and Fryxell (1985:992) suggested in the Sahel of Africa, under traditional pastoralist land use strategies, people were dependent on cattle, which were dependent on vegetation. These links have been broken down by overgrazing followed by drought.

> Their solutions included; *(1) people must be moved from degraded areas to new areas; (2) people must be educated in ways to develop a rural economy suitable to the land base; (3) Education and family planning must be instituted; (4) Cattle herds must be severely restricted or culled; 5) The vegetational succession on degraded land must be closely monitored; (6) once the land has recovered a modified migration or rotational grazing system should be returned*; (7) *Wells should only be constructed if they do not harm the migration system; (8)African governments should be encouraged to institute these measures."*

10.5.1a – Possible Solutions to Overgrazing

I would suggest a slightly different approach, using some of Sinclair's and Fryxell's ideas, as the Southern Monduli District was not as arid as the Sahel. First, mandatory family planning is out of the question. Also the people have few places to go, particularly in this area, with so much land already dedicated exclusively to wildlife. My first suggestion would be that the government needs to encourage greater integration between livestock and agriculture. There needs to be a more active promotion of legume based rotations (Coulson 1992, Assmo 1994, Shao 1999), or at the very least livestock manure applications to the fields (Rugumamu 1995, Mortimore 1998, Shao 1999). This would both offer greater ground cover (Coppock 1993) and more feed for livestock in times of drought.

Grazing needs to be more controlled. Where possible, as was shown in some villages in the research, there should be family reserves. This could be at least maintained or in some cases more clearly defined and demarcated. Some additional land should be set aside and demarcated for exclusive dry season grazing in every village. While this was the norm in many of the villages where I conducted research, this needs to be controlled locally. Large areas such as military training areas, inactive commercial farms, and other unused land resources ought to be available, especially to people in times of dire need, offering a degree of flexibility necessary in the non-equilibrial system so common to the research area (Behnke and Scoones 1993).

The watering of cattle poses a particularly challenging dilemma, as it was often the movement of cattle to water sources, that created many of the problems associated with overgrazing. While the creation of water sources has its critics (Sinclair and Fryxell 1985, Kikula et al. 1993), it would do a lot to alleviate the severe overgrazing that results along traditional cattle paths and natural water sources. This of course could create another dilemma, such as who would maintain these water sources (or pipelines as they are

frequently called). Yet, as will be discussed later, the sharing of revenue from wildlife tourism and hunting, a goal of the Tanzania Wildlife Policy (URT 1998) could provide a revenue source for such village developments (Lindsay 1987, Western 1994, Potkanski 1997).

Lane (1998:24) discusses how

> *"Range management should focus on "key" or limiting resources, those crucial to productivity of the wider dryland ecology or the most regular subject of conflict."*

In relating this statement to my research area, there were many areas of potential conflict. First was the severe erosion in Lashaine, largely caused by the intensity of cattle traffic in and out of the limited grazing areas. Other areas of contention include the access to water for both livestock and crops in Engaruka, the recent loss of wetland grazing areas in Selela, the lack of water in Mbuyuni, and the acute pressure on the water in Mto wa Mbu during droughts. Addressing these seasonal water shortages, through alternative means, such as the water tanks supported by TANAPA in Mswakini would seem to address one of the most pressing issues, with regard to developing alternative water resources.

Likely the greatest challenge in addressing the issue of overgrazing, was that there has been a shift in pastoral relations, as conflicts arise with neighbors over land-use. The disappearance of the resources the people have come to depend on, like grasslands and watering places which were or might be controlled by someone else were also critical issues. This has been a well known problem, and it has been studied many times throughout Sub-Saharan Africa (Barbier 1991, Western 1994, Lane 1998). It will not be easy to restrict land use or provide resources for some but not all of those people affected by land use change. Added to this equation was also a decrease in labor to be used for herding, as additional labor was needed in the fields or lost to the herders as their children were sent to school.

10.5.2 – Soil Erosion

Dealing with soil erosion, conceptually is strictly a technological issue (McCown et al. 1979, Holmberg 1991, Assmo 1994). It is a relatively simple concept, in that the use of vegetative cover will limit soil erosion. The fact that soil erosion needs to be reduced in order to limit further degradation is difficult to dispute (Coulson 1992, Newman and Ronnberg 1992, Kikula et al. 1993). However the difficulty lies in promoting soil conservation, when there has been little economic incentive to do so, as discussed in Chapter 8, with regard to the profits from the Catuman-Oxen agriculture model. But also in Tanzania, there has been a long history of failed intervention in soil conservation, when these measures were forced upon the local population (Ruthenberg 1964, Christiansson 1986, Mung'ong'o 1995).

According to Anderson and Grove (1987:7)

> "*Where measures have been introduced that relate directly to systems of land husbandry, such as soil conservation programmes and resettlement schemes of the late colonial government, these have been inspired by European notions of the improvement of rural Africa and often imposed upon a reluctant population. The exclusion or the social control of people has been the pragmatic guiding principle if not the original motivation of these policies of conservation.*"

However, when strict soil conservation measures were enforced, there was a rapid improvement in the local environment (Christiansson 1993, Mung'ong'o 1995), despite the sometimes, severe hardships on the local people. I do not suggest the return of strict regulations, under the threat of physical violence and incarceration. According to Lane (1998:23)"*The use of directives should be avoided.*" The solution I believe is to encourage people to embrace soil conservation through numerous means, including the use of participatory methods and interdisciplinary teams of well trained people to tackle this issue.

10.5.2a – Achieving Soil Conservation

The technical solutions to soil erosion problems were addressed numerous times in the interviews conducted in the research area, as described in Chapter 9. Most often these

were expressed as the need to use the plow across the slope and to "use ridges in the fields". These well known soil conservation practices have been supported by many authors familiar with the situation in Tanzania (Newmann and Ronnberg 1992, Assmo 1994, Rugumamu 1995). In addition, there were many other practices that have improved the conservation of soil in nearby areas. These included the use of grass strips, contour ridges (a form of terracing), creating live fences on the outskirts of fields with sisal and other native vegetation[4], tree planting, intercropping, bunding, building check dams, constructing waterways and using legumes as both a cover crop, intercrop, and dry season livestock feed[5] (Raikes 1986, Christiansson et al. 1993, Assmo 1994, Dejenes et al. 1997). Many of these have been traditional techniques used by the Chagga, the Meru and the WaArusha who lived on Mt. Meru.

I have used Anderson and Grove (1987:6) to introduce the reasons why my suggestions below, despite their flaws, might influence people for years to come.

> *"Attempts to manage the African landscape for conservation or development invariably involve direct interventions in the relationship between man and his environment (ie. between man and his means of production). The impact of these interventions often geographically extends far beyond the intention of the deliberate plan, being carried through a wide networks of social linkage."*

What I propose is the encouragement of soil conservation practices by four means. First would be through the education of the farmers. Second would be through local schools and small farm plots. Third is through the mass media, and finally, there needs to be direct incentive to encourage people to put these well known practices to use. My suggestion would be to give farmers ox carts, for putting these soil conservation measures into practice. I will describe below how and why I believe each of these practices has merit.

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[4] Which is often done around Maasai and WaArusha bomas in the research area.

The education of farmers seems like a very naïve "Western" statement. However, through participatory methods and getting just a few farmers to adopt these practices, it could provide a model by which other people could directly see the benefits of adopting soil conservation. Many farmers discussed having adopted practices after seeing their neighbors adopt successfully adopt them. Without seeing a neighbor or relative successfully using these techniques, the chance of this practice spreading by diffusion is unlikely. Furthermore, waiting for environmental neglect and degradation to force the people to use such practices, as described by Boserup (1965) in theory, and in practice (Meertens et al. 1996) will further extend the degradation and potential suffering.

Monduli has a strong presence of many NGO's interested in food security in this region. They should be encouraged to promote or continue to promote these practices. Of course the formal extension staff should also be involved. This would require funding, as many officers have neither the travel budgets or expertise to oversee and encourage such a program. The NGO's could offer both technical training, technical support, but most importantly the financial support.

Given the fact that "*Institutional lenders and donors have exerted a considerable influence over African agricultural development over the past 2 decades and seem likely to continue to do so* (Sinclair and Wells 1989:470)." It is entirely within the realm of possibility to encourage the NGO's to work together to save the local environment in the name of food security. There have certainly been many failed projects. Some ignored constraints due to the local environment. Others ignored the constraints faced by the culture, society, economy and the natural risk avoidance of the agriculturists. Finally, even "successful programs", often fail over time, because as donor financing ceases, the initiative fueled by the projects ends.

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[5] In Engaruka the use of Ngwara was seen as a crop insurance, as it required less water than maize, however, it also was planted between the rows of maize (intercropping) and was used for grazing cattle once the maize and

However, in the case of soil conservation measures, this is not a one time input like fertilizer. Neither is it a one time donation of an implement like a plow. The impact would be for the long term benefit of the farmer. The encouragement of soil conservation practices can have long lasting effects. Swift (1995) says there are numerous challenges with regard to reliance on pastoral NGO's as not only advocates for constituents, but also as educators. However, without their support, the inevitable is more environmental degradation and less food and economic security.

My second suggestion is the use of local schools as a focal point for promoting soil conservation measures, beginning at a young age (Christiansson 1986, Conroy 1999). There is no greater task then to educate the young people about the importance of food security in their own village. A number of young men in my interviews discussed how they had been influenced by a teacher, in adopting hybrid maize varieties or other improved practices. Julius Nyerere (1968) in his early promotion of *Ujamaa,* pointed to the need to educate young people about the basic agricultural practices in school. Most Tanzanians, teachers included, often maintain small agricultural plots or grew up on farms where they had to work. In every school there are people that could be encouraged to promote soil conservation and more sustainable agricultural practices. If the schools have been in part supported by TANAPA or other wildlife sources, it would be in their interest to encourage agricultural practices, that would intensify local agriculture, without costly outside inputs.

The third component in this education and encouragement process, would be through a mass media campaign over the radio, posters and local newspapers, supported by the Ministry of Agriculture and NGO's. My reasoning behind this suggestion is the following, in rural Monduli District, if you asked any man if he preferred Coke or Pepsi as a soft drink, there would be some debate, but ultimately despite Pepsi being cheaper (another advertising

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beans were harvested.

ploy), Coke would be declared better. If Maasai men can be taught to believe Coke was better than Pepsi, despite being 75% more expensive in 1999, I believe they could be sold on a campaign advertising the benefits of soil conservation in the same manner. The message should be on-going, like the message noted above in the advertisement of products like Coke, which had little or no value, on most farms, but were consumed anyway.

My fourth suggestion was giving away ox carts. I say this for two reasons. First, even in the United States, soil conservation is something farmers are encouraged to adopt. This is done largely through incentives and payments. Ox carts were the one item that was frequently requested by the men interviewed, both within and outside the interview itself. In this light, ox carts were something the people genuinely wanted. Instead of a cash payment that might be invested in more livestock or liquor, the ox cart would encourage agricultural intensification. As mentioned earlier, there was a lack of integration between livestock and agriculture. This remains a major stumbling block to intensifying agricultural practices. Encouraging the intensification of agricultural practices is an important step to both improving food security and the environment. An ox cart not only might provide the means to move manure from the *boma* to the fields, it could also provide a means of reducing soil erosion, by minimizing the use of local sleds, and reducing the daily workload of women in hauling water and firewood. Men and boys could more easily encouraged to assist with water and firewood, with the use of ox carts, as was often seen with families that had a cart.

My suggestion would be for NGO's to offer ox carts to farmers, with some minimum amount of agricultural land (maybe 5 ha) in exchange for implementing soil conservation practices as prescribed by themselves or in cooperation with the extension staff. The ox cart would not exchange hands until the work is done. It might also require some formal sign-up, for planning purposes. Initially I would target villages such as Lashaine, Lendikenya, and Arkatan that have the most severe erosion problems. This of course would be expensive, but I

believe it would be a one time payment, in exchange for long term environmental improvement, and the possibility of promoting soil conservation by demonstration, to other farmers, through increases crop yields. Even if the ox cart program was only short-lived, it could have long lasting effects on the environment, and might encourage others to adopt both ox carts and improved soil conservation measures.

10.5.2b – Restoring Severely Degraded Areas

The already severely eroded and degraded areas, in the high density villages, such as, Lashaine and Lendikenya (see Figures 9.1,9.2,9.3), need immediate rehabilitation by instituting more strict soil conservation and rehabilitation measures (Sinclair and Arcese 1985, Belshaw et al. 1991, Kikula et al. 1993). It is in these instances, local control over livestock grazing, like those instituted to control fire should be established, at least temporarily. In addition tree and shrub planting should be encouraged. Cutting and/or grazing of these plants should be severely restricted. Many areas are so densely populated, such as Lolkisale and Lashaine that many agro-pastoralists have already moved their herds to other areas. If this could be encouraged in the name of environmental rehabilitation, without the encroachment of new homes or fields into those areas, it would reduce problems like flooding, continued gully enlargement and soil loss.

Assmo (1994), points out there are many varieties of grasses, legumes and trees that could be used to increase production, protect soil resources, and restore or maintain soil fertility in the Arusha region in a book designed to guide extension work in this specific area. He offered many improved practices that were directly applicable to my research area, using the ideas I presented above.

10.5.3 – Dealing with Drought – Reversing the Soil Moisture Loss Problem

Dealing with drought does not imply bringing widespread irrigation to the numerous villages in the research area. There was simply not enough water, with even the best and most

expensive technology. Bringing additional groundwater to the surface, would likely also decrease the long term prospects of improving soil moisture, as has been shown throughout Africa (Sinclair and Fryxell 1985, Glantz 1994, Mortimore 1998). The answers lie in the use of the strategies described above. Begin with rehabilitating the severely eroded areas, thereby naturally retaining more of the surface water, rather than allow it to race onto the plains in large gullies. The combination of soil conservation measures, increased intercropping and legume use, as well as tree and shrub planting in key locations, would improve the situation dramatically. This of course would be very difficult to implement, yet given the success in self regulation of fire and wood cutting, this could provide a model, when combined with more secure land tenure, which will be described later in this chapter.

Similarly Rigby (1986:111) points out, the objective in development should be to use what already exists in their agricultural system, as the basis for improvement. There are many local family reserves that existed in the midst of severe erosion in villages such as Lashaine. These could act as a model of what could be achieved in degraded areas, with cooperation. Farmers acting as examples, can encourage vegetative growth and soil conservation control measures.

10.5.4 – Dealing with Weeds

As described in Chapter 9, weeds in crop fields and the increase of weeds in grazing areas were both considered an environmental problem. The use of widespread herbicides, which were virtually non-existent in the area anyway, does not seem likely. The only other alternatives in crop fields would be using oxen or donkeys in this operation, or increasing the use of crop rotations or intercropping (Raikes 1986). From an environmental perspective, intercropping and crop rotations would not only reduce weeds, but would also be less likely to increase soil erosion.

Intercropping maize and beans was practiced as a food security strategy in the research area. If the rains were late, some farmers, especially women, would plant both hoping to at least get something. When planting was delayed, the beans usually survived. The maize, however, would often fail. This strategy allowed something to be harvested from the fields for a woman to feed her family. There were very few farms in my study that practiced intercropping, as a soil conservation and fertility strategy. Even so, its adoption would indicate that it could be promoted for both economic and environmental reasons.

Mung'ong'o (1999) found that intercropping tended to decrease as the sizes of plots increased among the Kondoa Irangi, particularly as they moved down the slopes and to more arable land. [6] Extensive cropping with maize, finger millet, and beans (which were sold) was the main cropping pattern among the Kondoa Irangi. According to Mung'ong'o (1995) the sporadic intercropping of either maize or beans and the growing of legumes with finger millet were the only environmentally friendly cropping patterns that were practiced. The same practices could be seen when comparing the farms in Arumeru to those in Monduli. The environment and higher rainfall in Arumeru certainly influenced this practice. Yet, in Monduli, the intensification of agriculture was just as important for future food security.

In the research area, forage and bean legumes, would help generate soil fertility and reduce erosion. These small non-woody legumes would allow plow cultivation, and would also provide valuable dry season feed for livestock. Intercropping would also reduce the number of weeds in the fields. However, intercropping with forage legumes can be problematic, as legumes must be purchased and planted.

If legumes were used in crop rotations, instead of just intercropping, there would be additional challenges. Using draft animal power to grow non-food crops can also be a health risk for the animals, while also taking time away from growing food crops. Land tenure

systems would also have to be changed, if forage based crops were planted and grown (McCown et al. 1979), as they would have to be done in some sort of family reserve, so others did not use them as common village pasture.

The use of manure, intercropping or crop rotations with legumes, and more controlled animal traffic when traveling to grazing areas would reduce the pressure on the most palatable plants in grazing areas, thereby allowing them to be more competitive with weeds. However, without a strategy of rotating animals and somehow controlling their movements, this is likely a greater challenge than controlling weeds in the cropping areas.

The skill level of the Maasai with draft animals was high enough that they could easily weed with the animals, given the encouragement to do so. In its simplest form this could be done with a small plow and a donkey, or with a team of oxen, wearing muzzles and a wider than normal yoke. The use and availability of cultivators would likely be a major constraint.

10.6 - Identification of better methods of agriculture

The high input systems designed by Western scientists have had a 50 year, but disappointing history in Tanzania (Kjaerby 1983, Jorgensen 1988, Lane 1996 & 1998). The "Green Revolution" in Africa has largely been a failure when compared to Asia (NRC 1996, Paarlberg 2000). These modern systems have not been beneficial to the pastoralist, and only rarely to the agro-pastoralists. While I am an advocate for intensifying the agricultural systems in Monduli District, this needs to be done with the use of appropriate technology, methods for minimizing soil loss, and the increased use of indigenous plants (Richards 1983, Okigbo 1990, Mwalyosi 1993), including local varieties of beans and maize. This also needs to be done with the participation and collaboration of the local people.

[6] This was certainly evident in both Arumeru District and Monduli Juu.

I am not disregarding the importance of high yielding varieties (HYV's)of maize in the research area. Many of the varieties described in Chapter 8 have brought both increased income and food security. This can reduce the pressure to expand agricultural lands, but that was not been the norm. Unfortunately, as described in Chapters 8 and 9, appropriate fertilization, rainfall, or soil conservation measures have NOT been adopted to allow the continued success of HYV maize into the near future. The soil at the time of this research was being "mined" and without fallowing, manuring, or fertilization. The farms will continue to see decreasing yields, as presented in previous chapters, without some change in crop growing strategies.

I believe there must be a different approach. First, I am not suggesting farmers give up HYV maize altogether. Many Maasai and WaArusha farmers have seen the benefit of good genetics. Understanding the benefit of good genetics important. Some of these genes have certainly influenced local varieties. There may also be genetically modified crops that offer some hope for the future. Although Paarlberg (2000) and Conway (2000) point out there are many risks, such as the high cost of the technology and the possible escape of "transgenic genes", which could be particularly devastating in third world countries. While the continued use of HYV maize will offer increases in production on "new" or virgin land. Until HVY maize is available that will be cheap, nitrogen fixing, as well as, being a deep rooted perennial plant, it will not likely reduce the environmental problems described above.

Therefore, rather than adopt drastic measures to ensure food security, because of this "soil mining," other viable crop growing and soil conservation strategies must be promoted. This statement below by Holmberg et al. (1991:13) was the impetus for my ideas above and these below,

> *"Perhaps it is time for Northern governments to stop thinking in terms of subsidizing the production of a certain crop, but instead to think in terms of subsidizing various forms of sustainable land use, which would range from*

high tech (but not high energy) growing of various crops to the planting of forests..."

10.6.1 – Alternative Agricultural Strategies

Intensifying the agricultural system in the Southern Monduli District is key to feeding people in the future, regardless of any other conflicts. As mentioned earlier, the intensification and zero grazing or de-stocking option, despite its initial appeal for improving the environment, is not likely to work due to the shortage of water and grass in the dry season. Agro-forestry would also be a difficult concept to sell to the people, without severe economic or environmental reasons to do so. Many alternatives have been tried in nearby areas like Kondoa and Babati, so there is no shortage of ideas in a similar ecological zone (Newman and Ronnberg 1992, Christiansson et al. 1993, Mung'ong'o 1995). Rather than try to outline all possibilities, I have provided a few options below, and will point out the importance of land tenure and wildlife management, as equally important and immediate issues to ensuring the food security in this area.

10.6.1a – Alternative Grains and Crops

Similar to my own study, Sano (1999) provides an interesting case study, describing the use of sorghum and finger millet. [7] He looked at the introduction of sorghum due to interventions by regional authorities and an NGO called *Concern*, in the Iringa region. Maize was the predominant crop, in a largely semi-arid area. However, with the adoption (or maybe re-adoption) of sorghum, the village of Mkukula has not seen a famine in the 1990's despite this being a recurrent problem in the 1980's.

In addition, he found that since the 1970's and 1980's there has been widespread use of the ox plow in Iluwala and Mkukula villages in the Iringa region. Interestingly, the

[7] Millet is a traditional Tanzanian dry region crop, and continues to be grown largely for local beer production in much of the Arusha Region.

entrenchment of commercial plowing left the poorer farmers at greater financial risk. This was especially the case in Ikuwala. In Mkukula the plowing remained less commercialized, and access to plowing could be obtained by engaging in an exchange of labor or even free of charge. This was similar to statements made by Maasai and WaArusha farmers in Monduli District, who said you can be helped with oxen, but no one will help a poor farmer with a tractor if they cannot pay (see Chapter 7).

It would seem that in the study area, the villages such as Mbuyuni and Mswakini, might be much better suited to millet or sorghum production (Lal 1993, NRC 1996) based solely on soil moisture problems. Both crops are well known for being drought tolerant and growing in many of the more arid regions of Africa (NRC 1996). Millet is a traditional African and Maasai food source, being well adapted to low rainfall areas. Millet can produce at low levels of soil fertility, germinate in high soil temperatures, and grow with minimum amounts of moisture. Millets may also have a real place in marginal areas or areas undergoing reclamation. However, it does not produce as large a crop as maize per acre, and it suffers from a great deal more damage from birds. It certainly has a readily available market in Northern Tanzania, for both beer brewing and food. The downfall is that it does not produce as well as maize. As a result when maize was initially introduced it had many advantages. In high rainfall years maize continues to be a very profitable crop. However, without food aid, in years with low rainfall, some of the research villages would be hard pressed to meet their grain needs. A few farmers discussed having grown finger millet, particularly in Mswakini and some showed me their bird-damaged fields. There is potential, but bird resistant varieties would have to be developed.

Sorghum on the other hand, is one of the most productive and efficient grains grown by mankind in harsh environments. Most people interviewed were not as familiar with the crop and preferred to eat maize, millet or rice. Sorghum is a crop that was taken from Africa

and used around the world. Today it ranks as the world's fifth most important crop (NRC 1996). It has been the focus of more research than millet, yet still falls far short of the importance that rice, maize and wheat on the international research agenda. It would take a widespread change in attitudes and cultural preference to encourage Maasai to grow and eat sorghum, which may be impossible, without some widespread ecological disaster or economic incentive to do so. [8] Adoption of any crop is influenced by taste preferences by the people. In any case, adaptation in the long term must be judged by the degree to which the land use practices can be maintained without a decline in the productive capacity of the land (Boserup 1981), not by the "experts" who know what is best for the indigenous people.

The use of these crops has largely been abandoned, not because they were ill suited to the region, but rather because as indigenous crops, they have not received the attention of national and international research centers, NGO's, or the international business community. In Tanzania government policies long promoted maize, wheat and rice, all non-native crops, through various subsidization schemes. Their future lies, at the moment, in the hands of the people that have little interest in promoting a crop that will not likely be sold in Europe or North America. Although NRC (1996) points out that given environmental degradation in many parts of the world, sorghum is on the verge on a "global breakout". This is due to the human need to feed more and more people on less land. Much of the future farmland adopting sorghum will have to be in marginal agricultural areas like the research area described in this text.

Millet and sorghum have been grown in the past by Maasai. The use of these crops in nearby, drier regions, like Dodoma and Kondoa, certainly point to possibility of exploring the use of these crops in the drier areas of Monduli District. Their greatest prospects might be in

[8] Although, Downing et al. (1990:131) said, "*Even such a simple policy such as requiring sorghum flour to be included in bread, would stimulate the market for sorghum, which is more suitable (in some areas) than maize*

those villages such as Lashaine and Mbuyuni suffering from the most severe degradation and soil fertility loss.

Beans will continue to play an important role in both food and financial security. The development of faster maturing varieties in particularly important in areas with erratic rainfall. The development of varieties that are well suited to intercropping should also be encouraged.

10.7 - Land Tenure

The technological solutions and possible remedies for environmental degradation are easy, compared to the social and institutional change needed to make real changes in the environment. The land tenure issue has been a serious problem in Tanzania. Tanzania has adopted a largely free-market economy. This came with a huge influx of foreign investment. With the increase in tourism, international business, and trade, there has also been a lot of pressure on the state and individuals to sell land. Land in many cases, which they neither have title to or the right to sell. Chapter 6, described the situation and implied that policy changes will be necessary if any real impact will be made on reducing loss of land in the future.

Land tenure change, for the Maasai, will be particularly difficult as much of their land is commonly owned and under village control. The land laws that impact them have chaged little since the 1923 Land Law. Swift (1995:161) describes the need for reform below,

> "*Administrative reform in the field of pastoral land tenure should concentrate on restoring and supporting customary control of resources.*"

However, the need for restoring the customary control of resources, will likely be impossible given the history of the last 100 years, and current land uses and wildlife reserves in the research area. There are too many people that do not want the

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the current staple."

pastoralists to have the control they have had in the past, especially with far more people and only a fraction of the land now available for grazing.

There has been volumes written on how to effectively distribute tenure to pastoral lands (URT 1994, Lane 1998). Ultimately the problem is that open land is all too enticing to other people who have no land at all. In the case of wildlife conservationists, the Maasai lands (as described in Chapter 9) are also the only lands where any kind of migration and buffer zones would be even remotely possible. The Maasai goal continues to be to maximize cattle numbers and use crops as a means to that end. Yet, ultimately growing crops on a large scale has major implications for wildlife, future land allocation and distribution, as well as the future of cattle raising in this area.

This has created a tremendous pressure on the open land in Southern Monduli District (as described in Chapter 9). Walking or driving through the district with any local men, there was always discussion about someone who had sold land illegally, or who was being taken to court over illegally using or leasing land that did not belong to them. One example was a plot of land sold to a religious group to build a church, in Arkatan. The individual had no title or right to sell the land. Once the church was built there was little that could be done, according to the local people, yet as a village leader, he had sold a village resource for personal gain. Such was the incentive to sell land, in Monduli District's cash poor and land poor situation. This has also become the reason why land tenure needs to be more clearly defined, and addressed with a sense of maintaining any options in the future.

According to Rigby (1986:135),

> *"Tanzania's land tenure system has neither controlled land grabbing nor given security to the cultivators."*

This statement is as true in the year 2001, as it ever was. In the Monduli District there has been a great deal of settlement in the same 15 years (see Table 5.1), increasing the pressure or "land squeeze" on an already tense and fragile situation.

In Tanzania there has been tremendous efforts and time given to exploring the issues that surround land ownership and use (URT 1994, Sundet 1996 & 1997, Shivji 1998). Among the Maasai and WaArusha in the Arusha Region there has been at least an equal amount of discussion, debate and proposals (Ndagala 1992c, 1994, 1998, Lama 1998, Lane 1998, Guy 2000). Even in Tanzania there are new land laws called the Village Land Act – 1998 and the Land Act –1998, which institute new land tenure policies, but these have not been signed by the President of Tanzania.

One of the major efforts in Tanzania, has been to simply get the villages, which now largely control the land, to develop land-use management plans, based on boundaries that have been surveyed and marked out (Lama 1998, Ndagala 1998). Yet, there has been a severe lack of money and expertise to "demarcate the land". In the meantime, land in villages continues to be given away under the "user rights" arrangement to any villager who needs a plot for a home and subsistence crops. The random development is quite evident and continues despite the understanding that this process has continued to force the people down the spiral of poverty.

Sinclair and Arcese (1995:) suggest that,

> *"Land Tenure is an essential prerequisite to promoting effective land husbandry, since villagers are unlikely to invest time, money and labor in the careful utilization of resources they do not own. Giving villages title deeds to their land, by demarcating it and working with district authorities, has been accomplished in Loliondo Division of the Ngorongoro District. Once villages have title to their land they are then assisted in assessing their own resources and developing a land use management plan."*

The situation has become so severe in Monduli District that Ndagala (1998:167) suggested the following:

1. *Further alienation of land in pastoral areas should be suspended immediately, to allow villagers to determine their real land needs. Unless alienation is suspended some villages will hardly have any land left by the time they are due for survey.*
2. *The villages should be helped to produce land use plans for pastoralism, along with agriculture and other productive strategies.*
3. *The villages should enact by-laws that will ensure that their members protect the environment*

Ndagala (1998) also points out, the successful implementation of village title and land use plans needs the cooperation of many people. This included researchers, legal experts, planners and NGO's, who must all work together to help pastoralists take control of resources in a sustainable way. This is because there have been few concrete and well designed systems of land tenure for pastoral or even agro-pastoral people anywhere in Africa.

One reason so many people were needed to accomplish this, was that there was no simple model to follow. There have been many ideas (Sperling and Galaty 1990, Dyson-Hudson 1991, Behnke and Scoones 1993) but very few successful long term pastoral case studies to follow, especially when wildlife were part of the system (Western 1994). There have been so many failures, that as Goldschmidt (1981) pointed out, people and planners never seem to learn from previous mistakes.

Galaty (1994:200) suggested these future options for pastoral tenure in Africa,

> *"....Perhaps it is time that their (African) systems of land tenure were modeled on conditions of aridity, mobility and community, rather than on the individuals sedentary husbandry practiced on high density farmland in jolly England."*

Certainly village titling and land use plans remain somewhat unique, compared to the individual or national control of the grazing and open areas seen in North America. While

village titling and land use plans may have been accomplished in Loliondo (according to Sinclair and Arcese 1995), there remains a tremendous amount of agricultural pressure in the Loliondo district, like Monduli. The challenge will not be over once the village receives title. For example, the Maasai in Ngorongoro Conservation Area have not been allowed to cultivate. Many of them have migrated to Loliondo to do so. Furthermore, giving village authorities the legal title can be troublesome. There has been a lack of formal oversight, and accountability in most villages. I personally met former village treasurers, who were operating businesses in other towns, possibly with the funds that were said to have disappeared from their former village. There were also many land sales that seemed to occur, when someone wanted land over and above the "User Rights" provided by the village or customary tenure, inherited from family members (see Table 6.1). This will continue to haunt the Maasai, and I believe will be the greatest challenge in maintaining land under village title.

Place & Hazell (1993) conducted studies in Kenya, Rwanda, and Ghana. They focused on rainfed areas of agriculture only, similar to the study area in Monduli. They found that the inheritance of land continued to be the most common method of land acquisition. Land rights evolved slowly in response to population growth, agricultural commercialization, and changes in broader economic and political circumstances.

However, in contrast to what many of the authors presented as arguments above for reasons to encourage villages to acquire titles, in Madzu, Kenya land rights were not significantly related to land improvements (Place and Hazell 1993). Even given the many ranching schemes and wildlife management programs that have been initiated in Kenya (Graham 1989, Sperling and Galaty 1990, Campbell 1993, Western 1994), there continues to be degradation and poverty, despite these lands being held more by individuals and families than by villages. The land tenure experience in Kenya suggests that traditional tenure often exerts a stronger influence than do land titles (Place and Hazell 1993). In fact many people in

their study in Kenya had the right to a title, but had not bothered to update existing titles to reflect current ownership status. Place and Hazell (1993) point out,

> *"Our study provides little support for ambitious land registration and titling at this time"*

Lama (1998) suggested a formal land use plan, in addition to village title. This offers many advantages, as the people in the village would know that land would be determined to be for common grazing, seasonal grazing, crop growing, homes and or other uses. Lynam and Herdt (1992) also described land use planning as a way to designate appropriate areas for activities the land is best suited to.

The problem according to (Lane 1998:11) is,

> *"Formal land use planning often accompanies settlement and complicates matters for pastoralists, because of the planners inability to reflect the complexity and necessary flexibility of customary land tenure arrangements which permit mobility."*

There will be no shortage of work, whether it be research, political or ecological, to be done in finding better solutions to land tenure and land use zoning in pastoral regions of Tanzania. As stated in Chapters 6 & 9, the greatest challenges in this area are what to do with the wildlife. They add a whole different dimension this area, more like what has been seen in nearby Kajaido District in Kenya.

10.8 – Dealing with Wildlife Conflicts

As described in Chapter 9, wildlife were considered a menace by most of the farmers interviewed. Most recognized that there was value in having the wild animals, but this value rarely trickled down to them as individuals. They did not describe wildlife as "second cattle", as discussed in Western (1997).

Ndagala (1998:163) described the wildlife situation in Monduli District (belwo) as one of many "*environmental implications*" facing pastoral development ,

> "*Grazing livestock in the game areas is not allowed, but pastoral land is not protected from encroachment by wild animals. Marauding animals are a permanent threat to human life and to herds, as they compete for available grass during the dry season.*"

While the agro-pastoralists in the research area did not face the hardships described by McCabe et al. (1992), Taylor et al. (1996), and Potkanski (1997) who described the situation of dwindling herds and a complete lack of crop growing areas in the Ngorongoro Conservation Area. The Maasai and WaArusha agro-pastoralists in this study nevertheless faced many hardships and hard feelings as described by Ndagala (1998).

The wildlife depend upon the pastoral areas in Monduli district to migrate from wet season to dry season grazing areas (see Figures 1.1 and 6.1). While this migration was less dramatic than what is seen in the Serengeti and Masai Mara, it is nonetheless important to the survival of the wildlife in Lake Manyara and Tarangire National Parks. To the Maasai the conservation of wildlife was seen as an impediment to their expansion of cropping areas and their livestock numbers. To ignore this situation in light of the rapid agricultural expansion, would have been a grave oversight in this research.

There have been a great number of books and articles written on this topic. These authors have more expertise both in the ecology of the region and the conservation techniques necessary to protect both the wildlife, as well as the economic security of the local people (Yeager and Miller 1986, Anderson and Grove 1987, Sinclair and Arcese 1995, Western 1994 & 1997, Neumann 2000) than I will ever have. However, it is important to explore their ideas from the perspective of the agro-pastoralist, as this research focused exclusively on the human side of conservation and development.

Yeager and Miller (1986:144) pointed out that despite the moral and political dilemmas arising from a greater use of wildlife by the local people, the inevitable challenge will continue to be the feeding of a rapidly growing human population that surrounds the wildlife areas. Therefore they conclude,

> "*Concomitant improvements in agricultural land use will lessen the deadly ecological chaos that now prevails in the vicinities of most, if not all of Africa's wildlife areas. This outcome will serve both people and animals, rendering unnecessary a choice between them, but the plan will only work if tourist and other revenues are specifically dedicated to all side of the man-land-wildlife triad. In the final analysis, these and all such opportunities are matters of human awareness, will and public choice. The urgency of the present situation demands that immediate attention be paid to each.*"

Using this statement as a springboard, it would seem inevitable that there must be a greater investment in soil conservation and agricultural improvement technologies and land tenure reform as described earlier in this chapter, as well as in Chapters 6 and 9.

There has been a great movement in East Africa to use some of the Community Conservation Techniques described by Western (1994 & 1997) to address this situation, as has been done in Amboseli National Park in Kenya. Western pointed out, sharing revenues and getting Maasai to commit to wildlife conservation has not been easy. Over the course of twenty years there have been many failures, both on the part of the support of Maasai development through tourist monies, and by the Maasai in retaliation to the strict rules placed on their movement of livestock.

Throughout Monduli District there were numerous Community Conservation efforts that have been promoted by local NGO's such as Inyuat-e-Maa, with the support of the Africa Wildlife Federation in Arusha. There have also been commercial hunting companies, in villages like Lendikenya and Selela, which use revenue sharing as a means to offer support to the villages through school construction and water development projects. Finally, there have also been direct efforts by the Tanzanian government through the Tanzania National

Parks (TANAPA), as described in Chapter 9, as a way to share revenues with the villages that were most severely affected by wildlife encroachment and damage.

Staying in Arusha on weekends, I had the chance to meet numerous wildlife researchers including A.R.E. "Tony" Sinclair, author of Serengeti and Serengeti II. One night over dinner we discussed Maasai pastoralism, and Tony described the challenges that both the Maasai and the wildlife face, with regard to agricultural expansion. His ideas were central to my work, despite my work already being underway. I also met a number of his graduate students working on research projects that included research on land outside the National Parks, on Maasai land. One interesting project involved a graduate student studying cheetahs (*Acinonyx jubatus*). Apparently there appeared to be a greater concentration of cheetahs outside one of the National Parks, because the Maasai continue to harass and kill lions near their homes. The cheetahs rarely kill livestock, and seemed to be more compatible with Maasai pastoralism than other large predators. While cheetah numbers in Tanzania were dwindling, it was an interesting study, but one that highlights the conflict with wildlife that continues, despite the notion, that *morani* no longer try to kill lions to prove their manhood. [9]

Sinclair and Arcese (1995:609) described their perspective on protecting wildlife through community based conservation,

> *"The development of sustainable resource use in the local communities outside the protected areas is the only effective way of relieving human population pressure on protected areas in the long term. However, if local communities are to accept new practices, it is essential that the changes be made voluntarily by the residents, not through coercion or enforced controls. The Serengeti Research and Conservation Center has so far introduced methods to improve crop production, to provide incentives for farmers to use sustainable methods of cultivation, and to involve the farmers themselves in discussing problems and identifying solutions."*

The concept of participatory planning has been something that most development planners and conservation groups promoted as mandatory to ensure the people that any

development or conservation projects were not being forced upon them. This will be described later in this chapter, yet it is a central concept not only to agricultural development, but also to encouraging improved conservation practices. Ignoring the people's needs and wishes, did little to conserve wildlife in the early years of the establishment of Amboseli as a protected area (Western 1994 & 1997). As described in African Wildlife News (2000), there have been many concessions made to the Maasai in and around Amboseli in the name of conserving elephant habitat outside the park.

The statement above also included examples of how a conservation and research group in the Serengeti, promoted and supported agricultural development, a concept I described earlier in this chapter. If wildlife continue to be a major foreign currency earner in Tanzania, and the people continue to see little personal benefit (as was described in Chapter 9), the future of common grazing lands for both wildlife and livestock will deteriorate.

Sinclair and Arcese (1995) also alluded to the use of wildlife in other ways by the local community. This included local hunting and the sale of wildlife products. This of course implied ,as long as it was done in a controlled manner, but it was also a formal national policy described in URT (1998).

In 1998 and 1999 I went on a number of commercial safaris. My goal was to see first hand, the great numbers of wildlife that reside in the national parks, but also to see how the landscape differed both inside and outside the National Parks. The landscape itself differed little when viewing the park and a Maasai grazing area. However, as mentioned in Chapters 5 and 9, I also saw a greater number of wildlife outside the parks. Inside the park the animals were in greater concentration, but similar to wildlife parks in the United States, the animals know when they are in a park and when they are no longer protected outside it. Thus they seemed more scarce outside the parks.

[9] I did meet one Maasai man that described killing a lion as a morani.

There are other options with regard to community development. The migration of wildlife was of great concern. Paul Oliver, of Oliver's Camps, outside Tarangire National Park was another acquaintance (see Honey 1999:4-32). Over dinner one night he told me I should take a flight over my research area (which I could not afford), because I would see how little area the animals have to move between Tarangire, Ngorongoro and Lake Manyara, because of agricultural encroachment. He also said, that without Maasai grazing lands, the wildlife will not survive in the long term.

Paul also described the challenge of revenue sharing, which Honey (1999) highlighted in her article about Ecotourism and Olivers Camps. First, Oliver's Camp pays TANAPA $20/person/day to pass through and use Tarangire National Park (a standard fee for National Parks). In addition, Oliver's Camp pays two Maasai villages $12 US per tourist/night who stays in his camps. In addition he pays the villages an annual rent for use of the land for camera safaris. The Massai agree not to farm, cut trees, hunt or graze their cattle, except in times of real need. It seems like a win-win situation all around. However, Paul described one of the challenges that often faces anyone handing over funds to a village. After a period of some months, the villagers began to complain that they had not received any money. They thought Oliver's Camp had not made their payments. When receipts for payment were presented at a village meeting, the problem of accountability and oversight in village programs was evident, as some of the village leaders has taken the money and used it for personal use. While this problem was corrected, it displays the challenge with village control, as described in section 10.6.

Finally, there have been numerous programs where Maasai have been paid for similar rights to their grazing areas, such as in 1999, in Ololosokwan, Western Tanzania, where a village received a lump sum of $35,000 US, and a share of lodge rentals over a 15 year period, to be paid by a South African Tour Operator (AP Worldstream 1999), but this

deal resulted only after numerous lawsuits, with the help of the African Wildlife Foundation, against an Italian businessman, who had previously tried to seize the title to the land.This again pointing toward the need for an improvement in the land tenure system among the Maasai.

10.9 Maasai Tourism

There are many other options for Maasai development. Many Maasai men own businesses, buy and sell livestock, and use other means of acquiring cash, including the *morani* guarding homes and businesses. Being unique and well known, the Maasai have also tried to capitalize on sharing their culture. The idea of bringing people to the Maasai is not new. For example, in 1998, Sports Illustrated Magazine (Annual Swimsuit Edition), ran a series of photographs with women in swimsuits among Maasai *morani*. Clearly it was a marketing strategy to capitalize on the unique culture of the Maasai and portray this in contrast to modern American female swimwear. The author details how they had to pay the *mwenye boma* $1000 for this photo opportunity. This was presented to readers in jest, as if it were a lot to pay for their services. Given what the budget for a photo shoot in Kenya must have been, it was likely the smallest item on the budget.

While, such opportunities can generate income, they often do not reflect the value of what has taken place, nor do they reflect any long term security like land or cattle for the Maasai. Furthermore if the *mwenye boma* was given the cash, it was not likely the younger men in the photographs received more than a few dollars each. In the worst case scenario they were being exploited. In the best case scenario, they may have generated enough money to buy a small goat or a few days worth of food. This might seem like an extreme example, but driving along any major tourist road in Maasailand, you will find young boys trying to

sell themselves for photos, rather than trying to build their skills as herders, farmers, or businessmen.

Ecotourism and cultural *bomas* for tourists have gained popularity among visitors to East Africa. They supposedly help the local people. The cultural *bomas* I visited did seem to provide some additional income for women and young or old men in need of cash. They were also outlets for crafts and even wildlife products. There was also some cultural learning for the Maasai. However, there was also the perpetuation of the "Colonial Ideals" of one race being better than the other. While cultural *bomas* provide some income, they are not, and cannot be a replacement for livestock and agriculture for Maasai. Realistically, they are often more a measure of desperation, for people that have lost the means by which to earn a living, including their land, their livestock, and even their labor.

One of the most publicized "*cultural bomas*" was described Bruner and Kirsjenblatt-Gimblett (1994) in their article called "*Maasai on the Lawn: Tourist Realism in East Africa*". The article, written by anthropologists, critiques Mayers Ranch in Kenya, which essentially portrays Maasai as actors. The Maasai were trained to meet the tourists expectations, stripping themselves of their real belongings such as watches, socks, tee shirts, radios or any metal, aluminum or plastic containers. According to the authors, while the Maasai understand their role, the Maasai are really in it for the money, "*and that with the money provided by their work at Mayers they are able to increase their herds and maintain their culture (p.465).*"

I visited a few cultural *bomas*. Some were well done, in that they had tour guides, places to camp and eat, and formal tours to real homes and schools. In some cases it was a setting within which to tell their story and describe their dilemma. This was not the case in all instances. Sometimes the people running them were desperate for tourists to stop. Not understanding the desires of tourists, they sometimes created a situation, where tourists and

drivers became reluctant to stop, due to harassment and the feeling of being manipulated or worse harassed by the owners.

At Mayer's Ranch, the owners knew what tourists wanted. In many cases it was not a real view of the Maasai, it was the picture book view. They did not want to see the flies, the health problems, or the lack of colorful clothes that so frequently is the norm among rural Maasai *bomas*. Without some education, intervention, and tourist training, the chance of cultural bomas and other tourist based businesses being anything more than outlets for desperate people is slim. Yet the intervention by some outside group, that might assist with marketing and training also means there will be less money going to the people. The best hotels and most expensive tour operators rarely work with the small local Maasai communities in ventures where the Maasai were the major beneficiaries. Ecotourism can help the Maasai, but it will not sustain their culture or feed their masses for the future with any sense of dignity.

10.10 - The Maasai vs. WaArusha

In Chapter one, I posed questions about how the Maasai and WaArusha agricultural systems differed. This section will explore some of those differences, and highlight some of the differences between the groups. As described in Chapter 3, I did not see any open hostility, but you could sense that there was some degree of animosity between the two ethnic groups. There was some separation by ethnicity, yet in some villages such as Selela, there was a great mixing of many ethnic groups. In other villages such as Lolkisale, Mbuyuni and Mswakini these were exclusively WaArusha areas. Other villages, such as Losirwa and Esilalei were primarily Maasai villages.

The WaArusha have voluntarily relocated to some former Maasai areas, such as Monduli, Kisongo (the village of), Meserani, and Lashaine. They have also been forcefully

relocated from the Ngorongoro area in the early 1970's, by the Tanzanian government to be later relocated in Mswakini and Mbuyuni. Their relocation in both examples, have impacted the Maasai and their ability to graze these areas. They were also relocated to areas that did not appear able to sustain their current agricultural methods, such as Mbuyuni.

In Lashaine, this relocation was largely by choice in the 1960's, to alleviate some of the pressure in the nearby Arumeru district (Spear 1993b). However, the establishment of the Military areas in this section of Monduli District has seriously limited grazing areas. Combined with the expansion of the Rasharasha Farms, barley growing by the Tanzania Brewery and a rising population in nearby Monduli town, this has seriously degraded the environment (Kikula. Et al. 1993). To blame the current severe soil erosion problems solely on overgrazing was an understatement.

Mswakini was another interesting example. Many of the WaArusha interviewed said they were relocated to this area by the government. They were given farms after being told to leave the Ngorongoro Conservation Area. This was in the late 1960's, interestingly this was just before Tarangire became a National Park in 1970. This change in land use, not only prohibited herders from entering the park, but it also allowed wild animal numbers to increase, leading to the most severe wildlife conflict of all the villages in this study.

Mbuyuni was another area that was designated for settlement, by the Tanzanian government. The WaArusha complained about the many promises of water sources that have never materialized, or in the case of some sub-villages fallen into total disrepair. Add to this the most shallow and stony soils in this research area, these were some of the most vocal farmers complaining about drought, poor crop yields and the reverting to animal traction, after many years of successful tractor use on the largest agricultural plots in the research area.

Another interesting observation, I had expected the WaArusha in Monduli to have a greater use of ox hiring than the Maasai. This expectation was based on their long history

with the animals and my experience in the Arumeru district. However, the hiring of ox teams seemed to be primarily based on village of residence rather than wealth or ethnic group. Although the WaArusha were very familiar with this concept, more so than the Maasai, they admitted in villages such as Mbuyuni and Mswakini that they freely help someone in need.

The WaArusha appeared to be greater users of donkeys. They were quicker to praise their attributes, and were more likely to be seen using them for cart work. Donkeys in Africa are often seen as an animal to be used by farms in drier regions or by poorer farmers. Donkeys in this area doidnot have a fraction of the value of a mature ox (Lama 1998). Whether this was due to having smaller herds or simply preferring the donkey for its ability to resist disease and subsist on poorer quality feed than the cattle, it is hard to tell from my limited data. As noted earlier, I did not try to count livestock numbers. Yet, WaArusha corrals were on average smaller than Maasai corrals. The greater use of donkeys may have been due to a lower number of cattle to use as oxen, when diseases or poor grazing were problems.

Finally, in contrast to my estimates that the WaArusha had fewer livestock, the WaArusha did have larger agricultural holdings. The average size of all plots controlled by one man was 38.2 acres, while the average size controlled by one Maasai man was 19.7 acres. Thus their fields were on average twice as large. Many fields like those in Mbuyuni were larger, but did not yield near as much as other areas, because of the poor soil fertility and moisture. The size of these fields was something that was often contested, as many older residents said they were given this land, and they used a large portion of their agricultural holdings as personal grazing reserves or fallow land. While this might serve as a model for my ideas behind protecting one's resources, it was also an item that was frequently discussed among others as unfair.

10.10.1 - Social Issues and Potential Conflict

The potential for social conflict has long been in place, as I described in Chapters 6 and 9. Between the pressure on the land and the lack of tenure, there was social tension. Much of this tension has been subdued by a government, which has actively promoted peaceful coexistence among the many ethnic groups in Tanzania. In the past rainfall adequate for grazing and soil fertility for crops has also been in the favor of a peaceful coexistence. However, a severe drought could certainly tip that delicate balance. Because of droughts in other regions there have been recent outbreaks of violence among Maasai and other ethnic groups practicing agriculture in other areas of Tanzania (Mfugale 2000, Rwegayura 2000, and UN Integrated Information Network 2000). Past conflicts among Maasai, agriculturists, and wildlife in near Amboseli, in Kenya's Kajaido District, which were largely due to severe drought, were also well documented (Western 1994 & 1997, Africa Wildlife News 2000).

Increasing food security for all people must be a top priority. It will relieve tensions in the near future among both pastoralists, agro-pastoralists, and the wildlife with whom they share the landscape in the research area. Conserving the soil resources and soil moisture to ensure food security must be also be a top priority. Offering incentives and ideas to adopt more sustainable practices will go a long way to preventing ethnic or wildlife conflict in the near future. I did not see in Northern Tanzania the kind of tension I saw in Uganda. However, people who are hungry and without land, with huge open areas and wildlife nearby are not going to starve when they have other resources at their fingertips (Yeager and Miller 1986). Therefore the problems and tension surrounding a lack of land to grow crops or graze livestock will continue to plague the people who consider it their right to do so, no matter who controls the land.

10.11 Final Conclusions

There are numerous issues that remain unsolved in the research area surrounding the future of food security, rapidly growing populations, and insecure land tenure. It certainly seems possible that both social and wildlife conflicts among the Maasai and WaArusha will continue to escalate. However, the people and government of Tanzania have long set an example of national unity and peace. Hopefully, Tanzania will continue to lead Sub-Sahaaran Africa in this way in the future. There are many people that have a greater sense of this situation than me, including: (Spear and Waller 1993, Spear 1997, Ndagala 1992c, 1994, 1998, and Ole Kuney 1994), therefore, I will not try to predict the future, or offer suggestions beyond what I have already said about agriculture, land tenure and wildlife. I hope the Maasai and WaArusha who befriended me will adopt some of the practices I have discussed above or possibly adopt better ideas. I am sure they can somehow find a way to coexist with the wildlife which have long shared their landscape, while at the same time feeding themselves and their livestock on an ever shrinking land base. The greatest challenge of all may be the necessary change in the institutions, both government and non-government, that can formally and informally lay the groundwork to assist the people in the necessary adoption of more reliable and sustainable food production systems, while at the same time allowing the Maasai and WaArusha people to maintain some of their unique culture that is so widely known around the world. The use and adoption of oxen have been a change agent and technology that has assisted people all over the world for centuries in agricultural development. Reducing environmental problems associated with that development has long been part of a greater environmental nexus that mankind has yet to resolve. Hopefully this dissertation will shed light on a few of the issues that face the people in the midst of agricultural change and development.

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APPENDICES
1-4

MAASAI OXEN, AGRICULTURE AND LAND USE CHANGE IN MONDULI DISTRICT, TANZANIA

Appendix 1

Interview Questions – Tanzania 1999
Interviewee Number_____

Village - _____ Sub-village_____

1. Household Information
1.1 - Name _____

1.2 - How long have you been at this Boma?
1.3 - How large is this household – Wives?
- **Morani?**
- **Others?**

2. Land Use
2.1- How is land allocated for agriculture in this village?

2.2 - How is land allocated for grazing?

2.3 - How many fields do you have for growing crops and how large are they?

2.4 - How are the fields located?

A) All Together B) Scattered in Different AreasC) Far Away

2.5 - What crops are you growing?

1. Maize (Mahindi) 2. Beans (Ngwara, Soya, Rosecoco, Mbaazi, Canadian) _____

3. Rice (mpunga) 4. Cowpeas (Kunde) 5. Finger Millet (Mbege) 6. Tree Crops

7. Sorghum (Mtama) 8. Cassava (Muhogo) 9. Sunflower (Alizeti) 10. Chick peas (Dengu)

11. Tree Crops (Mgomba, etc) 12. Sweet Potato (viazi vitamu) 13. Vegetables

2.6 - For the crops you have listed, for which ones do you buy seeds?

2.7 - How often do you buy seeds? (every year, sometimes....Please Explain)

2.8 - Where do you buy seeds?

2.9 - How have seed choices changed over the years?

2.10 - What influences your choice of seeds when you do buy them?

2.11 - Do you notice any differences in the crops in their resistance to drought?

2.12 - Do you grow them in a sole or mixed stands? WHY?

2.13 - What is the difference between the crops you grow now and what you were doing 10-20 years ago?

2.14 - Do you use fertilizer?

2.14a - Where do you buy it?
2.14b - What type do you buy?
2.14c - How many bags/year?
2.14d - Is fertilizer always available?

2.15 Do you have any problems with pests (wadudu) in your crops?

2.15a – What pests have you had a problem with this year?

2.15b – Do you notice any differences in the crops and their resistance to pests?

2.15c – What crops do you use pesticides on?

2.15d – Where do you buy them and are they always available?

2.15e – Do have problems with wildlife eating or destroying your crops? What type?

2.16 Do you use manure?
2.16a – On what crops?

2.16b – How often is it used (each year?)

2.16c – How is it moved?

2.17 - What type of primary cultivation techniques do you use?

a) Tractor b) Jembe c) Oxen d) Other

2.18 – What type of secondary cultivation techniques do you use?

a) Tractor b) Jembe c) Oxen d) Other

2.18a – Who does this work?

2.19 – How has the soil condition changed in your crop fields in the last 10-20 years?

2.19a - How is the soil condition in your crop fields now?

2.19b – How is the soil condition in your grazing areas?

3. Livestock

What type of livestock do you have?

3.1 Cattle _____ 3.2 Goats _____ 3.3 Sheep _____ 3.4 Donkeys ____
3.5 Chickens ____ 3.6 Pigs _____

3.6 What disease problems do you see in your livestock?

3.7 Are medicines available?

3.8 Are there any diseases caused by wildlife in your herds?

4. Draft Animals – Yes or No?

4.1 What type? A) Oxen
B) Donkeys in yokes
C) Other

4.11a - Which animal do you prefer to use?

4.11b - Why?

4.2 - What activities are the draft animals used for?

A) Plowing B) Transport of Building Materials C) Transport of Water
D) Transport of Manure E) Transport of Sick Animals to the Boma
F) Harvesting G) Other Activities:

4.3 - How long have you used draft animals?

4.4 - How have draft animals changed your farm's composition?

4.5 - How have draft animals changed your farm's size?
4.6 - How have draft animals changed the profitability of your farm?

4.7 - How have draft animals changed the environment in this village?

4.8 Are draft animals widespread in this area?

4.9 How many years have draft animals been used in this area?

4.10 Are women involved in the use of oxen or donkeys for work?

4.11 Do you hire out your oxen? If yes, for what price?

4.12 – What is the future of draft animals in this area?

5. Environment
5.1 What are the major environmental problems in this village?

5.2 What are possible solutions to these problems?

5.3 How has the local environment changed in regard to agricultural biodiversity?

5.4 How has your herd mobility changed?

5.5 How has growing crops changed your herd of livestock?

5.6 Is the use of agriculture and crops the best path of development? What about other alternatives (for example wildlife management)?

5.7 How have you coped with drought in the past, with regard to both crops and livestock?

Appendix 2

Summary of Phase I of Research 1996 and 1998

Are Draft Animals an Indicator of Agricultural Biodiversity in Tanzania?

By Drew Conroy
January 12, 1999

PART I - OVERVIEW

One year ago my goal was to travel to Tanzania in order to get a better sense of how the use of oxen might be affecting the environment, particularly the agricultural biodiversity on small farms in Northern Tanzania. With the help of a number of interpreters and local research assistants I have gained a lot of insight and experience in this endeavor. Using Rapid Rural Appraisal (RRA) techniques I interviewed many people. Government officials, extension officers, Non-Government Organizations (NGO) leaders, as well as farmers and herdsmen of many different tribes, were my target audiences. Oxen are changing the landscape and influencing the livelihood of many farmers and pastoralists.

My project began March 3 at the University of Dar es Salaam. In the sweltering heat of "Dar" I spent about 10 days getting research clearance and a temporary residence permit. With the help of the Institute of Resource Assessment at the University I was able to find maps to help target villages in Northern Tanzania. From Dar es Salaam on the Coast, I traveled by bus to the Pare Mountains near Moshi, in the Kilimanjaro Region.

Staying with a Tanzanian teacher in Kisangara, for three weeks I practiced my Swahili and interviewed Pare farmers with the help of a Msafiri Banduka. The Pare people are just beginning to adopt oxen, and the impact on their agricultural system was hard to gauge. I was able to get a sense of the presence of European breeds of cattle. Holstein, Jersey and Ayrshire cattle were found on many farms that were "more progressive". Native Zebu cattle, as well as goats and sheep, were found on nearly every small farm.

While visiting a cattle market in the Pare mountains, I met the Maasai people. They told me stories of their many oxen and the numerous crops they were growing. With some skepticism, as I believed they were strictly pastoralists, I jotted down their tales. I had not planned on interviewing the Maasai or including them in my study. The Arusha and the Meru people had been my targeted populations.

Traveling to the Arusha region by local bus in the beginning of April, I was inspired by the many oxen I saw at work in the fields. Of particular interest were the great numbers of Maasai that were plowing fields and planting crops.

Much of Northern Tanzania has been the home of the Maasai. I never included the Maasai in my original survey plans. I believed as pastoralists they relied on others to grow any crops they consumed. I had read in a number of books that cultivating land was below them. It was obvious during my first few weeks in Tanzania that this might not be the case. The Maasai consider themselves great cattlemen and from my observations they are. They also readily adopt oxen to aid them in adapting to Northern Tanzania's rapidly changing landscape. Northern Tanzania is the home to some of the greatest wildlife areas in the world. The Maasai have been restricted from using many of their traditional grazing lands. Due to population pressure and ever expanding wildlife areas, their pastoral system is changing. The Maasai have had to become more sedentary. Maasai more than other tribes despise using a jembe or hand held hoe. Therefore, using oxen makes agricultural operations much more tolerable.

Maasai adopting agriculture is not new. The existence of the closely related Arusha tribe with their Maasai clothing and Maasai language have been practicing sedentary agriculture for generations. They settled on the well-watered western slopes of Mount Meru. Today their form of agriculture seems to include many modern inputs, and they have also adopted many European breeds of cattle and crops. The Meru people also live on the slopes of Mt. Meru, in the Arumeru region. Both groups have traded with the Maasai for generations. Both have been using oxen much longer than the Maasai.

The adoption of oxen by the Maasai is poorly documented, but appears to be widespread in the Arusha and Kilimanjaro regions. Many Maasai cited the Ujamaa village scheme (a forced settlement program) as the main reason they had adopted oxen. However, many people had adopted oxen only recently, without any pressure from the government to do so. There seems to be many Maasai pastoralists who are just beginning to make this transition to animal power in the Arusha region. Other reasons surfaced as to why oxen have become a primary power source for the farm. The Maasai tend to live further away from main roads and transportation routes, thus vehicles and tractors are virtually non-existent. In addition, the Maasai would rather place their investments in local cattle rather than foreign-made and extremely expensive equipment. My initial observations showed that the Maasai are using oxen for many more activities than other tribes in the region.

Draft animals and farmers are changing this region of Tanzania. As agriculture spreads into traditionally dryland grazing areas, the extensification of cropland and increased pressure on dwindling grazing land is changing the landscape and possibly the domestic animals within it.

I will be returning to Tanzania in 1999 for three months to complete my fieldwork for my Ph.D. I do not believe that the local breeds of sheep and goats are in any danger of genetic erosion, as indigenous animals are all that can be found. However, the native cattle breeds may be the first to be impacted by this change in agriculture. As people become more stationary, so do their animals. The Arusha and Meru are already beginning the widespread adoption of more productive dairy breeds of European cattle. As farms become smaller many farmers perceive there will be no need for cattle to be able to travel great distances and

withstand harsh environments. This perception may be true, but the drylands which the Maasai occupy are prone to drought, and European breeds do not do well when they have to search for water across tick and Tsetse fly infested areas.

There is still a lot I must learn. But I am now able to plan my research with a much better sense of what I will include in my formal survey, how I will be conducting it, and how much the project will cost. The Maasai and the related tribe, the Arusha, will be the primary groups I will survey in 1999.

I have included five other parts in this report. Part II includes the villages I visited. Part III includes the people interviewed, and Part IV is a summary of the questions I asked. Part V is a summary of the answers with some interpretation. Part VI is a brief summary.

These parts of the report are also the results of my observations as a participant observer in many villages, markets, and ceremonies, with interpretation again by my assistants. Some of my time in the field was even spent living with the people in their rural villages.

PART II - WARDS/VILLAGES VISITED

Kilimanjaro Region

1. Chanjale
2. Kisangara
3. Kisangara Juu
4. Lembeni
5. Mwanga
6. Ngulu
7. Nyumba ya Mungu
8. Same
9. Ugweno
10. Kahe
11. Mwangaria

Arusha Region

I. Arumeru District

East - A) Highlands
1. Ngare Nanyuki
2. Sakila

B) Midlands
3. Kikatiti
4. Maji ya Chai
5. Mararoni
6. Tengeru
7. Usa River

C) Lowlands
8. Nduruma Chini (Mararoni Kitongoji)
9. Karengai

West - A) Highlands
10. Oldonyo Sambu (Lemongi)
11. Olkokola
12. Engare Olmotoni
13. Mkulat

B) Midlands

14. Lasiraa
15. Kisongo

II. Monduli District

16. Arkatan
    2 subvillages visited
17. Lashaine
18. Lendikeyna
19. Mbuyuni
20. Mswakini
21. Makuyuni
22. Meserani
23. Monduli Town

PART III - PEOPLE INTERVIEWED

The original document had a list of 85 people interviewed in 1998. Almost half of the list were the farmers and agro-pastoralists interviewed. The remainder were extension officers, teachers at agricultural schools, NGO leaders, researchers, village leaders, and many other informants. These I have not included here, for the benefit of those interviewed.

PART IV - PRELIMINARY SURVEY QUESTIONS

The survey questions were simply asked of informants if they were willing to discuss the topic. Informants ranged from Extension Officers and NGO leaders to farmers we saw that were using draft animals, and others we met in our travels. Since much of my work was done on foot (kwa miguu), these interviews often included farmers traveling to the fields, farmers participating in markets, and even farmers in town. This was not a random sample, but it did represent farmers using draft animals from many different income levels in an area that covered the many different
agroecological zones around Mt. Meru, as well as the grassy plains from Monduli to Makuyuni.

Oxen Questions:

1) Are Oxen used in this village?
2) What activities are they used for?
3) How many oxen are used for plowing?
4) How long have oxen been in this area?
5) At what age do you begin to train the oxen?
6) At what age do you sell the oxen?
7) Where did you learn to use oxen? What about your father?
8) How has the technology of using oxen changed in your lifetime?
9) How much can a team or span of oxen plow in a day?
10) Can you hire oxen in this area?
11) How much does it cost to hire them?
12) Can tractors be hired for plowing?
13) What is the cost per acre?
14) Do women work oxen?

Livestock Questions:
15) What type of livestock are kept?
16) If you keep exotic cattle breeds, do you use them for work?
17) How do they compare to Native Zebu?
18) What are the major livestock disease problems in the area?

Crop and Farming System Questions:
19) What crops are grown in this village?
20) Are the seeds purchased or from the previous year's crop?
21) When are crops normally planted?
22) Are planters or cultivators used?
23) Do you use commercial fertilizer?
24) Do you use manure?
25) What are the prospects for oxen in this area in the future?
26) What do the young boys on the farm think of oxen?
27) Are oxen increasing or decreasing in this area?
28) Is there land available to expand your cropland?
29) Is there room for your sons to continue farming in this area?
30) How has the farming system or crops grown changes in your lifetime?

PART V- GENERAL SUMMARY OF ANSWERS TO QUESTIONS 1-30

Question 1. Are oxen used in this village?

Answer. The most frequent answer was that oxen are used by 90-95% of the farmers. However, Maasai admitted that when they break new sod they usually employ a tractor and then use oxen almost exclusively. It was also interesting that everyone seemed to know the cost of hiring a tractor, even when they all seemed to say they were using oxen. It became obvious later that oxen are used in great numbers in both Arumeru and Monduli. It was also easy to observe cattle in herds that had obvious evidence of having worn a yoke. These were seen everywhere, except in Arusha town.

Question 2. What activities are oxen used for on the farm?

Answer. In East and South Arumeru – The Meru farmers seemed to be using oxen only for plowing and planting, especially those found in the highland and midland areas. In the lowland areas other groups of people could be found and they seemed to use the oxen for some transport as well.

In West Arumeru and Monduli, the Arusha and Maasai seemed to use the oxen on a more regular basis. In addition to plowing and planting which were major activities, they were also using them for transporting firewood as well as poles and thorn bushes for house and "boma" construction. Both groups also said the animals are sometimes used for transporting water and harvesting crops. The Arusha also said the animals are used for hauling manure to the fields. Only one farmer said he was weeding with oxen and had evidence to back it up. Extension officers seemed to want to believe that a lot more people were weeding with oxen, but even the SG-2000 farms had cultivators with very little evidence of regular use.

Question 3. How many oxen are used for plowing?

Answer. The answer ranged from 2-8, depending on soil conditions and the number of cattle available. Generally the Meru used fewer cattle and the Maasai more. Some Maasai also stated that, if a young man needs to borrow more oxen for plowing, this is very easily arranged at no charge.

Question 4. How long have oxen been used in this area?

Answer. There was a lot of variation that coincided with geographic location. Meru farmers seemed to have the longest experience, with very old men telling me their fathers had used them. Others knew the animals had been introduced by white farmers (some even said they were South African). The Arusha people in West Arumeru seemed to have used them for a similar length of time, as many old men told me they had been used for generations. The Maasai, however, had much more recently adopted them, with many people giving me years in the 1960's and 1970's when they adopted the use of oxen for cultivation.

Question 5. At what age do you begin to train oxen?

Answer. Most farmers said 2 to 3 years, and I saw plenty of evidence of that, as many young teams were yoked behind older larger teams. Training among Maasai seemed to be much more carefully planned, as they always introduced the animals to working weeks before they asked them to plow. They also tied them up for periods of time if they were wild, to acclimate them to being restrained in the yoke. The oxen used by the Meru didn't seem any less trained, and one SG-2000 demonstration farm had a team that would put my own animals to shame.

Question 6. At what age do you sell the oxen?

Answer. Most farmers said they sell the oxen when they can get top dollar, which seems to be at maximum size and weight, somewhere near 7 to 8 years. So most said they usually work the animals for about 4 to 6 years.

Question 7. Where did you learn to use oxen?

Answer. Almost every farmer said their father; a few Maasai said they just picked it up while watching others.

Question 8. How has the technology changed in your lifetime?

Answer. Most farmers said it has not changed at all; a few farmers said they were now weeding and a few others said they were using carts for transport.

Question 9. How much can a team or span of oxen plow per day?

Answer. The answer ranged from one-half acre to one acre per day. The Maasai said they start early in the morning and finish about 1 pm, to let the animals graze in a specially

designated area, since they didn't go with the herd that was already far from the boma. They said the animals do not lose weight while working. The Meru and Arusha farmers said they plowed about the same amount per day and usually worked the animals about 6 hours/day.

Question 10. Can you hire oxen in this area?

Answer. Among the Meru the answer was always yes, but among the Maasai they scoffed at the idea, saying if someone needs to plow their field, all they have to do is borrow someone else's animals. There is no need to pay. From the Arusha I didn't get this information.

Question 11. What is the price to hire oxen for plowing?

Answer. The price ranged from 4,000 – 8,000 Tsh/acre, with most people saying it was 6,000 – 8,000 Tsh. Conversion 600 Tsh = $1 U.S.

Question 12. Can tractors be hired in this area?

Answer. Everyone said that tractor plowing was available, a few farmers even admitted to having a tractor, but still keeping and using oxen. The only farmers I met that owned tractors were Maasai. There were other farmers that I saw with tractors, but I didn't stop to talk to them. The Maasai were sort of found by accident. The Maasai were quick to point out that tractors get the job done, but they are very costly, and even hiring them out didn't seem to cover the costs of owning them. Most Maasai said they frequently had to sell cattle to buy spare parts, which they did not like to do.

Question 13. How much does it cost to hire a tractor?

Answer: It was always more costly than ox plowing. Most reported 10,000 – 12,000 Tsh/acre. This actually seemed quite low to me given the price of petrol or diesel. I can't imagine how this would actually cover the total cost of operation and ownership.
** I had to wonder if they really measured acreage or even had a good idea of what an acre was. I was told that they certainly did, but I never really checked this.

Question 14. Do women work oxen?

Answer: Among the Maasai this generated a great deal of laughter. They simply said that women have donkeys. The Meru said that they usually don't, but did not consider it a totally off the wall question.

Question 15. What type of livestock are kept?

Answer: Almost every farmer was keeping a mixed group of livestock including sheep, goats, cattle, and poultry. The Arusha and Maasai, as well as Meru in the lowlands were also keeping Donkeys. There was a lot Holstein, Jersey and Ayrshire cattle kept by the Meru and Arusha in the midland and highland areas of Arumeru.

Question 16. Are European breeds of cattle used for work?

Answer: Yes, I saw a number of European type cattle working in the yoke - Jerseys and even a huge Holstein bull, but only on Meru and WaArusha farms in Arumeru

Question 17. How do the European breeds compare to native Zebu?

Answer: Maasai scoffed at the European cattle breeds, saying they would never survive a dry season. The Arusha said they don't have the stamina of a Zebu, but their size and ease of training makes them an OK work animal. When I asked about the use of crossbreeds for work, I was told it didn't happen by the Meru in Engare Nanyuki. The evidence of wounds on the oxen's necks in the cattle market that day showed otherwise.

Question 18. What are the major disease problems of livestock?

Answer: East Coast Fever was cited over and over, and the Tsetse Fly in Maasailand. One Maasai farmer in Makuyuni said there are so many disease problems that he only works oxen for a few years then sells them to reduce the risk of loss by death. Another farmer was plowing with Donkeys in Maji ya Chai because 3 of his 4 oxen had died. Finally, one Maasai Boma in Mswakini village near Tarangire National Park had ten cattle and four goats die the night before we arrived in the village. All the Maasai farmers seemed to think I carried a bag full of medicine in my backpack and that my mission was to cure the diseases their animals were inflicted with.

Question 19. What crops are grown?

Answer: In the highland areas the diversification was amazing. Banana trees, shading coffee and papaya trees. Outside the grove that usually surrounded the house maize, bean and vegetables grew. Every square inch in the highland areas seemed to be utilized. Vegetables were tucked in here and there around the house as well, and other fruit trees grew all around the homes (jackfruit, oranges, and pears). The farmers we talked to in the highland areas kept oxen in intensive systems of management carrying the feed to them as grazing land was not available. It was an amazing system, where the oxen were used to plow the little valleys and hillside corn and bean fields.

In the midland areas there was less diversification and more beans and corn. There was also rice in some places. Where water was plentiful or irrigation used there were also farmers growing tomatoes, potatoes, onions and other vegetables like cabbage.

In the lowland areas it was almost exclusively beans and corn with corn being predominant. Many lowland farms were intercropping various species of beans with corn.

In Maasailand, the only crops were beans and corn. Although some farmers mentioned others that are growing wheat, and others millet. The wheat is said to be inspired by the Tanzania Breweries, but that market was no longer reliable, and an extension agent in Monduli said that fingermillet is not a traditional crop either. Some Arusha said they were growing millet as well, but not as much as they had in the past.

Species or types of beans grown by Maasai included pigeon peas, ngwara, dengu, ulizi, choroko (a very small type of bean of which the greens are sometimes eaten), soybeans, geerros (a white bean).

Question 20. Are the seeds for these crops purchased or are they kept from the previous year's harvest?

Answer: Almost all the farmers said they were keeping seeds from previous harvests. The reasons varied from the high cost of the seed to the additional high requirements for inputs for hybrid varieties of maize. Many farmers had stories about using purchased seeds, as some companies and stockists had sold them seed that never germinated. They also felt that even if they could afford the seeds and the inputs, even with increased production, the risk was not worth it. Crop prices were usually very low when it came time to sell.

A few farmers had good things to say about purchased seeds and other inputs. Lobulu's face certainly lit up when he saw the size and quality of the maize in an SG-2000 project farm.

Question 21. When are crops planted?

Answer: Typically the planting season runs from March to April in drier areas. However, this year has not been typical at all, and it seemed that there was corn in every possible stage of development. The "El Nino" rains had provided many opportunities for planting and the farmers took advantage of them. In the highlands there were typically two seasons, and even two successive crops October-January at the time of the short rains and in March and April during the long rains.

Many farmers wait for rains to come before planting. This can make planting difficult, especially for mechanized planters that become clogged with the wet sticky soil. Most farmers seemed to be planting right behind the plow. Many farmers were still planting beans in May, as they had likely harvested a crop from the short rains.

Question 22. Are Mechanized Planters or Cultivators used?

Answer: Some of the largest farmers are using tractors for plowing and planting, but the majority are not. Even the Wazungu (white)farmers and the SARI research farm that grow beans, maize and other crops are using local labor for weeding. The Maasai simply said 'why would we invest in such equipment when we have so many women and children willing to do such work?'.

** I had to wonder if the Maasai are using oxen simply to alleviate their own burdens that have come with a more sedentary agriculture. It might seem that oxen simply allow them to get on with all of their other important pastoral and more respected jobs.

Question 23. Do you use commercial fertilizers?

Answer: The vast majority of farmers said no, except for those that we met who were working with an NGO like SG-2000.

Question 24. Do you use manure for fertilizer?

Answer: Most of the Meru and Arusha around the mountain were using manure. I didn't see any evidence of this, but the Arusha assured me that they use wheelbarrows, ox sleds and

even their women to move it. Many of the Maasai scoffed at such an idea, and usually replied that their fields were still fertile.
** It was obvious to me that there was a tremendous amount of manure creating problems around the Maasai homes with all the rain this year. Taking it to the fields would have made for a much cleaner and healthier environment for both people and cattle. And the crops didn't look so good that a little manure might have helped.

Question 25. What are the prospects for oxen in the future?

Answer: I wasn't asking this question when I began talking to farmers, but it seemed like a good question given all the changes many of the farms and the economy were going through. The answer was usually that they are a very sustainable and useful power source. Most farmers agreed that they would be used for many years to come.

Question 26. What do young boys on the farm think of using oxen and tractors?

Answer: A unanimous "Of Course They Like Tractors", but the farmers all said that even so, oxen are a reality; tractors for most will not be.

Question 27. Are oxen increasing or decreasing in this area?

Answer: There were a lot of geographic areas that I covered quickly, but I felt the farmers and extension officers I asked had a good sense of the situation. Most of the Maasai said the use of oxen was increasing, many of the Meru in the midlands and lowlands said they were also increasing, as most of the tractor schemes had come and gone. The Arusha in West Arumeru said that it seemed to be the same. I didn't get a good sense of the situation in the highlands.

Question 28. Is there land available to expand your farm?

Answer: In the highland areas it was an invariable NO! In the midland areas, it also didn't seem like there was much land available. In the lowland areas of Arumeru, it was said that there was land for expansion, but this area was drier and some of it much more marginal. The Maasai near Arusha said they were cramped for both cropland and grazing land, but most said they had steadily increased their cropland each year for many years.

Question 29. Is there room for your sons to continue farming in this area?

Answer: Most farmers said yes, even though in the previous question most had answered that land was difficult to come by.

Question 30. How has the farming system changed in your lifetime?

Answer: This question was usually at the end, and it was often brushed aside. However, the Maasai were usually eager to answer, by saying that they had been forced to settle and had lost much of their traditional grazing lands and been forced by economics and reality to reduce the size of their herds. Although many still said their goal was to have huge herds of cattle.

The Meru and Arusha said things were much the same as they had been for most of their life, in terms of the crops they grew. But there seemed to be more Maize grown now than compared to the past

Part VI. Summary

My research next year (1999) will not continue to try to evaluate the presence and use of oxen as an indicator of livestock or crop genetic diversity. I will instead try to look at the whole farm system, and see how the use of oxen has changed the way the Maasai and Arusha people practice agriculture in an area under tremendous pressure for agricultural development.

Appendix 3

Human Research Clearance – OSR UNH

UNIVERSITY OF NEW HAMPSHIRE

Office of Sponsored Research
Service Building
51 College Road
Durham, New Hampshire 03824-3585
(603) 862-3564 Fax

January 9, 1998

Drew Conroy
TSAS
131 Barton Hall

IRB No.: 1921 Title: The Import of Draft Oxen...

Dear Mr. Conroy:

The Institutional Review Board (IRB) for the Protection of Human Subjects in Research has reviewed the protocol for your project as Exempt as described in Federal Regulations 45 CFR 46, Subsection 46.101(b)(2). Approval is granted to conduct the project as described in your protocol. If you decide to make any changes in your protocol, you must submit the requested changes to the IRB for review and approval prior to any data collection from human subjects.

The protection of human subjects is an ongoing process for which you hold primary responsibility. In receiving IRB approval for your protocol, you agree to conduct the project in accordance with the ethical principles and guidelines for the protection of human subjects in research, as described in the enclosed "The Belmont Report." Information about other pertinent Federal and University policies, guidelines, and procedures is available in the UNH Office of Sponsored Research.

There is no obligation for you to provide a report to the IRB upon project completion unless you experience any unusual or unanticipated results with regard to the participation of human subjects. Please report these promptly to this office.

If you have any questions or concerns, please feel free to contact me at 862-2003. Please refer to the IRB # above in all future correspondence related to this project. We wish you success with the research.

Sincerely,

Kara L. Eddy
Regulatory Compliance Officer
Office of Sponsored Research
(for the IRB)

KLE/sw

UNIVERSITY OF NEW HAMPSHIRE

Office of Sponsored Research
Service Building
51 College Road
Durham, New Hampshire 03824-3585
(603) 862-3564 FAX

LAST NAME	Conray	**FIRST NAME**	Andrew (Drew)
DEPT	Thompson School, Room 131, Barton Hall	**APP'L DATE**	5/13/99
OFF-CAMPUS ADDRESS (If applicable)		**IRB #**	2153
		REVIEW LEVEL	EXE

PROJECT TITLE The Impact of Draft Animals on Agricultural Intensification in Tanzania

The Institutional Review Board for the Protection of Human Subjects in Research has reviewed the protocol for your project as Exempt as described in Federal Regulations 45 CFR 46. Subsection 46.101 (b) (2). category 2 .

Approval is granted to conduct the project as described in your protocol. Changes in your protocol must be submitted to the IRB for review and approval prior to their implementation.

The protection of human subjects in your study is an ongoing process for which you hold primary responsibility. In receiving IRB approval for your protocol, you agree to conduct the project in accordance with the ethical principles and guidelines for the protection of human subjects in research, as described in the Belmont Report. The full text of the Belmont Report is available on the OSR information server at http://www.unh.edu/osr/compliance/belmont.html and by request from the Office of Sponsored Research.

There is no obligation for you to provide a report to the IRB upon project completion unless you experience any unusual or unanticipated results with regard to the participation of human subjects. Please report such events to this office promptly as they occur.

If you have questions or concerns about your project or this approval, please feel free to contact me directly at 862-2003. Please refer to the IRB # above in all correspondence related to this project. The IRB wishes you success with your research.

For the IRB,

Kara L. Eddy, MBA
Regulatory Compliance

cc: File
Robert Eckert

Appendix 4
Permission to Use Figures

Subj: **Use of figure**
Date: 1/8/2001 12:20:47 AM Eastern Standard Time
From: Bob.McCown@onaustralia.com.au (Bob McCown)
To: oxwoodfarm@aol.com

Drew, your email eventually got to me. I have no problem with your use of the figure with the usual attribution of origin.

Cheers

RL McCown
CSIRO/Agricultural Production Systems Research Unit
PO Box 102, Toowoomba, Qld. 4350
Tel. +61 7 46881390; Fax. +61 7 46881193

---------- Headers ----------
Return-Path: <Bob.McCown@onaustralia.com.au>
Received: from rly-xb05.mx.aol.com (rly-xb05.mail.aol.com [172.20.105.106]) by air-xb03.mail.aol.com (v77.31) with ESMTP; Mon, 08 Jan 2001 00:20:47 -0500
Received: from teapot23.domain2.bigpond.com (teapot23.domain2.bigpond.com [139.134.5.165]) by rly-xb05.mx.aol.com (v77.27) with ESMTP; Mon, 08 Jan 2001 00:20:37 -0500
Received: from localhost (localhost [127.0.0.1]) by teapot23.domain2.bigpond.com (NTMail 3.02.13) with ESMTP id ha769815 for <oxwoodfarm@aol.com>; Mon, 8 Jan 2001 15:20:59 +1000
Received: from tba12.tag.csiro.au ([146.118.221.9]) by mail2.bigpond.com (Claudes-All-Encompassing-MailRouter V2.9c 3/13508); 08 Jan 2001 15:20:55
Message-ID: <001b01c07932$ae0cb8e0$09dd7692@bobm>
From: "Bob McCown" <Bob.McCown@onaustralia.com.au>
To: <oxwoodfarm@aol.com>
Subject: Use of figure
Date: Mon, 8 Jan 2001 15:19:52 +1000
MIME-Version: 1.0
Content-Type: text/plain;
  charset="iso-8859-1"
Content-Transfer-Encoding: 7bit
X-Priority: 3
X-MSMail-Priority: Normal
X-Mailer: Microsoft Outlook Express 5.50.4133.2400
X-MimeOLE: Produced By Microsoft MimeOLE V5.50.4133.2400

FAX Transmittal Cover Sheet

UNIVERSITY OF NEW HAMPSHIRE

Thompson School of Applied Science
Barton/Cole/Putnam
Durham, New Hampshire 03824
TEL (603) 862-1025
FAX (603) 862-2915

Date: October 17, 2000 Time: 10:30 am

Total pages to follow: -0-

To: Kibuyu Partners- David Bygott & Jeannette Hanby
P.O. Box 161
Karatu, Tanzania
FAX Number: +255-57-8310

From: Andrew Conroy - Associate Professor

Subject: Permission to Use Maps from book called Planning for a Better Environment in Monduli District"

Additional Comments: I am in the process of finishing my Ph.D. at the University of New Hampshire. It is titled, "Maasai Agriculture, Oxen, and Land Use Change". I would like to use the maps from the following pages:2, 10, 12, 18, 20,24, 36, & 66, in my dissertation. Would you grant me permission to do this? I would cite this properly, but I do need written permission.

We'd be interested in an abstract of your findings. DB.

You could mail it or fax it to the address or number above.
Thank You, Andrew Conroy

If there is an error in this transmission, please call (603) 862-1025

So glad someone uses these things!

Permission granted - David Bygott for KIBUYU PARTNERS.