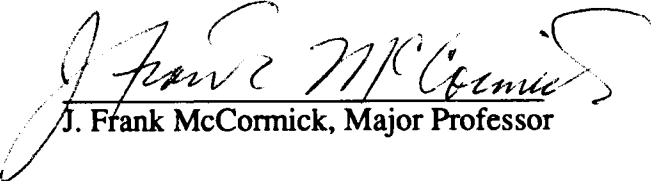
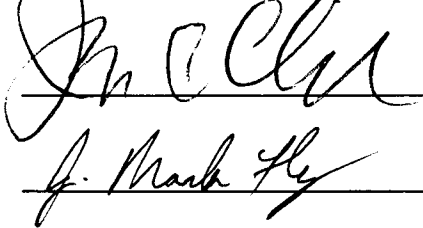


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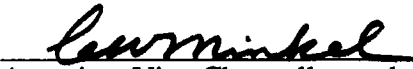
I am submitting herewith a thesis written by Helen C. Snook entitled "Local Perspectives on Human-Elephant Conflict near Rimoi National Reserve, Kenya." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Ecology and Evolutionary Biology.


J. Frank McCormick, Major Professor

We have read this thesis
and recommend its acceptance:


J. Mark Fly

Accepted for the Council:


Associate Vice Chancellor and
Dean of the Graduate School

**LOCAL PERSPECTIVES
ON
HUMAN-ELEPHANT CONFLICT
NEAR
RIMOI NATIONAL RESERVE, KENYA**

A Thesis
Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville

Helen Snook

May 1997

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ABSTRACT

The goal of this study was to use local perspectives to describe the conflict between humans and elephants (*Loxodonta africana*) occurring near Rimoi National Reserve and to suggest locally acceptable solutions. Thirty-two household interviews were conducted in Rimoi Sublocation to gather information regarding the socioeconomic context of the conflict; elephant activity and human response to that activity; local attitudes toward wildlife, elephants in particular, and the Kenya Wildlife Service (KWS); and possible solutions to the conflict. Additional information was gathered through conversations with residents, KWS staff members, and other development organizations active in the area, and from direct and participant observation while camped in Rimoi Sublocation for 5 weeks between 13 June to 20 July 1996 (wet season). In addition 13 household interviews were conducted in neighboring Kabulwa, Biretwo, and Kamnarok National Reserve.

People living in Rimoi Sublocation subsist by growing grain crops in small plots and by raising livestock which graze freely on the communally owned lands. Elephants impact many farmers by entering their fields and destroying crops. Sixty-eight percent of farmers interviewed said that elephants entered their fields during 1995. Elephants leave the reserve and enter fields at night during the rainy season. Men try to keep elephants away by making noise or lighting fires, while most women and small children hide in their houses. People consider elephants the second most important problem they face, with lack of water and rain the most important problem. Fifty-nine percent of those interviewed view wildlife as bad, and 78% view elephants that way. Some aesthetic appreciation of, and curiosity about, wildlife was noted, as was some of the conservation ethic of traditional Kalenjin people. Few people (23%) feel that KWS is doing a good job concerning the problem with elephants. Many feel that fencing the reserve would be a good idea, however locals now

benefit from occasional access to the reserve which would be lost with fencing. Other suggestions for ways to mitigate the conflict may be more acceptable, such as employment of local scouts and increasing the number of rangers available to scare away elephants. Impacts of fencing on neighboring areas should also be considered. Kabulwa and Biretwo, for example, appear to have less depredation by elephants, but a fence along the western boundary of the reserve (as planned) might direct the elephants north and south into these areas.

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I. INTRODUCTION

A. Historical Context of Human-Wildlife Conflict in Africa

Humans and wildlife have experienced sustainable coexistence throughout much of African history. In fact, the savannas of present day Africa may have been created over millennia by the interaction between humans, their livestock, and elephants (*Loxodonta africana*) and other wildlife (Western and Gichohi 1993). This interaction affected the culture of traditional Africans who recognized the economic, ecological, and spiritual importance that nature had in their lives (Mwenya 1993, Nsanjama 1993, Olindo 1991, Ross 1992). In contrast, foreign interest in African wildlife during the nineteenth century was for short term economic gain, with no consideration of the ecological role that species played or of ethical implications of large scale slaughtering of animals. The level of resource extraction for ivory and trophies, which peaked in the late nineteenth century, was not sustainable (DiSilvestro 1991, Nsanjama 1993). This exploitation, combined with other factors such as increasing human population (Buss 1990, Eltringham 1982, Parker and Graham 1989, Sykes 1971) resulted in decreased abundance and distributions of many species of wildlife, particularly the "big game" animals.

Colonial governments responded by removing local people from lands that were then designated protected areas. In Kenya, Nairobi National Park was established in 1946 and other protected areas were established soon after. These national parks and reserves allowed only limited access to the lands. White people, who could afford hunting licenses, and later organized "safaris", were those that were able to benefit from the lands.

Decisions regarding resource use were taken out of local hands. Traditional tribal leaders were ignored and traditional values were belittled. People were cut off from food, grazing lands, water, and ceremonial resources that had always been part of their culture. In the

process, wildlife, which had been viewed by indigenous people as an asset, lost its value (DiSilvestro 1991, Nsanjama 1993, Orenstein 1991, Sykes 1971).

Protected wildlife populations grew and ventured beyond the reserve boundaries into crop and grazing land. Desperate and frustrated, local people resorted to illegally killing the animals in defense of their property and to demonstrate their discontent. They also participated in poaching as a means to gain income. Recently controls have tightened in some countries, and large-scale poaching in places like Kenya has declined since the 1980's (Dublin et al., n.d.), but subsistence farmers living next to wildlife increasingly suffer as animals become bolder and as human and animal populations grow. In addition, conflict-related elephant kills by locals and wildlife officials have increased in Kenya and elsewhere (ibid.).

B. The Need for Involvement of Local People

The failures of the colonial and post-colonial wildlife management efforts suggest that sustainable management of biological resources in Africa will not be possible as long as local people are excluded from the planning, execution, and rewards of resource management. Where intact, traditional beliefs must be considered when deciding on management approaches. The Kenyan conservationist Perez Olindo (1991) suggests that once cultures completely lose traditional perspectives, the job of saving wildlife will be much more difficult. Of older Africans who recall the conservation ethic typical of many African peoples Olindo says, "They represent a tradition that may become extinct like the elephant if both are not protected." In addition to traditional practices and beliefs, current needs, knowledge, attitudes, and ideas of local people must play a part in wildlife management. Respect must be accorded to local leaders if local people are to respect advice from the outside. These ideas are the basis for the current community-based conservation

efforts throughout Africa, including ADMADE in Zambia (Lewis et al. 1990), CAMPFIRE in Zimbabwe (Murphree 1993), and the Purros project in Namibia (Jacobsohn 1993).

Kenya is also experimenting with this new approach. Lands surrounding Amboseli National Park have been managed with the involvement of the local Masaai. The head of the parastatal Kenya Wildlife Service (KWS), David Western, has been involved with this project and recently compiled a book on this approach entitled *Natural connections. Perspectives in community-based conservation* (Western and Wright 1994). In a KWS supplement to the Kenyan Press on "Wildlife Day" in 1995, Western was quoted as saying that "local communities are the ultimate custodians of wildlife, who should be the main beneficiaries." He emphasized that people living adjacent to the parks must be consulted on issues that affect wildlife (Grudah 1995).

C. The Importance of Human-Elephant Conflict in Kenya

An issue of main concern to KWS is human-wildlife conflicts. Western is quoted as saying, "Containing the conflict between agriculture and wildlife is the single biggest cost KWS will incur in the coming years" (Baskin 1994). In addition, KWS recently sponsored a five-member committee to review the human-wildlife conflict in Kenya. According to a newspaper article (Mwangi 1995), human death is the most "sensitive" issue, with cumbersome and inappropriate compensation procedures resulting in resentment of KWS and the Kenyan government, while crop damage was the "most common and debilitating" impact of conflict with wildlife.

Due to their sheer size and resulting resource demands and intractability, elephants are among the most destructive wildlife when involved in conflicts with people and their croplands. In a study of the human-elephant conflict in the Laikipia and Samburu Districts

of Kenya, Thouless (1994) reports that, for people on subsistence farms, "Although other wildlife species--zebra, buffalo, hartebeest, porcupine and bush pigs--damaged crops, elephants were the most widely feared because of their ability to eat and trample huge quantities of crops in a single night, the difficulty of stopping them with any barrier, and the danger they posed to human life". According to the head of the KWS Elephant Programme, John Waithaka (1996b), elephants kill more people in Kenya every year than does any other animal.

Potential negative impacts on elephants as a result of human-elephant conflicts are important as well. Concern for the well-being of elephants stems from a realization of the ecological importance of elephants in maintaining the openness of savanna ecosystems which provide grass for grazers (Bus 1990, Western and Gichohi 1993). Elephants are important for the dispersal of seeds (Tchamba and Seme 1993) and environmental enrichment through manure deposits (Buss 1990). Elephants are also important economically as one of the biggest tourist attractions in Kenya (MacKinnon 1986, Western 1991). In addition, of importance are ethical and aesthetic considerations of the elephant as one of the most magnificent creations of nature (Orenstein 1991).

According to Waithaka (1996a), conflict between humans and elephants is increasing in the Kerio Valley of western Kenya, where Rimoi National Reserve is found (Figure 1). In this semi-arid region, Kalenjin pastoralists have increasingly incorporated land cultivation into their way of life, which leaves these people more vulnerable to destruction by elephants. In addition, people are no longer able to hunt crop-raiding elephants as they had in the past, which not only controlled damage to crops but provided food, clothing, and income through utilization of the meat, hide, and ivory, apparently on a sustainable basis (Massam, 1968). A 1995 KWS report (Mulama and Waithaka 1995) states that approximately 50 or

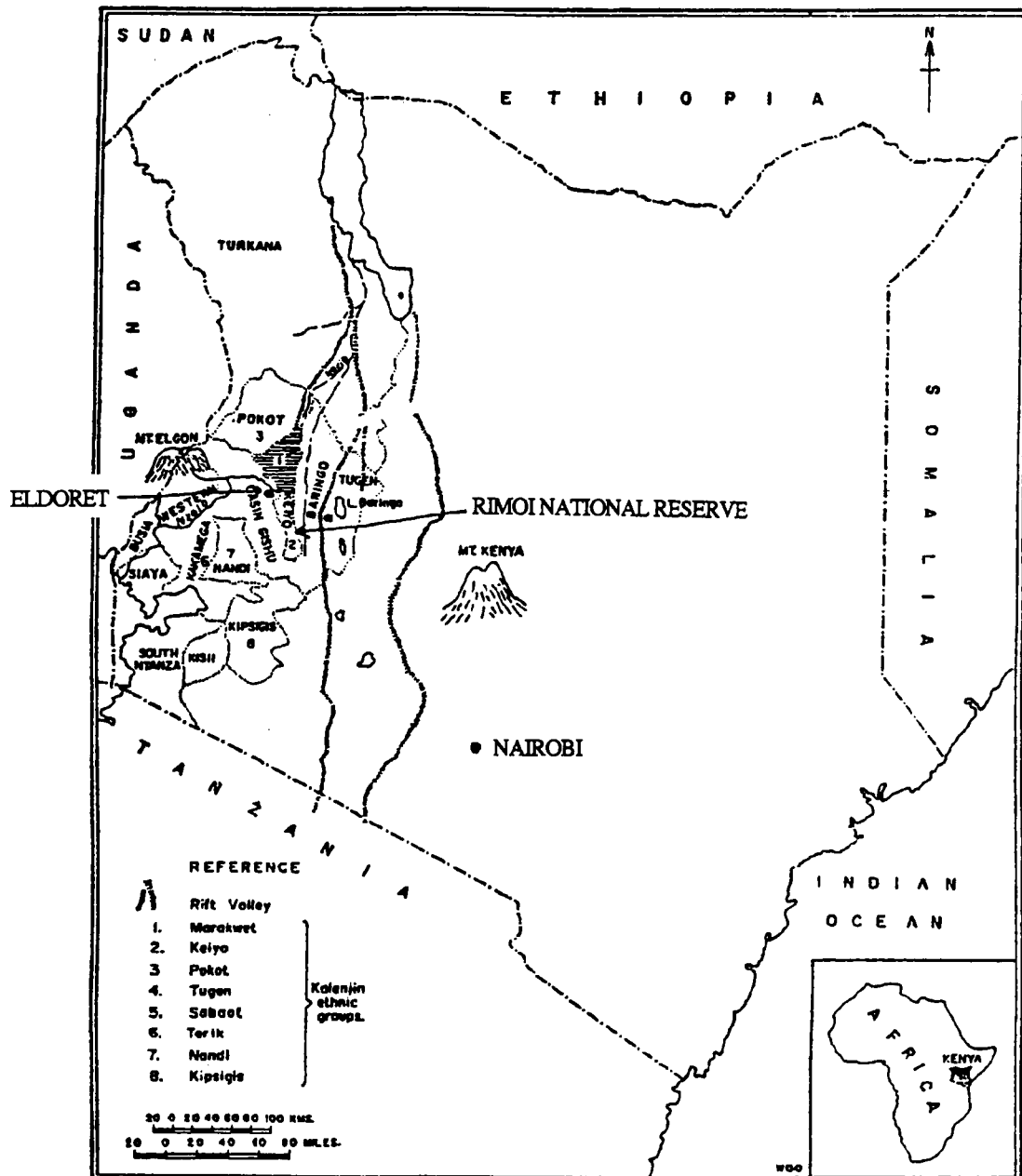


Figure 1. Kerio Valley, Kenya. In the southern Kerio Valley is the Keiyo region and the adjacent Marakwet and Tugen (Baringo) regions. To the north is the Pokot region. Adapted from: Kipkorir, B.E. and F.B. Welbourn. 1973. *The Marakwet of Kenya*. East African Literature Bureau. Nairobi.

more reported cases of conflict occurred in the region of Rimoi National Reserve each year in 1991 through 1994. In addition to elephant-caused crop damage, human and elephant deaths have occurred in the area. Two people were killed in the reserve by elephants in 1996. Elephants have been speared by locals as well, with two elephants killed between 1990 and 1994, and one killed in neighboring Kamnarok Reserve in May 1996. There have been no KWS control kills of problem elephants (Mulama and Waithaka 1995).

D. Literature Review of Human-Elephant Conflict Studies

1. Elephant activity

A detailed study on patterns of feeding during crop raiding by Asian elephants (*Elephas maximus*) was conducted by R. Sukumar (1992). He found that bulls (alone or in groups of up to 4) raid crops much more frequently than members of family groups (which are composed of related females and their young, and in this study were made up of 3 to 25 individuals). This greater frequency of raiding by bulls was noted for African elephants in Gabon (Lahm 1996), in Ghana (Dudley, Mensah-Ntiamoah and Kpelle 1992), and in Kenya (Thouless 1994). Sukumar (1992) suggests that this prevalence for crop raiding by males is a result of a reproductive strategy that makes it advantageous for bulls to take risks to increase their physical fitness. He also found that bulls were more likely to kill people, perhaps due to testosterone-associated aggressiveness, and he says that particular individuals can be notoriously problematic. Raiding of crops was done at night, when crops were ready for harvest. Thouless (1994) says that raiding took place throughout the year but was most intense around harvest season, when family groups would raid as well as bulls. Seasonality of crop raiding is also mentioned for elephants in Burkina Faso (Damiba and Ables 1993) and Gabon (Lahm 1996). Tchamba (1996) in his study in Cameroon, found that seasons of raiding varied per region, according to migration patterns of elephants. In Ghana, (Dudley, Mensah-Ntiamoah and Kpelle 1992) crop raiding among

forest elephants (*L.a. cyclotis*) decreased at a time when forest fruit production increased. These different studies listed crop species taken. Grain crops were taken in most areas, but certain trees, such as orange or cocoa were taken in some areas but not in others. Browsing, trampling, and uprooting caused damage to fields, generally in that order of increasing severity. In addition to damage to crops, damage to grain stores (Thouless 1994, Damiba and Ables 1993) and fences (Emerton and Majiwa 1992) occurred.

2. Human response

Human response to elephant activity is described by several researchers. Sukumar (1992) says that people in the Indian villages that he studied depend on noise making, shining flashlights, and guarding from tree-top or ground-level shelters, with little success and sometimes fatal consequences. Tchamba (1996) says that Cameroon farmers make noise, sleep in the fields, throw sticks and stones, and (fatally) wound elephants with shotguns. Damiba and Ables (1993) mention that similar techniques are used by villagers in Burkina Faso. They sometimes clear a large strip of land to deprive the elephant of cover, or hang kerosene lamps around the fields to keep elephants away. In Gabon (Lahm 1996), some people do not use any means to protect of their crops. Others use fires or lamps, make noise, hang cables with bottles or tin cans attached, or make scarecrows. Some abandon lands that are near an attraction to elephants, such as a swamp or fruiting trees. In Kenya, people near the Aberdares Forest Reserve keep wildlife away by standing guard, using lights and fire, burning rags, or digging trenches around their farms (Emerton and Majiwa 1992). In Tanzania, Newmark et al. (1994) mention that the most successful means to deal with conflict with wildlife was to contact a wildlife officer, but that this was rarely done, probably because of the distance to wildlife officers.

3. Local attitudes

Local attitudes toward elephants and wildlife managers were determined in Tchamba's (1996) study, which utilized household interviews to gather data. Half of the Cameroon farmers that he interviewed associated no benefits with elephants. The benefits that they did mention included meat, ivory, and skin, and a few mentioned tourism and employment. Ninety-eight percent of those interviewed mentioned disadvantages associated with elephants, specifically the loss of crops and danger to people. Almost 90% of the interviewees felt that wildlife managers were ineffective at reducing crop damage. They felt that the wildlife department acted as law enforcers serving the needs of tourists and safari companies. Although meat from control kills goes to local people, almost all of those interviewed felt that they did not benefit from this, saying that it is the authorities who receive most of the meat. Many interviewees thought that more elephants should be killed. There was not a clear understanding about whether or not compensation for damages was available.

In a study by Newmark et al. (1993) about 70% of interviewees living next to protected areas held neutral or negative attitudes toward people that worked in the park or reserve. Those that mentioned positive aspects said that the park people keep wildlife from their farms. Some said that the park staff provide medical assistance and transportation. More people had positive attitudes toward the park or reserve itself. About 70% were against abolishing the adjacent protected area due to potential tourism opportunities, the protection of wildlife, for future generations, and because it helps keep wildlife away. The people most in favor of abolishing the adjacent protected area were agriculturists living next to a reserve from which they had been translocated, who were dependent on wild sources of meat for protein. The area was more remote than others, and hence more economically limited and less likely to benefit from tourist revenues. Reasons given for abolishing the

reserve were to obtain more land, to eliminate wildlife problems, and because there is no benefit received from the reserve. Factors that may be associated with negative attitudes towards the reserve were conflict with wildlife and flooding problems, a lack of grazing land or ownership of smaller parcels of land, the experience of impacts of park creation (which longer term residents were likely to have), or lack of contact with park staff. In a similar study (Newmark and Leonard 1991) most people residing adjacent to Kilimanjaro National Park had positive views toward the park, due to its role in watershed protection (from which they benefited directly in terms of water availability) and, to a lesser extent, revenue generation through tourism.

4. Solutions

Possible solutions to human-elephant conflict are discussed by various authors, and some incorporate local views. Tchamba (1996) said that one third of those interviewed had no suggestions for ways to reduce crop raiding. Just over a third suggested moving the elephants and fencing them in elsewhere. Other ideas included shooting the responsible elephants, shooting all the elephants, or scaring the elephants with gun shots. Tchamba's recommendations include further study on the effects of shooting crop raiders, the use of a local/wildlife team to keep elephants from farms near the National Park, safari-hunting -- with part of the revenues used to improve local socio-economic conditions, and conservation education programs to increase local awareness of tourist potential and the importance of natural resource conservation.

Newmark et al. (1993) suggest that the focus of extension programs should be to reduce people's mistrust of park employees by increasing contact between the employees and the local people. In addition to opening the dialogue between these two groups, he suggests that tangible benefits will help improve local attitudes, as will education of local people as

to the broader-scale benefits of wildlife management. They also suggest the promotion of land use practices that encourage low density human habitation next to protected areas to minimize conflict with wildlife, and the funneling of donor funds to communities adjacent to parks to improve local people's economic status and attitudes.

Sukumar (1992) and Thouless and Sakwa (1994) deal specifically with how to prevent elephants from entering crop fields. Both recommend electric fences. They acknowledge that the fences do not provide impenetrable barriers to elephants, but suggest rather that electric fences act more as a demarcation of boundaries. Thouless and Sakwa suggest that relatively simple electric fences combined with teaching the elephants what the boundary means, by shooting trespassers, could be a successful way to limit elephant raiding. They add that even without shooting, electric fences reduce raiding by family groups with calves (which Sukumar, 1992, says are less willing to take risks). Sukumar assumes an 80% success rate for electric fences, based on short term observation of elephant/fence interactions. It is suggested that elephants learn fence breaking techniques (Thouless and Sakwa 1994) so presumably fence success would decline with time. Sukumar suggests that installation of electric fences should be combined with translocation, the shooting of notorious individuals, and projects to improve farming productivity, including irrigation. It seems that this might increase temptation to elephants, which Thouless and Sakwa (1995) say reduces the success rate of a fence, unless the area in need of protection was reduced in size or the selection of crops was changed to those that are unpalatable to elephants. Unfortunately, crops that subsistence farmers grow as food are generally relished by elephants.

Other ideas for ways to mitigate human-elephant conflict are offered. Damiba and Ables (1993) suggest that game ranches like the one they studied in Burkina Faso promote

positive attitudes of locals toward wildlife. Although crop raiding is still a problem, farmers see tangible benefits in the form of the availability of jobs, medical services, meat from game cropping, craft sales to tourists, and recognition by local administrators. People are willing to put up with increased risk of crop degradation to reap these benefits.

Elephant expert Iain Douglas-Hamilton (1993) says that wildlife managers must win the acceptance of local people by the sharing of tourist revenues, by offering protection from elephants using fences, and by compensation for losses. KWS Director David Western (1993) suggests treating parks and their environs as single ecosystems and mimicking erratic forces of nature, perhaps using irregular culling or fertility control on elephants to maintain a dynamic equilibrium while controlling damage to farms. The head of the KWS Elephant Programme, John Waithaka (1996b), suggests the training of local game scouts, the establishment of community-run parks, water provision, erection of electric fences, and translocation (Waithaka 1996b).

E. Objectives

As a result of various historical factors, human-elephant conflict is an increasingly important problem in many parts of Africa. To deal with this conflict effectively, local people must be incorporated into the planning, execution, and rewards of wildlife management. Local perspectives must be taken into account when deciding on mitigation strategies. In the last decade, some researchers have begun to focus on compiling these perspectives. In Kenya, KWS realizes that this type of work is necessary to effectively deal with conflicts between humans and elephants. Near Rimoi National Reserve no studies had been conducted that would enable KWS to understand local perspectives on conflict with elephants from the reserve. This study was designed to fill that need.

Specifically, the goal of this study was to help KWS mitigate human-elephant conflict occurring near Rimoi National Reserve by describing the conflict, as defined by local people's words and actions, and by offering ideas for solutions to the conflict based on local needs, opportunities, and suggestions.

Objectives were to:

1. Delineate the socio-economic context of the conflict.
2. Describe elephant activity that impacts local people and the human response to that activity.
3. Determine local attitudes toward wildlife, elephants in particular, and KWS.
4. Compile and assess locally-identified solutions to the conflict.

II. SITE DESCRIPTION

A. Kerio Valley

1. Abiotic factors

The study sites were located in the Kerio Valley of Kenya (Figure 1), which is found at 35 degrees east longitude and between 0 and 1 degree north latitude. The altitude is 1000 meters at the valley floor and 2200 meters at the top of the escarpment. The valley is approximately 150 km long north to south, and averages 6.4 km in width. The mean maximum temperature in the valley is 33 degrees C, with 750 mm of annual rainfall. The rainy season is March to September with maximum rainfall usually in May and August. Temperatures drop as one ascends the escarpment to the plateau, and rainfall increases. Soils are of basement and volcanic origin, and are clay loam or sandy. (Data from the Ministry of Finance and Planning *Elgeyo Marakwet District development plan 1984-1988*.) We observed that large stones and boulders are common, especially at the base of the escarpment.

2. Flora and fauna

The Rimoi region of the valley is covered by arid thorn bushland and woodland. Acacia trees are the dominant vegetation type, and include *Acacia melliphara* and *Acacia tortillis*. Overgrazing has made grasses sparse in much of the region and increased woody species (ASAL, n.d.), but within the reserve grasses found in open glades include *Themeda triandra* and *Cynodon dactylon*. (Data from Wildlife Conservation and Management Department, 1985.) Most plants are thorny. Specific plant species are described by the Kerio Valley Development Authority (1980).

Animal species found in the region include elephants, rock hyrax (*Procavia johnstoni*), aardvarks (*Orycteropus afer*), porcupines (*Hystrix cristata*), striped ground squirrels (*Xerus erythropus*), dikdiks (*Madoqua* sp.), impalas (*Aepyceros melampus*), leopards (*Panther pardus*), hyenas (*Hyaena* sp.), jackals (*Canis* sp.), buffalos (*Syncerus caffer*), several translocated Rothschild's giraffes (*Giraffa camelopardalis rothschildi*), monkeys including vervets (*Cercopithecus aethiops*), and monitor lizards (*Varanus* sp.). (Species list compiled through personal observation and local reports verified by KWS rangers or wardens). Most of these species are very shy and it is difficult to see anything but tracks or other signs. Birds, however, are easily observable and include red-billed hornbills (*Tockus erythrorhynchus*), white-browed sparrow weavers (*Plocepasser mahali*), paradise fly-catchers (*Terpsiphone viridis*), wood hoopoes (*Phoeniculus purpureus*), go-away birds (*Corythaixoides leucogaster*), and drongos (*Dicrurus adsimilis*). The elephant population in Rimoi National Reserve consists of resident groups and groups which migrate south from Turkana, together totaling approximately 100 individuals. Eighty-eight elephants were counted in the Rimoi National Reserve in 1996 (Muneni, 1996). These were in 3 groups, and included many young.

3. Rimoi National Reserve

Rimoi National Reserve lies in the southwestern portion of the Kerio Valley, in the Keiyo (previously Elgeyo-Marakwet) District (Figure 2). The reserve is bounded by the Kerio River on the east. Across the river is Kamnarok National Reserve. The reserves lie parallel to one another, each being about 20 km long and 3 km wide, and they function as one ecosystem for the animals that occupy them.

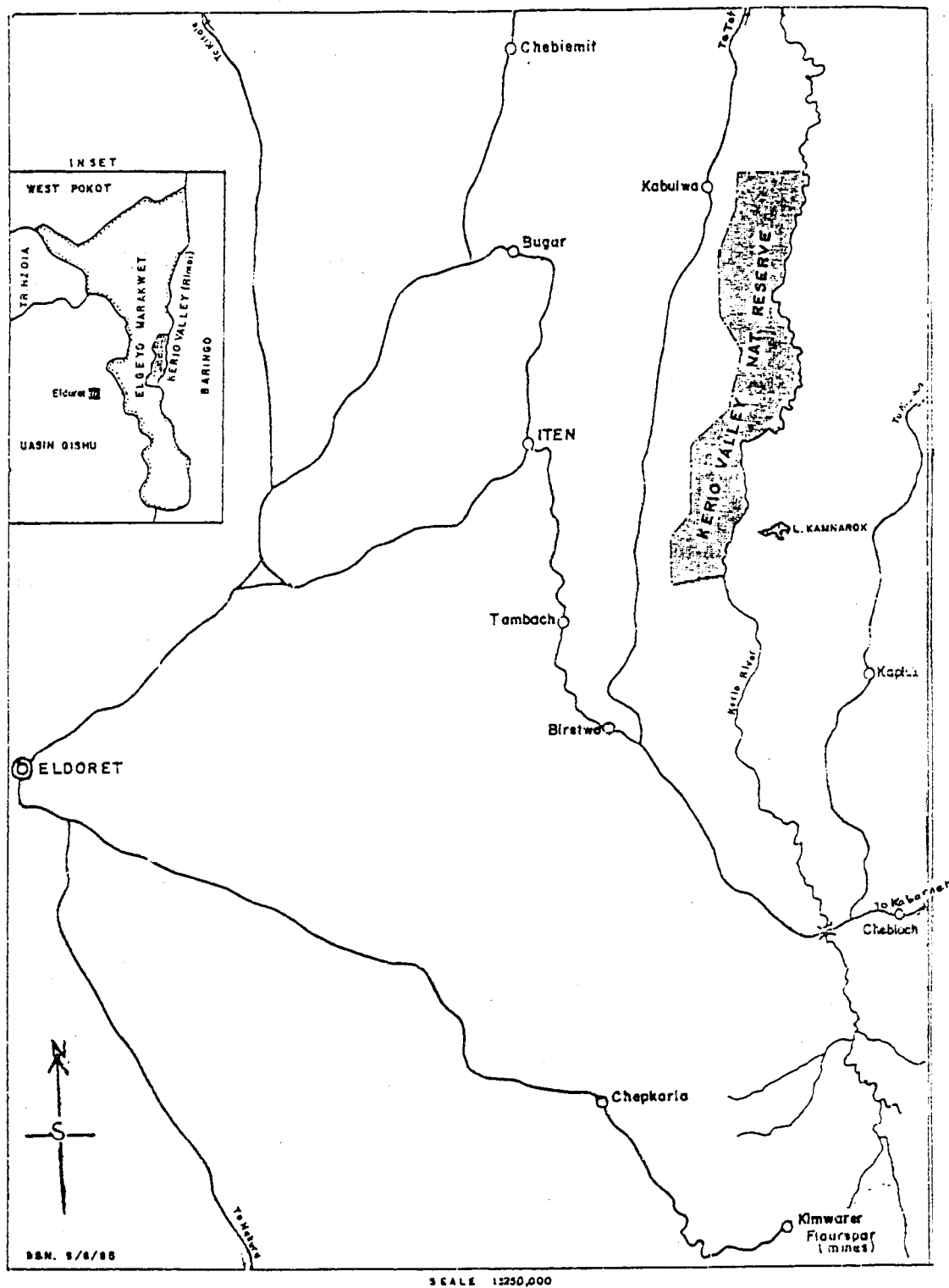


Figure 2. Regional Setting of Rimoi (Kerio Valley) National Reserve. In addition to Rimoi National Reserve, Kabulwa, Biretwa, and Lake Kamnarok (of Kamnarok National Reserve) are also indicated. Source: Wildlife Conservation and Management Department. 1985. *Kerio Valley (Rimoi) National Reserve management plan*. Ministry of Tourism and Wildlife. Kenya.

During the 1960's the valley was established as a hunting area. The area was popular amongst the white population for rhino hunting (Massam 1968). Negotiations for development of Rimoi National Reserve ("rimoi" in the Keiyo language means young calves' grazing grounds) began in 1973. Rimoi and Kamnarok National Reserves were mapped in 1983. In 1995, a Memorandum of Understanding (MOU) was signed between KWS and the Keiyo County Council regarding Rimoi National Reserve. The contract states that the wildlife will be managed by KWS and that the County Council, who owns the land, will arrange for translocation of the human residents. Since then, all but 3 or 4 homes within Rimoi Reserve have been vacated and residents have built new homes just outside of the reserve. The area is frequently patrolled by rangers, and we saw that trespassers from outside areas are occasionally arrested. We were told, and observed, that Rimoi Sublocation residents sometimes use the reserve as a route to Baringo District, and that their livestock sometimes graze within it.

Two rangers are generally stationed in the valley to manage wildlife around Rimoi Reserve. They are based out of Kabulwa (Figure 2), where semi-permanent housing includes a radio unit for contact with the warden at the headquarters in Iten. A draft of the *Rimoi (Kerio Valley) National Reserve subecosystem management plan 1995-2000* (KWS and Keiyo County Council, n.d.) calls for the relocation of the warden's office to the valley, where a reserve headquarters will be built. It also calls for an increase in staff (to approximately 30 rangers) and the purchase of vehicles and other equipment. An interpretive center and a campground are to be created. The plan concedes that surveys showed few wild animals and poor visibility due to thick scrub, so the development of alternative activities is emphasized. In addition to traditional game drives, hiking, climbing, picnicking, nature trails, bicycling, camel rides, and night drives will be promoted. Research or special

interest zones will also be included in the reserve, and while tourist use is low in the beginning, the reserve will cater to Kenyan university students and other groups. All signs of former human presence are to be removed, including beehives, exotic trees and vacant houses. The new plan suggests that in the future consumptive wildlife utilization may be considered for species that are abundant and causing problems for man or property. Contraception is mentioned as a possible future tool for management of resident elephants, along with the construction of electric fencing along the western reserve boundary, and increased Problem Animal Control activity. Attitudinal studies and an Environmental Impact Assessment are to occur before any fencing is installed. Possible community wildlife project proposals include continued assistance with the supply of chemicals for cattle dips (for tick control), the building of classrooms, conservation education programs, revenue sharing opportunities, wildlife ranching, and opportunities for small scale tourism-related businesses.

An MOU has not been signed yet between KWS and Baringo District for Kamnarok National Reserve, and people still reside within that area. Apparently as a result of the human presence, Kerio Valley elephants tend to spend most of their time on the Rimoi side of the river, as was suggested by the May 1994 aerial survey which counted 76 elephants in Rimoi Reserve and none in Kamnarok Reserve (Litoroh 1994).

4. History and culture of the people

The southern portion of the Kerio Valley has been, for many years, inhabited by Kalenjin people of various subgroups. These include the Keiyo, their northern neighbors the Marakwet, and their eastern neighbors the Tugen (Figure 1). Within the groups, land has always been owned communally, and was divided into areas of different usage types (Kipkorir and Ssenyonga 1986). The steep sides of the escarpment were where the

people resided, because they offered a good lookout for potential cattle raiders. Pastoral and agricultural activities, as well as hunting and gathering, occurred on the valley floor or on the plateau (Massam 1968, ASAL, n.d.). In the 1940's people began using the valley floor for year round (not just wet season) grazing (ASAL, n.d.), and in the 1960's, following a reduction in intertribal warfare, many of the Keiyo people moved their residences to the valley floor (local informant, Massam 1968). Other changes included an emigration from Elgeyo-Marakwet District during the 1970's, as young men left in search of more fertile lands recently vacated by White settlers. This trend ended in the 1980's due to crowding in most of the better agricultural areas and the beginning of development in Elgeyo-Marakwet District (Ministry of Finance and Planning, n.d.). The district growth rate, which had been -0.65% between 1969 and 1979, grew to 3.53% between 1979 and 1989. An emigration of educated people is the present trend (ASAL, n.d.).

Rimoi residents told us about other migrations since the 1960's. These included immigration of the Marakwet people south into the Rimoi portion of the Valley in response to intensified cattle raids from the Pokot to the north. The Marakwet said that they were also enticed by greener (moister) grazing lands. More recently the Tugen have moved west into the Rimoi area to escape the more densely populated and heavily farmed Baringo lands. This immigration of people, with their livestock and crops, into the Rimoi region of the valley has created pressures on the land that were not there 40 years ago.

Cultivation, although practiced for many generations, has always been secondary to pastoralism in the culture of the people, who feel that they were forced into agriculture by historical events (Massam 1968, Kipkorir and Ssenyonga 1986). The people's diet traditionally consisted of meat, milk, and blood, supplemented with cultivated sorghum and millet, and fruits and vegetables gathered from the forest (Kipkorir and Ssenyonga 1986).

All of these foods are still utilized today, although blood, game meat, and gathered foods appear to make up a smaller portion of the diet than they probably did in earlier times. In addition, there is an increasing dependence on purchased grains (Kipkorir 1986).

Conservation was a part of traditional Kalenjin culture, according to Kasaggam (1992) who interviewed elderly Marakwet about their traditions. He said that central to the Marakwet (whom he said share many beliefs and practices with the Keiyo and Tugen), was a belief that "...nature had no mouth with which to speak and could not protect itself. It needed man to be its voice." At meetings the Marakwet "... would discuss the proper use of land, soil, trees, water and grazing fields, and the safeguarding of sacred, ritualistic places." The concern for the natural world was reflected in the totem system, whereby each clan had an animal as its totem and the clan was held responsible for the protection of that animal. The belief that people could be reincarnated as animals created a great respect for all animals. Birds had special significance in that they acted as messengers which traveled between the physical and supernatural worlds and were able to help people understand the environment. Myths which guided people's activities illustrated an awareness of ecological interrelationships such as the connection of deforestation with erosion and a decrease in rainfall. (Kipkorir [1978] mentions myths of other Kalenjin groups which connected the history of the people to the natural world, as did the myth which described the start of cultivation of grains as occurring when a person observed that a finger millet seed which had fallen into some elephant dung grew into a plant.) Practices amongst the Marakwet that curbed resource depletion (despite communal land ownership) called for equitable resource utilization. For example, days of irrigation channel utilization alternated amongst community members (as they still do in Marakwet District), and gathering rights were kept on a rotating schedule. Natural materials which were important culturally, such as ostrich feathers, were collected as found items when possible. In addition, these materials were

protected by selected elders, and many materials were shared with other clans to help prevent overexploitation of the resource.

Hunting among the Kalenjin, although important as a source of meat (since domesticated livestock was rarely butchered, per Kipkorir 1986), was undertaken with moderation. This was evident by the great number of wild animals that remained in the Kerio Valley, despite long-term coexistence with Kalenjin people (Massam 1968). Groups hunted communally, and the meat was shared equally (Kipkorir and Ssenonyonga 1986, Massam). Hunting was not done for sport (Kasaggam 1992). Animals were killed for food, clothing, a source of income, and to minimize crop raiding or livestock depredation (Massam 1968). When a crop raiding elephant was speared, every part of the killed elephant was utilized, and was distributed following strict rules (Massam 1968). People were discouraged from consuming more animal protein than necessary. Kalenjins were not allowed to eat meat and drink milk at the same time, nor were wealthy men (who by definition owned much livestock) allowed to eat the flesh of wild animals (Kipkorir 1978).

B. The Main Study Area: Rimoi Sublocation

Rimoi Sublocation, which has an area of 180 sq km, incorporates most of the southern half of Rimoi National Reserve (Figure 3). It is 12 km north to south and 15 km east to west (ASAL 1995), with the Kerio River its eastern boundary. On the west it extends halfway up the Elgeyo Escarpment. The area of arable land is 9 km by 12 km (ibid.), which includes all but the reserve and the sides of the escarpment. The dirt road between Biretwo and Tot passes through the sublocation (Figure 2). There are no matatus (privately owned public transport vehicles) that regularly travel the dirt road, so transportation is difficult for residents. We measured 17 km between Rimoi Centre and the paved road. Once at the

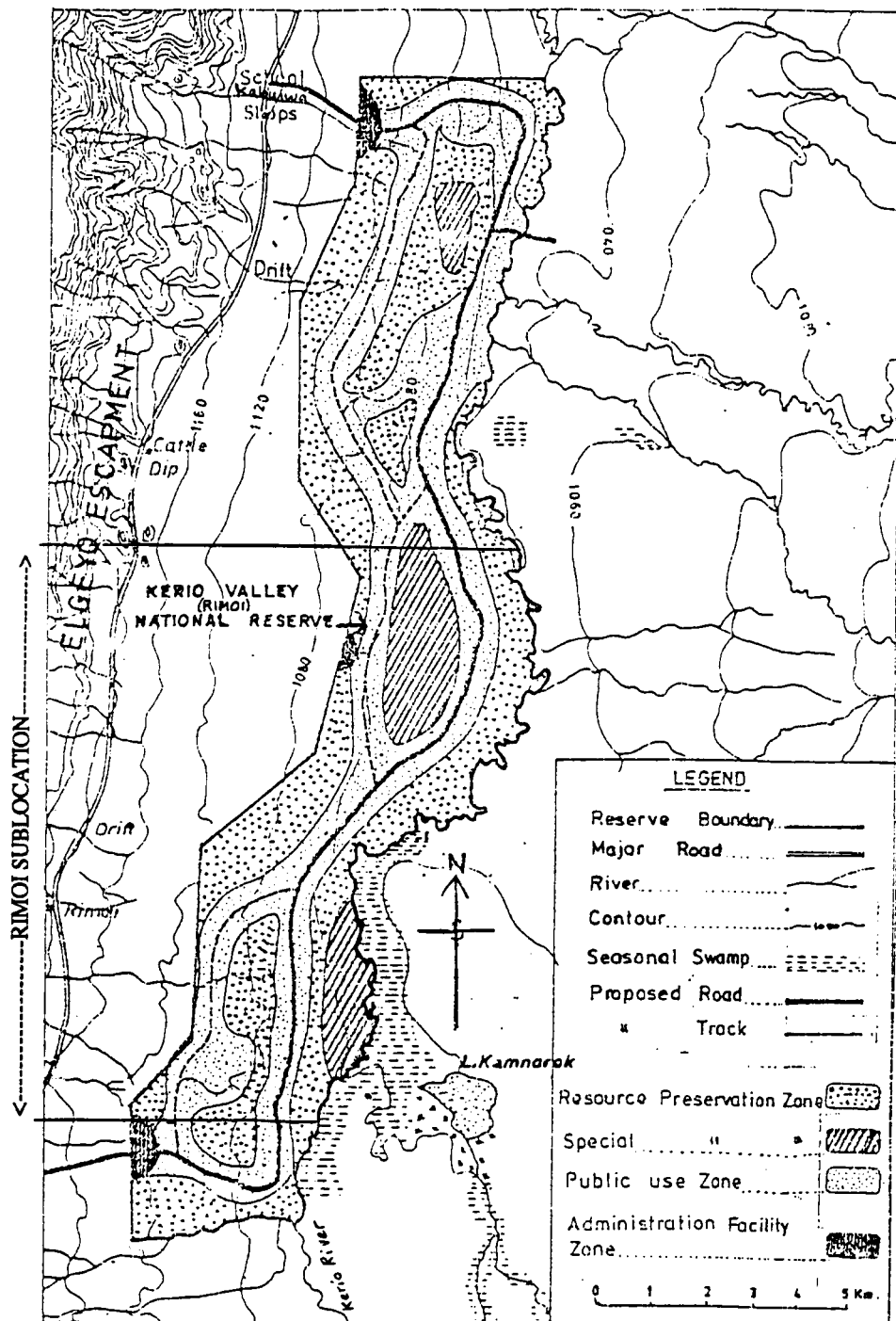


Figure 3. The Main Study Area: Rimoi Sublocation. Rimoi Sublocation is bounded on the east by the Kerio River. The western boundary is not pictured but lies on the side of the escarpment. Rimoi Sublocation incorporates approximately half of Rimoi National Reserve. Source: Wildlife Conservation and Management Department. Ministry of Tourism and Wildlife. 1985. *Kerio Valley (Rimoi) National Reserve management plan.* Kenya.

paved road, people can wait for vehicles to take them to the towns of Iten (21 km away) or Kabarnet (30 km away).

Two all-season rivers pass through the sublocation, the Kessup and the Rimoi, although water from the Rimoi River had been diverted into irrigation furrows while we were there so the original river bed was dry. The Kerio River is approximately 1 m deep during the rainy season, but disappears during the dry season. In addition, smaller seasonal streams fill up with water briefly after it rains on the plateau.

Two cattle dips and a primary school are found here, and a sporadically functioning borehole is just north of the sublocation boundary. Rimoi Centre consists of a concrete-block shop with a couple of basic lodging rooms. Other businesses in the sublocation include 2 open-air tea-shops and 2 small dry goods shops within people's houses. The medical dispensaries are about 15 km away, near Biretwo or Kabulwa. Tambach Hospital is 28 km away, and Iten Hospital is 38 km away. The Arid and Semi Arid Lands Development Programme (ASAL) is active in the area with projects such as improving water catchment and providing employment through road maintenance. KWS is involved with trying to improve infrastructure near Rimoi National Reserve through assistance in building classrooms and cattle dips. The human population in Rimoi Sublocation is quite sparse. The number of inhabitants is estimated as 1220 (ASAL 1995), or 8 people per sq km. In addition, the total livestock population is estimated at 14,000 goats, 10,000 head of cattle, 7,000 sheep, and 800 chickens (ASAL 1995).

C. Neighboring Areas: Kabulwa, Biretwo, and Kamnarok Reserve

Kabulwa is adjacent to the northwest corner of Rimoi National Reserve (Figure 2). Larger than Rimoi Centre, Kabulwa's center has a dozen simple shops and restaurants, Administrative Police and Ranger housing, and minimal piped water. Nearby is a school, a Catholic church, and a medical dispensary.

Biretwo is 10.5 km south of the Rimoi National Reserve boundary (Figure 2). Shops, small restaurants, and lodging are available along the paved road that runs through the town, and there is a dispensary. Farms appear somewhat larger and more productive than those at Rimoi or Kabulwa.

Kamnarok National Reserve lies to the east of Rimoi National Reserve and incorporates Lake Kamnarok (Figure 2). In the region near the lake the population appears denser than that of Rimoi, and, as mentioned above, people still live within the reserve boundaries. The area appears less wooded and more overgrazed. Rimoi residents told us that this region is much drier than Rimoi. The lake area is a dry season watering and grazing ground for wild and domestic animals. There are many shops and small restaurants on the dirt road connecting this area to the Iten-Kabarnet road to the south. Of note regarding this area is the May 1996 spearing of an elephant, as mentioned above, and the killing of a buffalo and its young while we were in the region in July 1996.

III. METHODS

A. General Methodology

This study employed techniques that were developed by sociologists and anthropologists (Babbie 1995, Denzin 1989, Lofland and Lofland 1984) and that, more recently, have been used by development and conservation workers (Byers 1996, Joint preparation 1991, Shaner et al. 1982). It incorporated ideologies found in research methodologies such as rapid rural appraisal (RRA) and its Kenyan offshoot, participatory rural appraisal (PRA) (Ford 1993). As described by Conway and McCracken (1990), RRA involves

...systematic, but semi-structured, activity in the field...designed to acquire quickly new information, and new hypotheses about, rural life... 'Truth' is approached through the rapid build up of diverse information rather than via statistical replication. Secondary data, direct observation in the field, semi-structured interviews, the preparation of diagrams all contribute to a progressively accurate analysis of the situation under investigation.

With flexibility that allows for modifications in the field based on feedback, recognition of the value of local knowledge and views, and a 'triangulation' approach that utilizes different sources of information (Conway and McCracken 1990), this type of process allows organizations " ... to design solutions to 'real' or 'identified' problems rather than conducting research to solve 'assumed' and 'imagined' problems and constraints" (Abalu et al. 1987).

Our approach differed from that of an RRA or PRA in that my assistant and I did not comprise a group of experts in various fields, as is generally employed. Nor was it our role to elicit an action plan from the community, which is the objective of PRA. In addition, a PRA had recently been undertaken in our study area and so it was not necessary

for us to gather general community information through the preparation of group-derived diagrams and interviews of community leaders, as that had been done by ASAL.

However, like an RRA or a PRA, our study incorporated local knowledge and views. It employed triangulation with the use of some of the same information sources (secondary data, semi-structured interviews, and direct observation) combined with another social assessment technique, participant observation (Byers 1996, Lofland and Lofland 1984, Shaner et al. 1982), that our longer stay allowed. And the goal was similar to that of an RRA or PRA, in that our goal was to describe locally-defined problems and opportunities in order for KWS to develop appropriate solutions to local human-elephant conflict.

Other studies on human-elephant conflict that have incorporated the use of some of the same tools for data collection include those undertaken by Thouless (1994), who compiled secondary data, Sukumar (1992), who combined the use of secondary data with extensive observations of elephant activity, and Emerton and Majiwa (1992), Damiba and Ables (1993), Newmark et al. (1994), and Tchamba (1996) who gathered most of their information through interviews of local people.

B. Site Selection

Our site selection was circumscribed by KWS personnel. The head of the Elephant Programme, John Waithaka, suggested that we do our research in the Kerio Valley because no research had been conducted on human-elephant conflict occurring there. The Coordinator for the Elephant Programme for that region, Martin Mulama, suggested that we do our study near Rimo National Reserve, because conflict was occurring around the reserve and information was lacking regarding details of the timing and causes of occurrences and attitudes of local people toward elephant management. In addition, as mentioned above, a need for "fence attitudinal studies" had been expressed in the most

recent Rimoi National Reserve management plan (KWS and Keiyo County Council, n.d.). The warden at Iten (the district headquarters) suggested that we base our camp in Rimoi Sublocation (Figure 3). At that time there was a lot of elephant activity in the area and, as a result, the KWS rangers who were to assist us were stationed there. The neighboring areas of Kabulwa, Biretwo, and the Lake Kamnarok region of Kamnarok National Reserve were also examined briefly, due to interest in these areas expressed by wardens in Iten and Kabarnet. These areas are affected by the same groups of elephants that affect people in Rimoi Sublocation.

C. Information Collection

1. Secondary data

A literature review began in the United States and covered historical approaches to conservation in Africa, community natural resource management, human-elephant conflict, KWS policies and practices, the Keiyo people, and the Kerio Valley. That review was continued in Kenya in libraries in Nairobi, Eldoret, and Iten at KWS, National Museums of Kenya, East African Natural History Society, ASAL, and Kerio Valley Authority offices, as well as at public facilities.

Additional information was compiled through consultations with KWS personnel in the Elephant and Community Wildlife Programmes in Nairobi, and with wardens and rangers in Iten, Kabarnet, and in the Kerio Valley. The Forestry and ASAL staff in Iten, the Museum Director in Kabarnet, and the Rimoi Chief, Assistant Chief, and Village Elders also provided information. An ASAL-led community session in Rimoi Sublocation, which identified community problems as they relate to reforestation, was also informative.

2. Introduction to the area and community

The initial trip to the main study site was on 14 June 1996 with Mr. Mulama, who was also visiting the area for the first time. In the company of local rangers, we traveled to the reserve boundaries and visited a shopkeeper whose crops had been damaged by elephants. Other introductions to the rest of the area and community followed, usually in the company of the rangers. Despite our KWS escorts, we tried to maintain a sense of separateness from them so that 1) attitudes toward the KWS would not effect our relationships with people, 2) responses in interviews would be less pointed, and 3) expectations for immediate problem-solution from KWS would not be unduly raised by our presence. We were introduced as students from the United States who wanted to find out more about life of the people in the valley. We offered that although we were not its employees, KWS was interested in knowing what people's views were, and suggested that information that people told us would help KWS do so. During the first week we met with the Chief and Assistant Chief and participated in a school community day, hoping that we would become a familiar entity to the community. In addition, we camped on land that was inhabited by a local family (Figure 4) and met the family members and neighbors. We stayed at this same site from 13 June until 20 July, with occasional one- or two-day trips to neighboring areas including the other study sites.

3. Interviews

a) The questionnaire

A household data form and questionnaire sheet were developed and used to guide and record information from the interviews (Appendix A). The household data form was based on one described in the *Participatory Rural Appraisal Handbook* (Joint preparation 1991). A village data sheet presented by Mackinnon et al. (1986) was also used as a reference. The questionnaire itself included questions similar to those used in other studies, such as

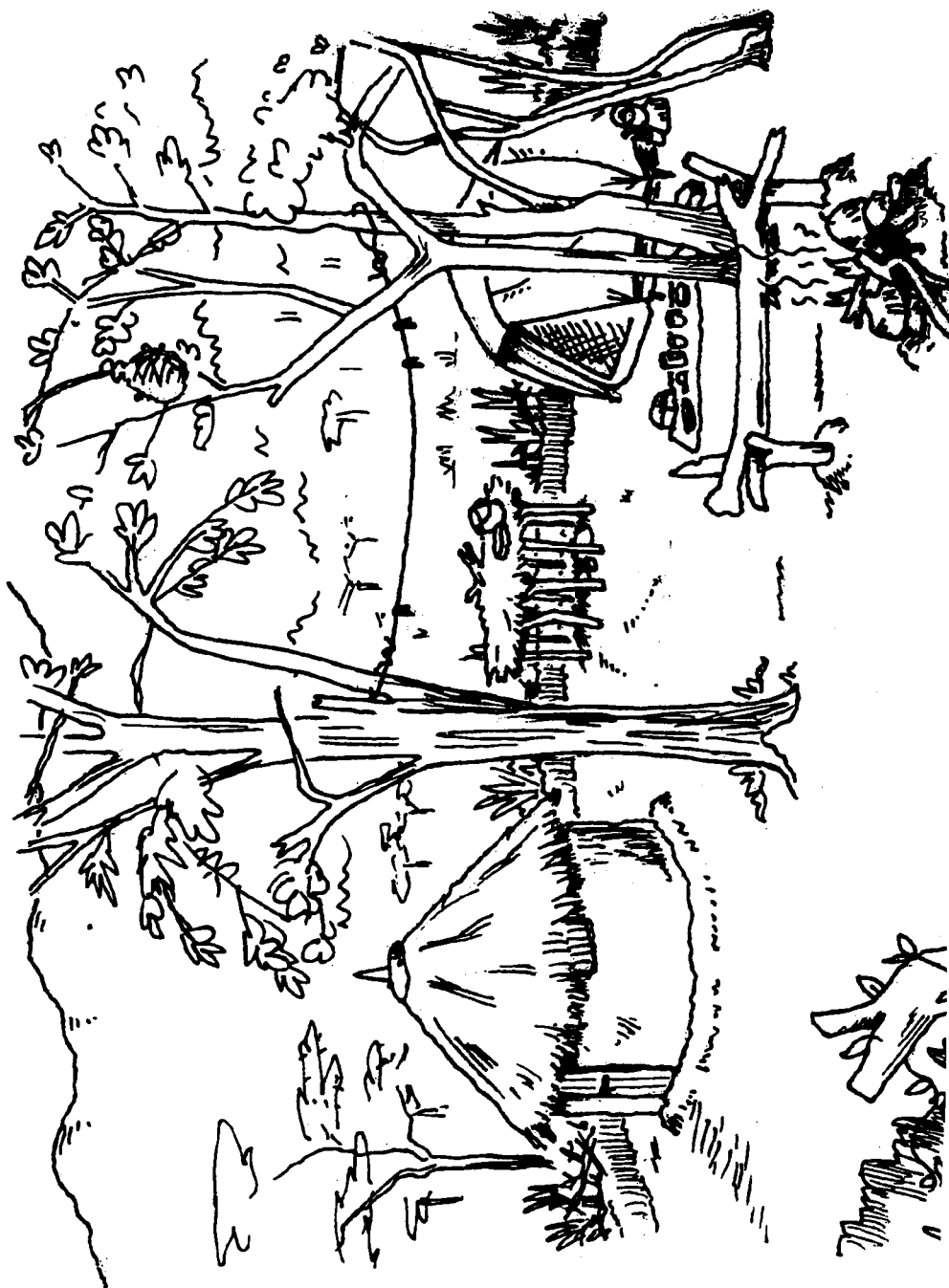


Figure 4. Sketch of Field Camp in Rimoi Sublocation. Our tent is pictured on the right. On the left is a typical mud round house in which the owner's children and KWS rangers resided during our stay. In the foreground is our shared cookfire. The compound is enclosed by a thorn and stick fence that was built to keep livestock out. In the background is the Elgeyo Escarpment. Sketch by Steve Stratakos, Kenya, 1996.

those by Damiba and Ables (1993) and Tchamba (1996), and incorporated question development techniques described by Denzin (1989), Lofland and Lofland (1984), and Babbie (1995). Other works, such as *Voices from Africa* (Lewis and Carter 1993), also provided ideas for questions. Questionnaires found in the *Participatory Rural Appraisal Handbook* (Joint preparation 1991) were useful in the preliminary stages of question writing. Suggestions regarding the length of the questionnaire were given through personal communication by researchers with interview experience (E. Hammond, J. Munyugi, A. Snook; pers. com. 1996).

The list of questions was modified several times. The first modification occurred once it was known that a PRA had taken place previously. Additional modifications occurred once we arrived at our site and after the first days of interviewing, in response to new information and an awareness of the success or failure of specific questions.

b) Sampling of the local population

Semi-structured interviews were undertaken following the guidelines described in the *Participatory Rural Appraisal Handbook* (Joint preparation 1991). Because we wanted to get a sense of how much impact elephants had on people and their property, the sampling unit we selected was the household (defined as those residing together in a compound -- usually the husband, wives, and unmarried children). Those sampled were to represent residents of Rimoi Sublocation within the range of elephants. No households were sampled from the hillsides too steep for elephants to climb (slopes greater than approximately 45 degrees, and indicated as beyond the reach of elephants by locals and an aerial elephant census done by KWS [Litoroh 1994]). However, some of those interviewed in lowland fields or "goat houses" (habitable enclosures where goats are kept at night) did have homes higher up the escarpment. Thirty-two interviews were undertaken,

which is just over 15 % of the 205 households. This exceeds the suggested 10% sample size recommended for a 200 sampling unit total (Davis-Case 1990). Adult household members of both sexes and different ages were sought out, so that any difference in views within the household might be exposed. The final distribution of sexes was 60% men and 40% women. The distributions of ages were 28% between 18 to 22, 43% between 23 and 59 years old, and 28% 60 or over.

Initial plans to randomize the sample using village lists were rejected due to a delay in receiving the lists as well as logistical difficulties in locating a particular individual's house and finding anyone at home. Random sampling using transects was also rejected due to the sparsity of households. Because random sampling was not possible, purposive sampling was used (Babbie 1995) whereby a sample of interviewees was selected that we believed would lead to the most comprehensive understanding of the subject of study. We sought to represent different physical regions -- the north, south, east (near the reserve) and west (at the base of the escarpment) -- as well as variation in terms of proximity to the road and the reserve boundary. An attempt was also made to include households of different economic levels, although there was little variation. Only 2 families in the area are wealthy enough to have metal-roofed, cement-walled houses, and one of those households was interviewed. The different tribes were well represented in the samples, although households were not selected on that basis. Keiyo and Marakwet people each made up 34% of those interviewed, while 22% were Tugen. In cases of mixed ancestry, when apparent, the father's tribe was used to designate the tribe of the interviewee. The actual proportion of different tribes in the population is not known.

The sublocation was divided into regions. Each morning the selected region was reached by vehicle or foot and then a house was sought out by walking away from the road. The

person interviewed at the first house was asked to direct us to another house where someone was at home. Because people regularly left their homes by mid-morning, we occasionally encountered and interviewed people in their fields, along the road, or at a neighbor's house (Figure 5).

c) The interview process

Once in the field, interviews were conducted using techniques for rapport development, listening, and probing suggested by Denzin (1989), Lofland and Lofland (1984), and Babbie (1995), and following the protocol required by the Research Administration (1990-1991) at the University of Tennessee, Knoxville. We were usually escorted to the interview households by a KWS ranger or a resident. The escort introduced us and then left. In accordance with the Research Administration protocol, we explained our purpose, told the interviewee that his or her participation was voluntary, and told the person that all answers would remain confidential. Verbal explanations and consent replaced a written form because most interviewees were illiterate, and because it had been suggested that suspicion associated with signing any paper would reduce our success in finding willing interviewees (J. Munyugi, pers. com. 1996). The questioning was conducted in Ki-Swahili, and then translated into English for the assistant to record on a prepared form (Appendix A). Each interview took 20 to 30 minutes, which seemed to be the limit of interest for most individuals.

Following the interview, notes were written on the interview form regarding any remarkable observation about the home or farm, the interviewee's attitude, the activity being engaged in, other household members in the vicinity, etc. (Babbie 1995, Lofland and Lofland 1984). Interviews were reviewed at the end of the day, checking that each answer was clearly and accurately recorded, and notes regarding the successes or problems of the

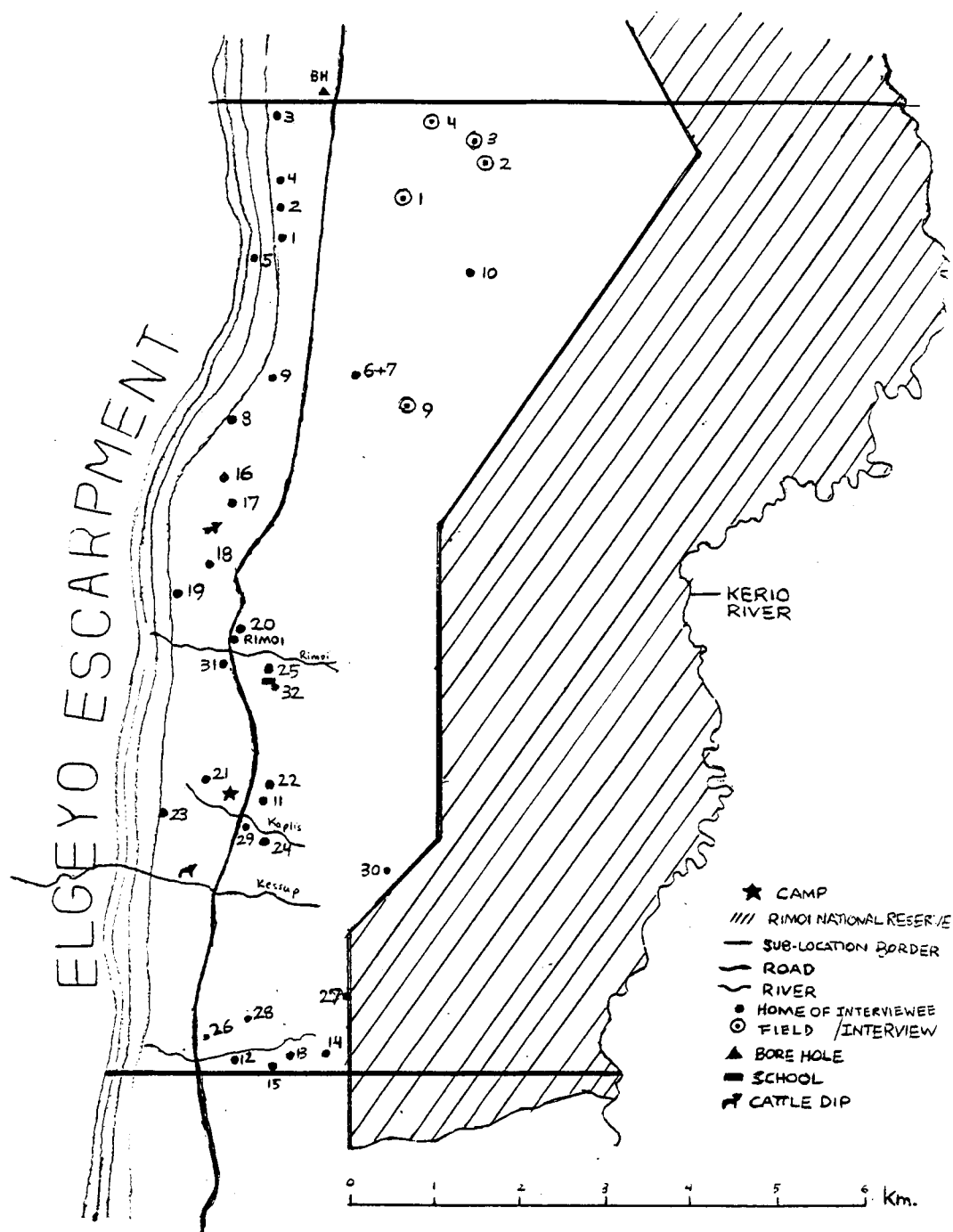


Figure 5. Interview Sites in Rimoi Sublocation. Points indicate locations of interviews. For interviews that occurred at other than the person's home, the home location is also indicated. Also shown is Rimoi National Reserve at the right, local rivers, the dirt road passing through the sublocation, and other types of infrastructure. Adapted from: Survey of Kenya, 1976.

day, topics to pursue or ways to improve upon the interviewing technique were written in an interview log in a field notebook (Joint preparation 1991).

4. Direct observation

In addition to observations made during the interviews, we attempted to learn as much as possible about our surroundings in the valley by direct observation (Conway and McCracken 1990, Joint preparation 1991, Shaner et al. 1982). These observations were unstructured but deliberate attempts to find out about various aspects of the life of Rimoi residents and the context for their interaction with elephants. This included observations of households and farms, schools, shops, markets, workers, and wildlife. Residents often assisted us by letting us visit their property and explaining the use of items, as well as indicating the local names and uses of various plants and animals. The rangers showed us portions of the reserve, indicating signs of human, elephant, and other activity. The rangers also showed us fields that had been damaged by elephants and, in Kamnarok Reserve, an elephant that had been killed by humans. Notes on observations were entered into the field notebook throughout the day.

5. Participant observation

In response to 1) necessity, 2) a desire to better understand the context for local perspectives (Lofland and Lofland 1984, Shaner et al. 1982), and 3) the desire to be more familiar and less intimidating to residents, we participated in many daily activities with local people throughout our five-week stay. Alongside local women and children, we collected water from the stream for cooking and drinking. We bathed and did laundry in the river close to our camp and then the one farther away when the first river dried up because of lack of rain. We helped collect firewood for our shared cookfire, and we, like the others, ate our meals seated on logs or stones (Figure 4).

When we had access to a vehicle, we experienced the boulders and gullies and mud of the 15 km drive to the paved road, and the numerous detours to pick up people or things that had no other means of transport. When we were sick and had no vehicle, we experienced the same difficult trip seated on the backs of bicycles which friends pedaled. When we ran out of food, we joined local women and children in their biweekly three-hour climb to the town 1200 meters above. One night we accompanied a ranger and farmers who were guarding the fields at night and in the darkness we wondered which bushes the 100 elephants lurked behind and shared the fear that the residents feel many nights.

These experiences were recorded in the field notebook every night. These, in combination with direct observations, helped us refine the interview questionnaire initially, and helped us understand interview responses. When, during interviews, some women appeared tired and unsmiling, or when people told us that lack of water and food or the presence of elephants were problems for them, we knew what that meant. We could also understand the importance of the interconnectedness of community members and the direct connection between the community and its natural environment.

D. Analysis

Information from interviews was tallied by hand for each question. Missing responses were categorized as "not applicable" if the question did not apply to the situation of the particular interviewee. They were categorized as "missing data" if the interviewer had been unwilling to answer a question or if the question was not asked due to a change in the interview sheet or due to oversight. The data were plotted in graph form and converted into percentages for ease of interpretation (Babbie 1995). Other information gained in the field through observation, consultation, and literature was copied from the field notebook,

organized by category (Babbie 1995), and used to augment information gathered through interviews. A draft report was prepared immediately upon leaving the Rimoi area, and was referred to when writing this paper.

IV. RESULTS

A. Main Study Area: Rimoi Sublocation

1. Socio-economic context

a) Cultivation

Most residents continue to practice shifting cultivation on land that is still owned communally, under the name of the Keiyo County Council. Land adjudication is planned (Van der Walle, pers. com. 1996). Most farmers interviewed have small fields, with 84% (27/32) cultivating a total of 2 acres or less (Figure 6). People cultivate several fields in different locations, in order to take advantage of the most fertile soils and to minimize possible damage by elephants. Over 60% (20/32) plant millet and/or corn (maize) (Figure 7). Beans and cowpeas are also common crops. A variety of other crops are grown to a lesser extent, including other grains, legumes, vegetables, fruits, and tree seedlings. We observed that some interplanting of crops is practiced and all fields are protected from livestock using temporary thorn and stick fences. We were told, and observed, that rains are irregular and few, beginning sometime between March and May, and crops are often lost due to drought. People may replant if the expected rains fail. One resident told us that millet tends to grow better than corn (and is more pest resistant), but that people prefer to eat corn. Therefore they grow millet and sell it to buy corn with which to make the staple "ugali" (boiled grain meal). Another resident said that people like growing corn because it requires less work to plant, weed, and harvest than millet. We observed that a few people have created irrigation furrows which originate in rivers on the escarpment. Traditions that are evident in this region include the continued use of hand-made hoes for cultivation (Figure 8). New practices include the use of animal (goat) manure as fertilizer for their crops, and some terracing on the steep rocky slopes (pers. obs., Kipkorir and Ssenyonga 1986). It appears that most people do not grow, or store, enough food to maintain

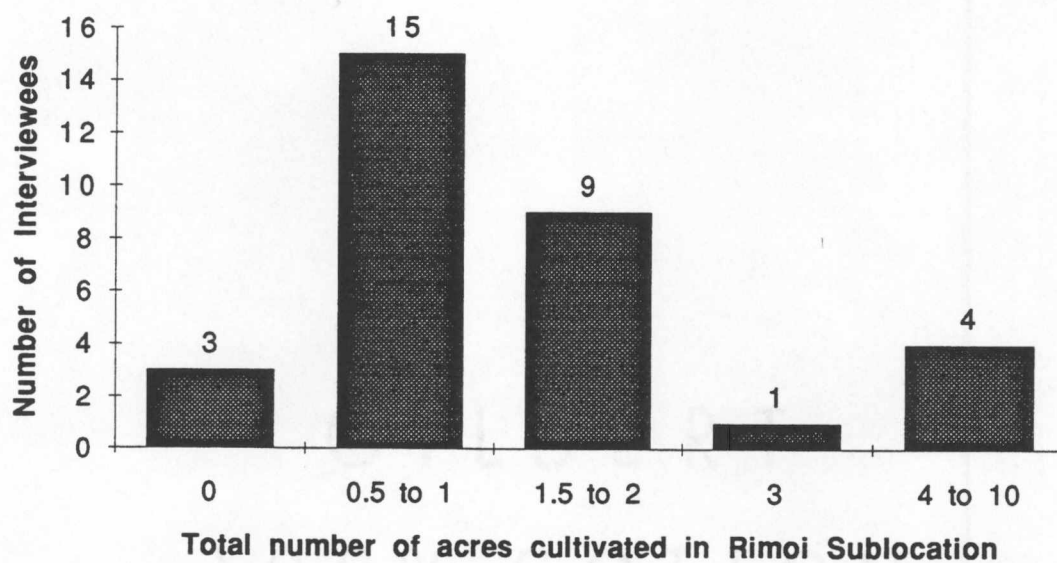


Figure 6. Total Farm Size in Rimoi Sublocation. (N = 32.) Land cultivated by interviewees may be divided into separate fields in various locations. Land parcels outside of Rimoi Sublocation are not included in the totals. Kenya, 1996.

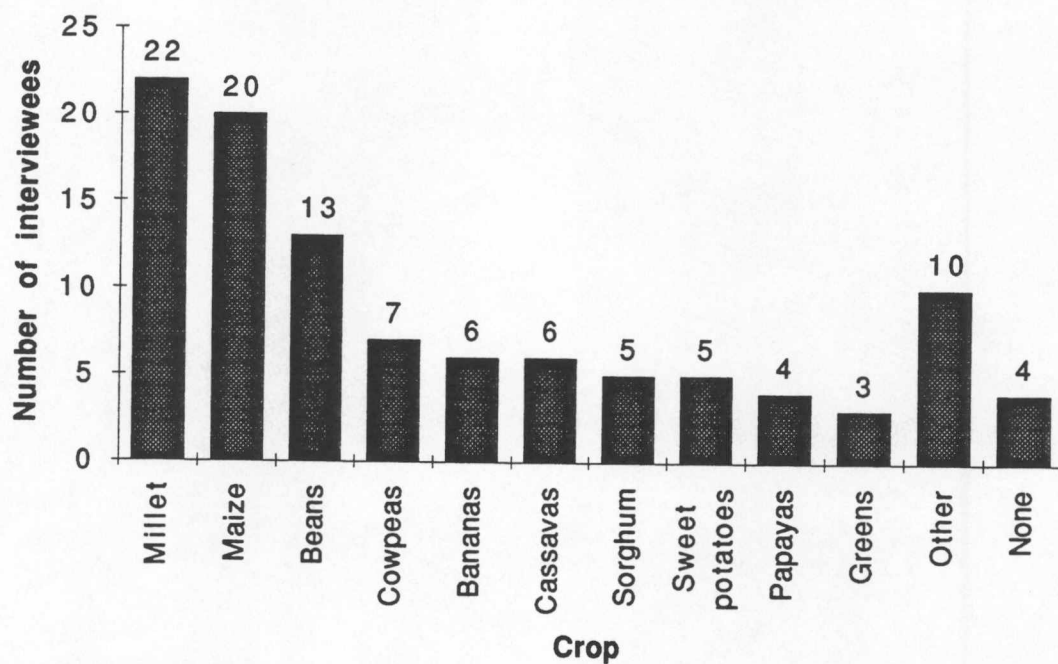
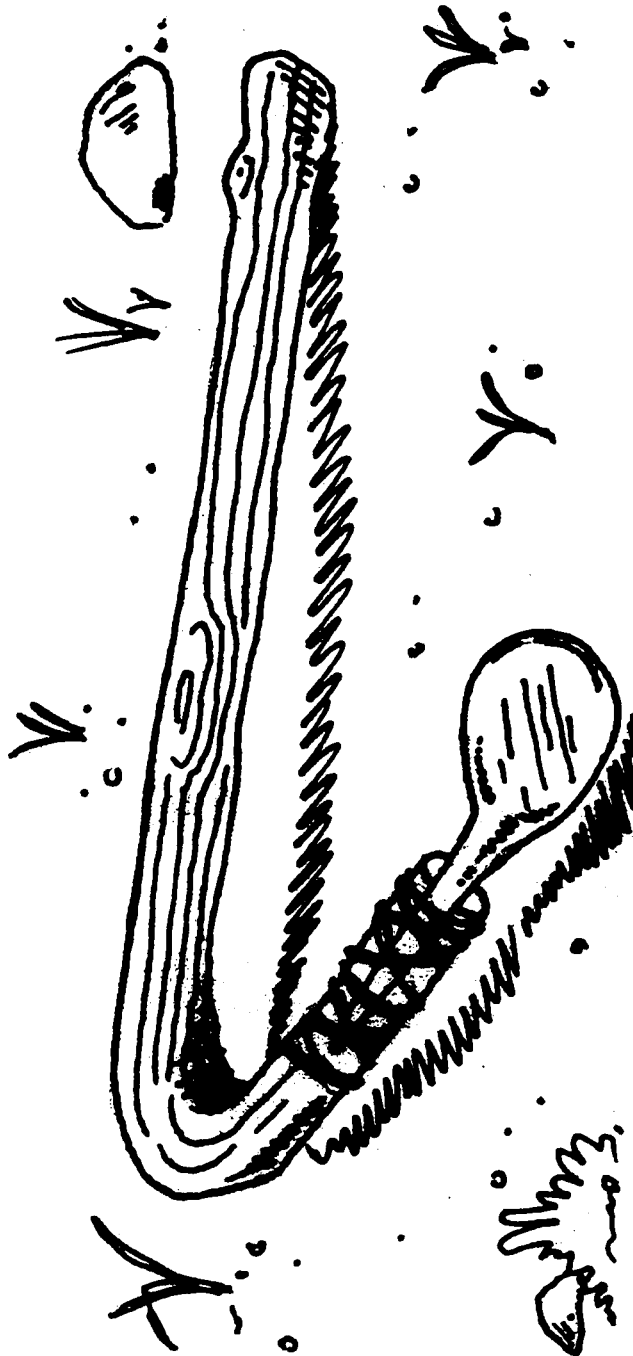


Figure 7. Crops Grown in Rimoi Sublocation. (N = 32.) Crops included in "other" are mangos, watermelon, green grams, white beans, peanuts, and tree seedlings. Kenya, 1996.



Mokombet

Figure 8. Sketch of Traditional Hoe Used in Rimo Sublocation. The traditional hoe or "mokombet" is made of a curved piece of wood and a metal blade. It is used by many farmers, especially when planting millet. Sketch by Steve Stratakis. Kenya, 1996.

themselves year round and therefore, as mentioned above, the women and children must climb up the escarpment to Iten to buy corn flour for their families.

b) Livestock

Livestock provides the main source of income for residents, as well as being a source of milk for drinking and cooking, and occasionally meat. It might be noted that the rule regarding the consumption of meat separately from milk was mentioned to us by an elderly man, suggesting that some of the traditional conservation practices are still part of the present-day culture. Ninety percent of those interviewed (29/32) have goats (the top income source per ASAL 1995 *PRA exercise*), and 78% (25/32) have cows (Figure 9). In addition to these animals, many people have sheep and chickens and collect honey from beehives that they suspend from trees (Figure 10). Goats, sheep and cows are kept in thorn- or stick-walled enclosures at night, and are set free to graze untended during the day (Figure 11). As is mentioned in the ASAL *PRA report* (1995), overstocking has led to severe erosion problems and a lack of forage. Huge gullies -- some 6 meters deep -- are visible throughout the valley floor. This lack of forage, combined with livestock diseases, such as contagious caprine preulo pneumonica (CCPP), have recently made people more dependent on crop production for food. Cattle dips and spraying are used to control tick-borne diseases, but drugs to control the recent CCPP outbreak were available too late for many, and some interviewees lost whole herds of goats at the beginning of 1996. One resident told us that there exists a cooperative group of farmers that pool their financial resources to allow each to better maintain their livestock.

c) Other sources of income

In addition to the sale of living livestock and crops for cash, the following income sources were observed. Livestock-related products, including goat skins, honey, eggs, and

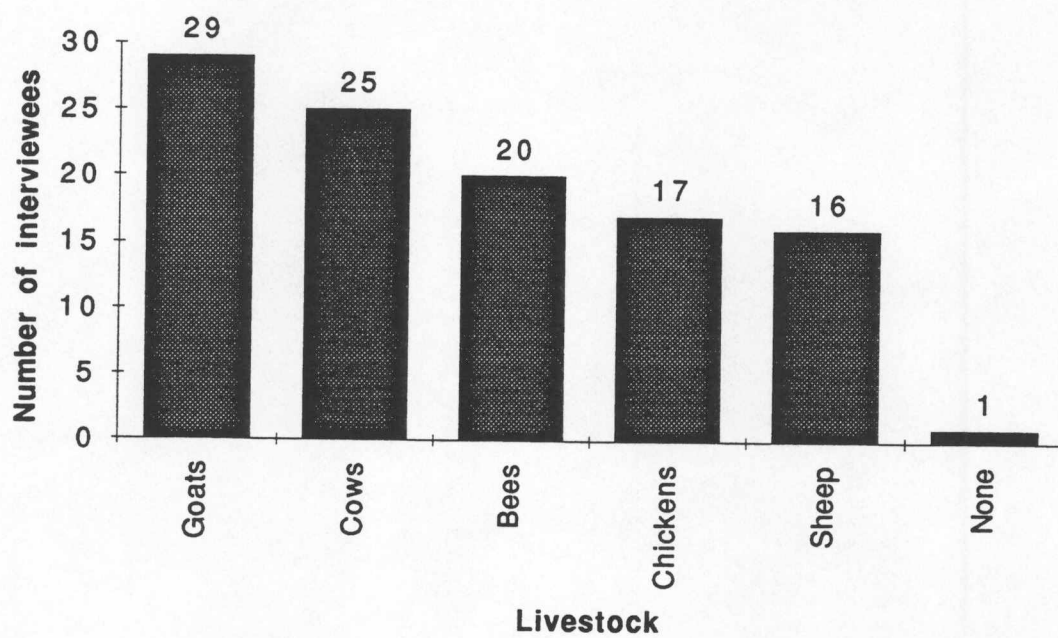


Figure 9. Livestock Kept by Interviewees in Rimoi Sublocation. (N = 32.) Kenya, 1996.

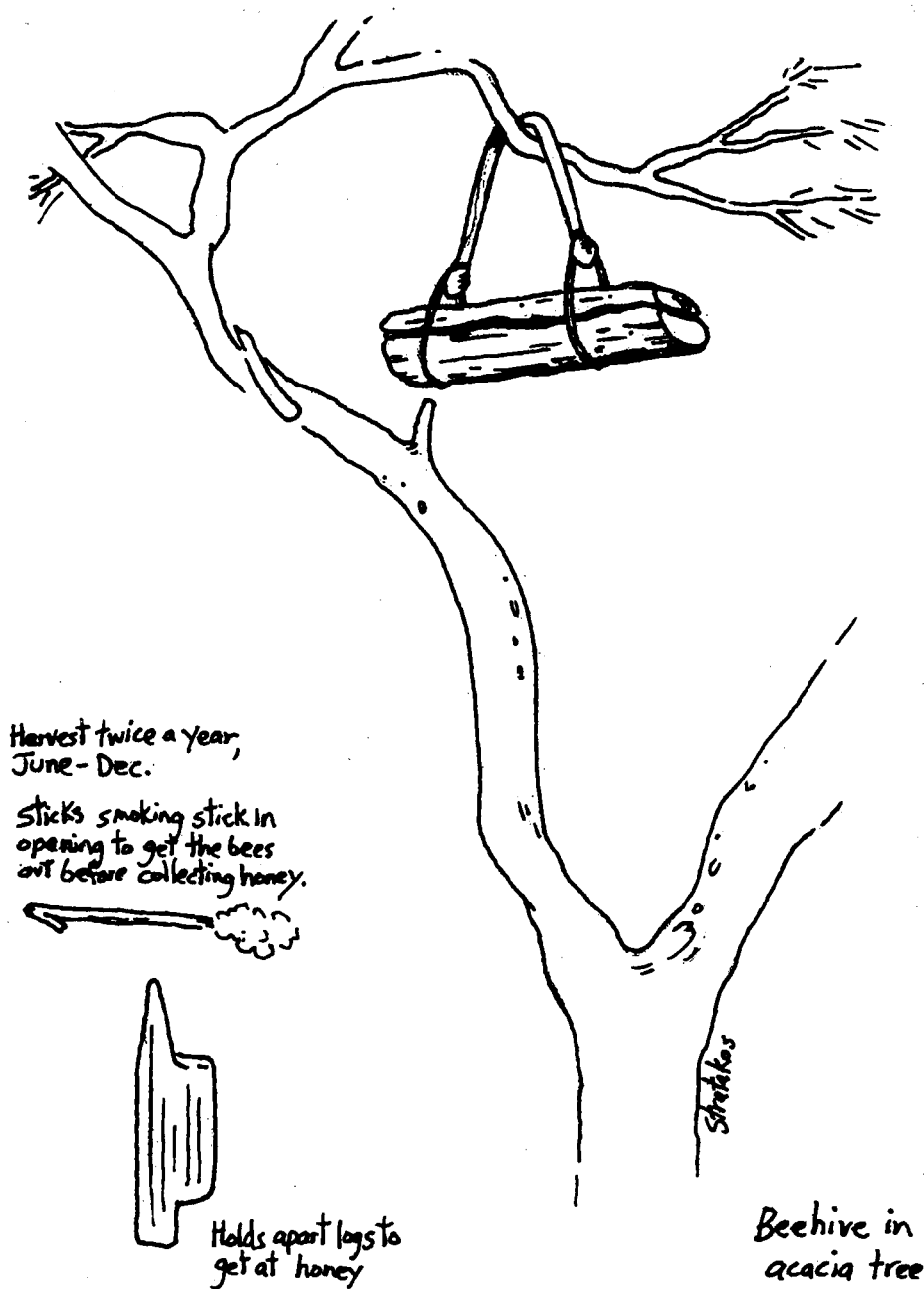


Figure 10. Sketch of Log Beehive in Rimoi Sublocation. Log beehives are suspended from Acacia trees by curved wood frames to which the hive is wired. Honey is harvested using smoke and a wooden piece that props the log halves apart. Beehive trees are sometimes pushed down by elephants. Sketch by Steve Stratakis. Kenya, 1996.

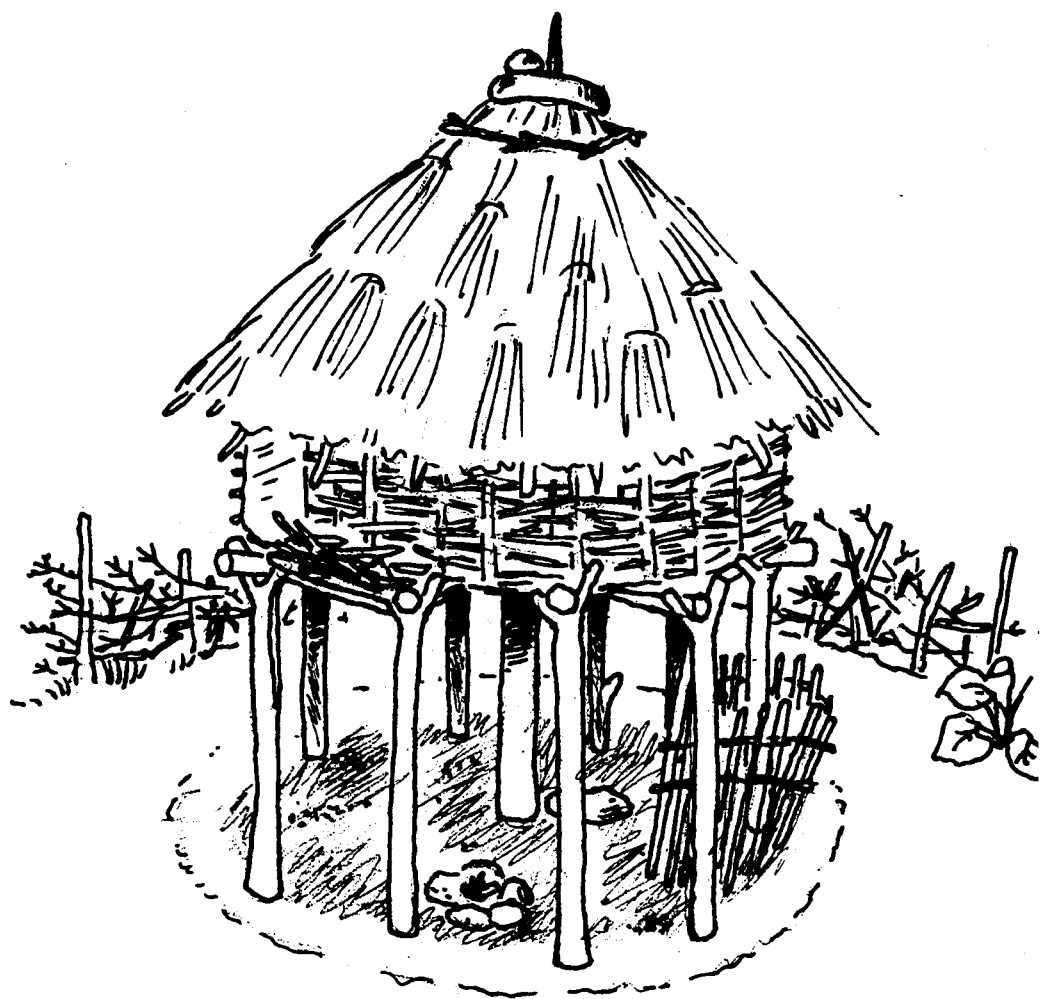


Figure 11. Sketch of a Goat House within a Goat Enclosure. Goats are kept within the enclosure at night. Kids are kept in the fenced area beneath the house. The mud and stick house provides shade, a place to store things, and a place for the owner to sleep. Grain stores are similar structures, with a floor closer to the ground. Both are vulnerable to elephants. Sketch by Steve Stratakos. Kenya, 1996.

chicken hutches are sold. Sales are made locally or goods are brought to various regional markets. Local businesses include several small shops which sell dry goods including salt, sugar, tea, aspirin, and anti-malarials. One of these shops also sells sodas and, as mentioned above, rents rooms. The two open-air tea shops make money from the sale of tea and simple prepared foods. Although their production is illegal, home-brewed millet and maize beer and hard liquor (Figure 12) are sold by the bottle or at an outdoor gathering spot. Charcoal is produced and transported to Iten and other towns for sale. Services that provide income include delivery of goods by bicycle (by men traveling along the valley floor) or by foot (by women traveling up and down the escarpment). One individual rents out the use of his corn mill. Approximately forty people are employed by ASAL to maintain the dirt road during the nine months of the year when rains may occur (April through December). A primary school employs teachers. Other employment opportunities are outside of Rimoi Sublocation, including a fluorspar mine at the southern tip of the Kerio Valley.

d) Houses and their contents

It was observed that most people live in traditional round houses made of sticks, mud, and dung (Figure 4), although some houses are built of stones as well as mud. The houses are thatched with grass that grows on the sides of the escarpment. Grain store houses and goat houses are also mud and thatch (Figure 11). People sometimes reside in the goat houses, which they like because the floor is raised off the ground and mosquitoes tend not to enter through the downward-facing door opening. Wood fires are used for cooking. Milk and honey are kept in traditional containers made of gourds, leather, and wood, although purchased metal pans are used for cooking food. Most houses contain bows, arrows, and poison sap used for hunting, although hunting has been illegal in Kenya since 1977.

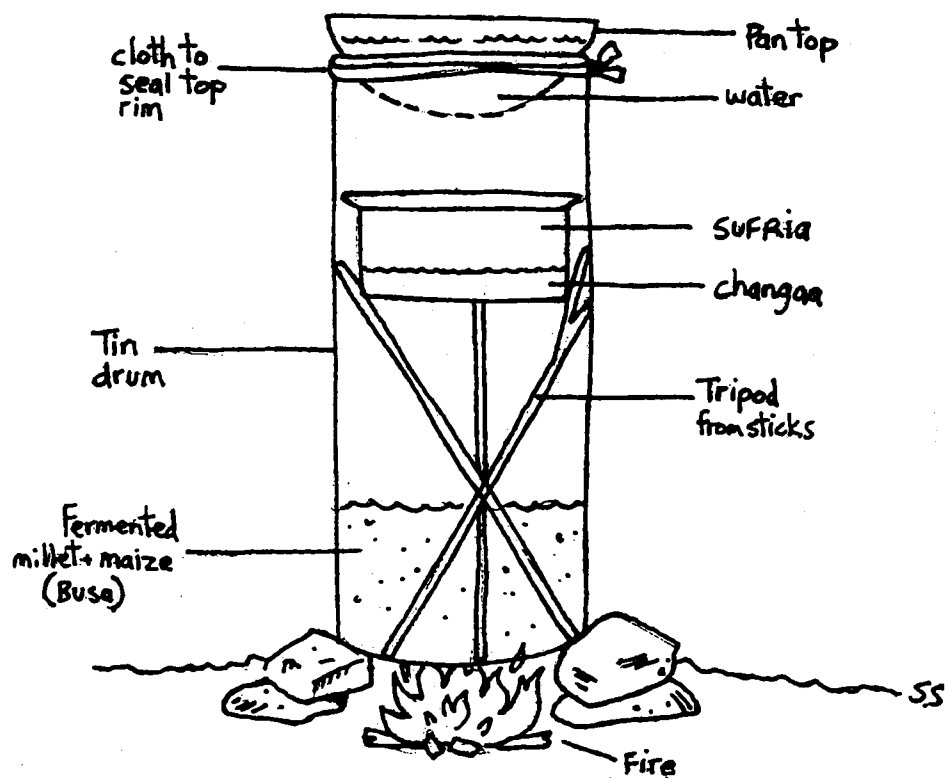


Figure 12. Sketch of a Liquor Still in Rimoi Sublocation. The still is made of a tin drum and metal cooking pans ("sufrias"). Beer from millet and corn is distilled to make "changaa", which fetches a good price locally or regionally. Sketch by Steve Stratakos. Kenya, 1996.

(Rangers spend dry season trying to keep people from hunting the apparently abundant dikdik and impala.) One person showed us a spear.

People wear clothing typical of Westerners, although one man was seen wearing a goat skin. Many clothes, such as a "Bulls" shirt and a "Minnie Mouse" shirt worn by the man with the spear, are probably second hand items from the US. The writing on one mud-walled house also reflected the ironic juxtaposition of American culture in traditional Africa. Written in a contrasting color of mud were the hand-written words that said "We enjoy Coca Cola".

e) Education

People in Rimoi Sublocation have access to a local primary school, but there is no secondary school within walking distance. Most interviewees had received little formal education, with 46% (15/32) having had no school, 44% (14/32) having attended one year or more of primary school, and 9% (2/32) having attended one year or more of secondary school (Figure 13). Three percent (1/32) had attended teaching college. This person, whose birth home is on the plateau, is working in Rimoi Sublocation as a teacher. It appeared that most children today attend elementary school.

2. Elephant activity and human response

a) Season of activity

Eighty-three percent of the interviewees (25/30) said that they only see elephants during the rainy season (Figure 14), particularly at night (Figure 15) when rain is actually falling. Fresh dung, footprints, tusk marks, and broken trees were plentiful in the area during our stay, which coincided with the rainy season. During the rainy season elephants travel into farm fields and next to houses, where most of the encounters with elephants occur (Figure

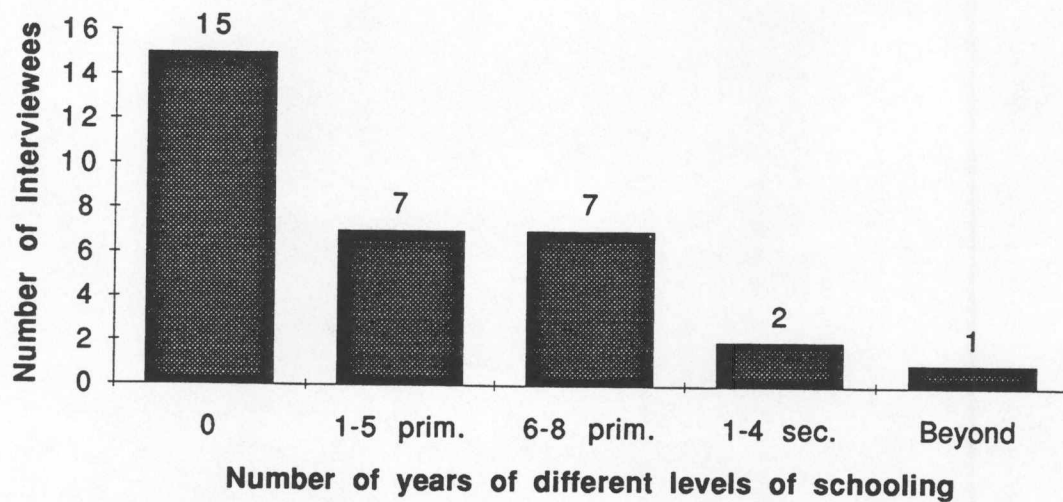


Figure 13. Education of Interviewees in Rimoi Sublocation. (N = 32.) Both men and women were represented in the large group with no formal schooling. Those with 1-5 years of primary school were all men. Those with more primary school or some secondary school were divided equally between the sexes. The individual with schooling beyond secondary school was a male originally from the highlands. Kenya, 1996.

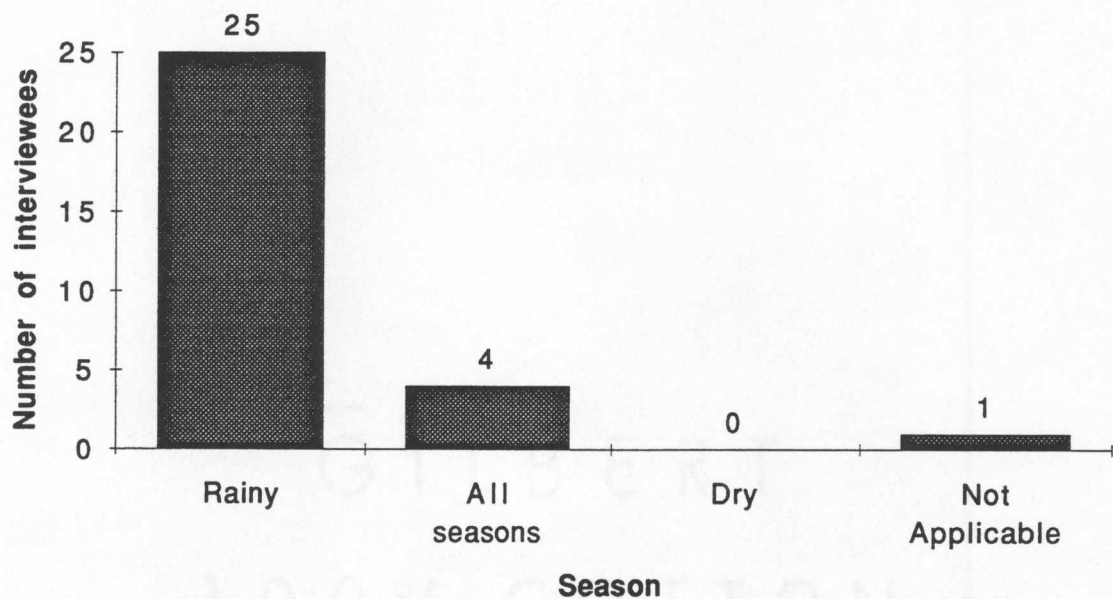


Figure 14. Season of Elephant Encounters in Rimoi Sublocation. (N = 30. Missing data = 2.) Three interviewees said that elephants enter fields during rainy season but that occasional dry season crop depredation occurs, one person stating that this was done by lone elephants or elephants in pairs. These responses were scored as "rainy". Kenya, 1996.

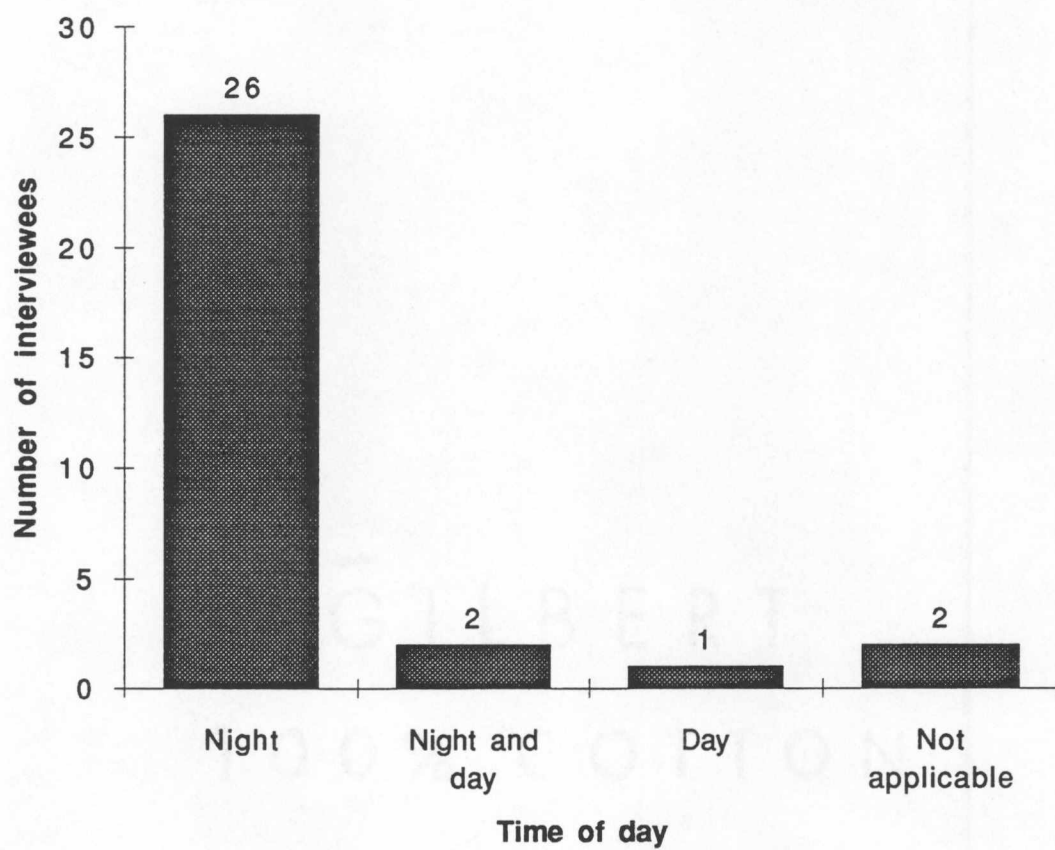


Figure 15. Time of Day of Elephant Encounters in Rimoi Sublocation. (N = 31. Missing data = 1.) "Night" includes late evening and early morning. Kenya, 1996.

16). Dry season and daytime encounters with elephants generally occur in or near the reserve. However, three interviewees mentioned that infrequently crop raiding by elephants does occur in the dry season, one person stating that the animals were large and alone or in pairs (presumably bulls). Eighty-one percent (25/31) said that they see elephants in large groups, which they guessed to be made up of 10, 20, or 100 individuals (Figure 17). Most of those that talked about the composition of large elephant groups said that they usually see mixed-aged groups. We saw evidence of large mixed-age groups outside of the reserve. Twenty-nine percent of interviewees (9/31) mentioned seeing single elephants and pairs of elephants, which were associated with large size and aggressiveness. The only elephant that we actually observed during our stay was a very large lone bull foraging in the bush outside of the reserve one morning.

b) Variation among years

It is not clear how much yearly variation in elephant activity there is. Fifty percent (10/20) of the interviewees that talked about variation among years said that the elephant activity is the same every year, while 40% (8/20) said that certain years are “worse” than others. However, 87% (20/23) felt that long ago the problem with elephants was less severe or non-existent (Figure 18). When asked why, the answers varied. Some explained that long ago people farmed little and lived up on the escarpment. Some said that the human population was smaller. Others said that there are more elephants now, or that elephants are more accustomed to people, or that elephants have realized that there is food where people live. Some said that hunting long ago kept the elephants away. Others said that intensive ivory hunting has made the elephants become more aggressive.

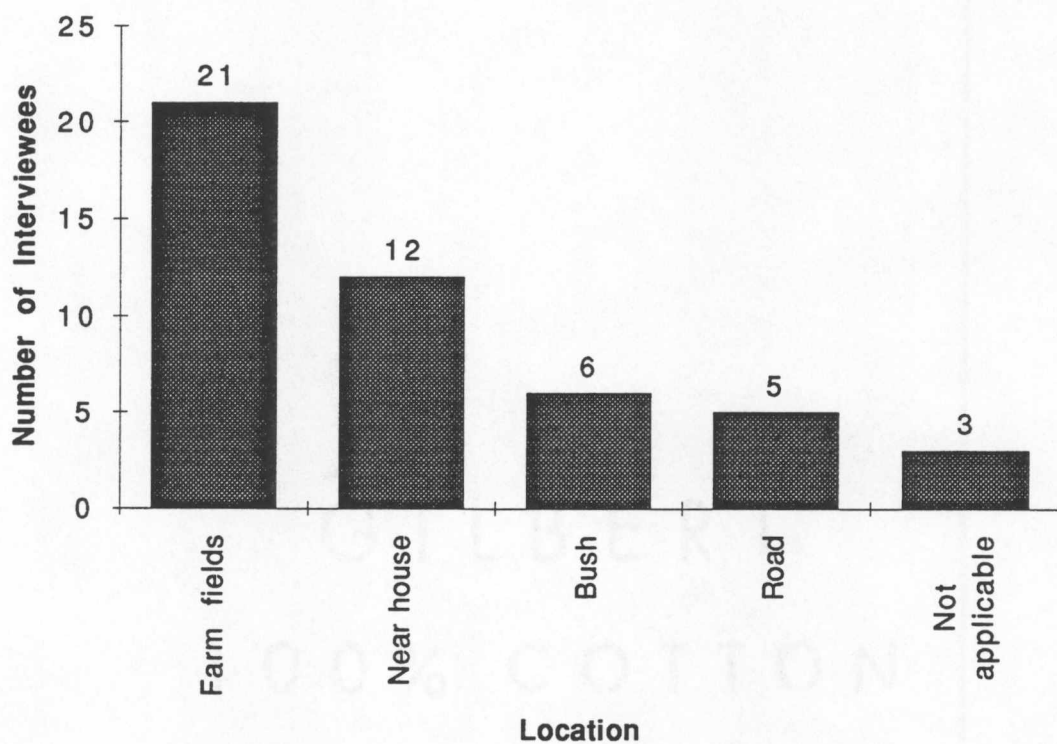


Figure 16. Location of Elephant Encounters in Rimoi Sublocation. (N=30. Missing data = 2. More than one response per interviewee possible.) "Bush" generally means the reserve. Kenya, 1996.

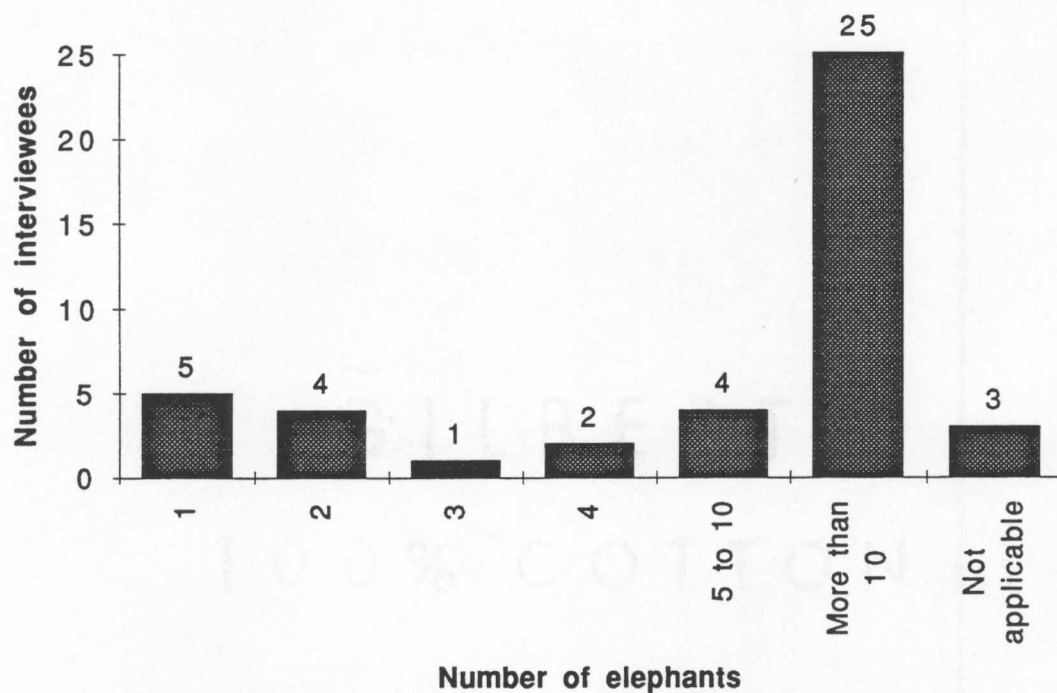


Figure 17. Size of Elephant Groups Seen in Rimoi Sublocation. (N = 31. Missing data = 1. More than one response per interviewee possible.) Groups of 1 or 2 animals are presumably bulls. Groups of 5 or more are presumably family groups. Groups of 3 or 4 animals may be either bulls or family groups. Kenya, 1996.

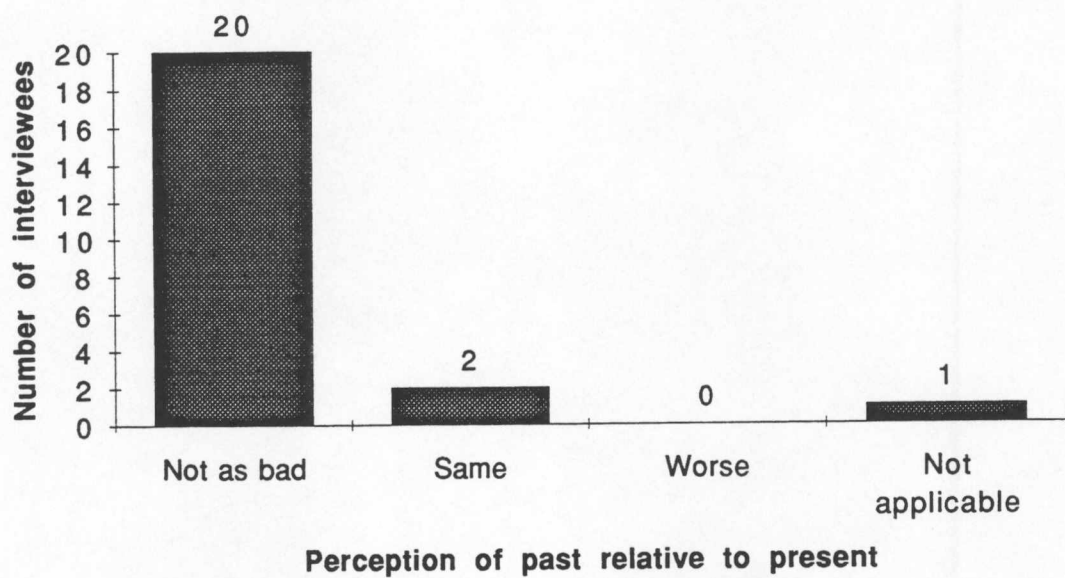


Figure 18. Human-Elephant Problem in the Past in Rimoi Sublocation. (N = 23. Missing data = 9.) Kenya, 1996.

c) Frequency of activity

It appears that most residents are directly impacted by elephant-caused crop destruction. Sixty-eight percent of interviewees (21/31) said that elephants had entered their fields at least once during 1995 (Figure 19). Fifty-two percent (16/31) said that elephants entered 3 or more times. By July of 1996, 42% of interviewees (11/26) said that elephants had entered their fields at least once during that year (Figure 20). By that time, rains had just begun and most crops were still immature. We saw several millet fields that had elephant foot prints through them, and noted that about a quarter of the crop may have been lost due to trampling or uprooting.

d) Human response

When elephants approach farm fields or houses, 47% of the interviewees (15/32) mentioned that they try to scare elephants away with loud noises such as yelling, clapping, or banging metal pieces together (Figure 21). Nine percent (3/32) said that they scare the animals by blowing traditional hand-made wooden whistles (Figure 22). Twenty-two percent (7/32) said that they build fires or throw flaming logs to scare elephants away from fields. We saw and heard noise-making devices during our stay, and observed thatch-roofed platforms in trees that are used as lookouts from which to guard fields. Flashlights are also used to make elephants go away. In addition, although not mentioned during the interviews, we observed that some farmers track down the KWS rangers and ask them to sleep in the fields to help protect crops. The rangers light noise- and flame-making devices known as thunderflashes, which often scare the elephants away, although, according to KWS, the flashes become less successful as the elephants get accustomed to the routine. The rangers sometimes fire their rifles to scare the elephants away. Sixty-eight percent of those interviewees that talked about their success (13/19) mentioned that elephants usually

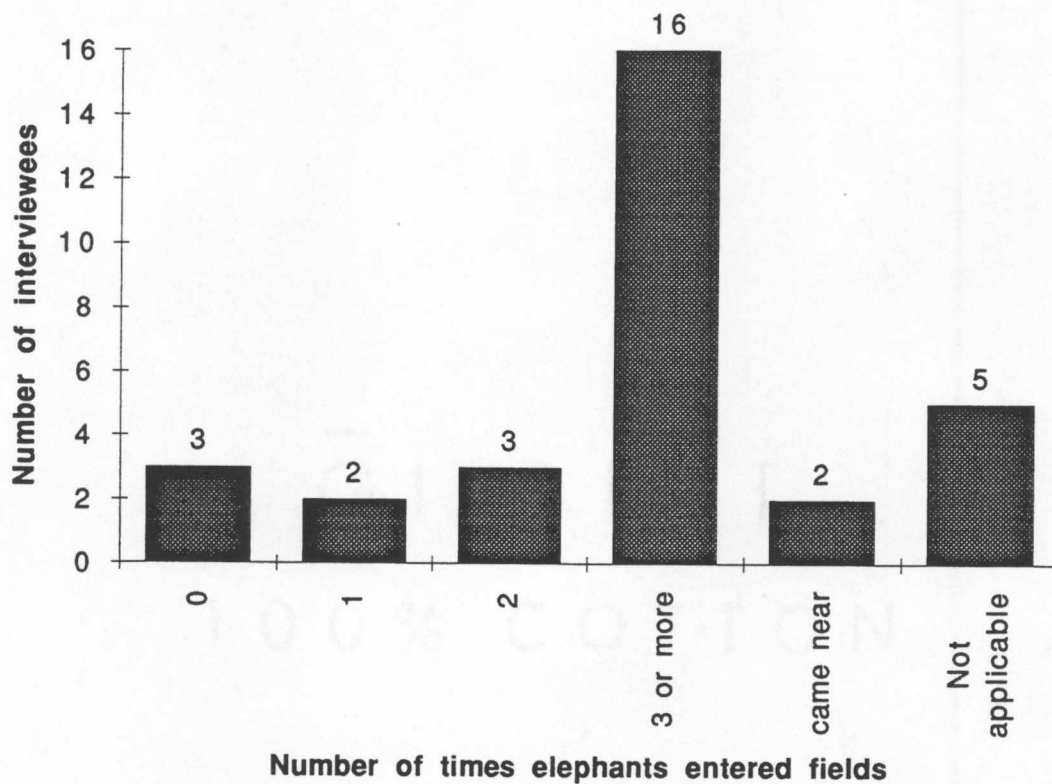


Figure 19. Elephant Activity in Farms in Rimoi Sublocation in 1995. (N = 31. Missing data = 1.) Kenya, 1996.

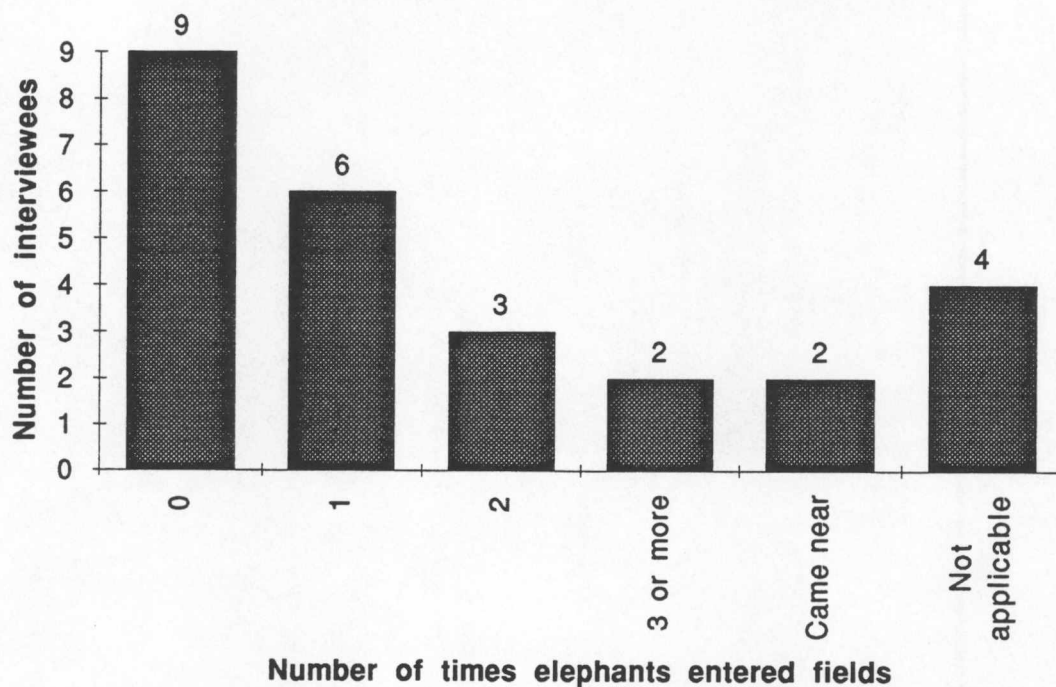


Figure 20. Elephant Activity in Farms in Rimoi Sublocation by June/July 1996. (N = 26. Missing data = 6.) If a total number was not given but an interviewee mentioned a specific incidence of crop depredation, the response was scored as "1". Kenya, 1996.

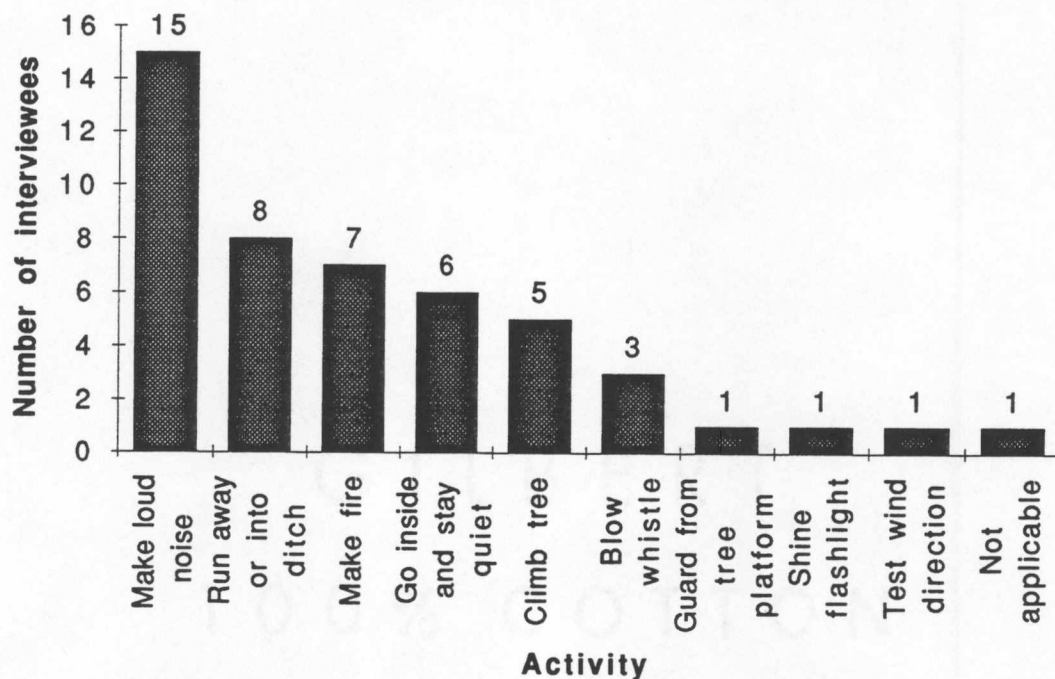


Figure 21. Human Response to Elephant Activity in Rimoi Sublocation. (N = 32. More than one response per interviewee possible.) Noise making includes yelling, clapping, or banging metal pieces together (sometimes suspended and activated from a line some distance away). Fire making includes stationary fires on the ground or flaming logs which are thrown. Some responses are intended to keep elephants out of fields. Others are intended to protect the individual from danger. Kenya, 1996.

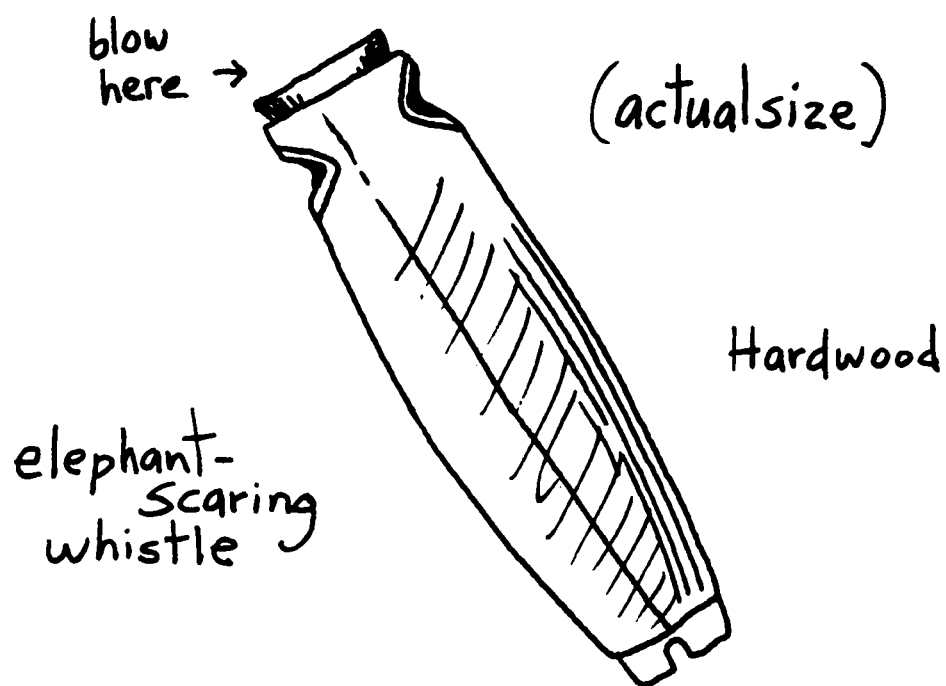


Figure 22. Whistle Used by Rimoi Sublocation Residents to Scare Elephants. Sketch by Steve Stratakos. Kenya, 1996.

ran away in response to the farmers efforts, but 16% (3/19) said that sometimes the elephants stay, and another 16% (3/19) said that elephants always just stand and look at the farmers. Two people who were not interviewed, but whose farms had recently been visited by elephants, mentioned that the elephants had chased them. Many said that once the elephants have started eating the crops they are very hard to chase out of the field.

"Guarding" is generally a man's job (ASAL 1996) and that includes keeping elephants out of the fields. From our interviews it appears that most (but not all) women and children, and some older men, stay inside the houses and keep quiet until the elephants pass by. Some of the men knew quiet a bit about the elephants as they were more likely to have encountered them than were the women and children. When elephants are encountered away from home, people run away, run into a gully, or climb a big tree (Figure 21). One person mentioned using dust or ash to determine whether the elephant is up- or downwind.

e) Perceived severity of conflict relative to other problems

Elephants are perceived as a big problem, but according to the results of our interviews, not the biggest problem for Rimoi residents. In order to determine how important human-elephant conflict is to local people, interviewees were asked to state the two biggest problems in their daily life, before any reference to wildlife was made. Seventy-eight percent (25/32) mentioned that among their top two problems was a lack of water or rain for domestic use, livestock, and crops (Figure 23). Sixty-three percent (20/32) mentioned hunger among their top two problems, however, on further probing most broke this problem down into more specific causes (including elephants or lack of rain, or for non-Keiyos lack of land), and in that case the responses were scored in terms of those causes. Thirty-eight percent (12/32) listed destruction caused by elephants among their top two problems. Twenty-two percent (7/32) listed hunger, with no other explanation. Health

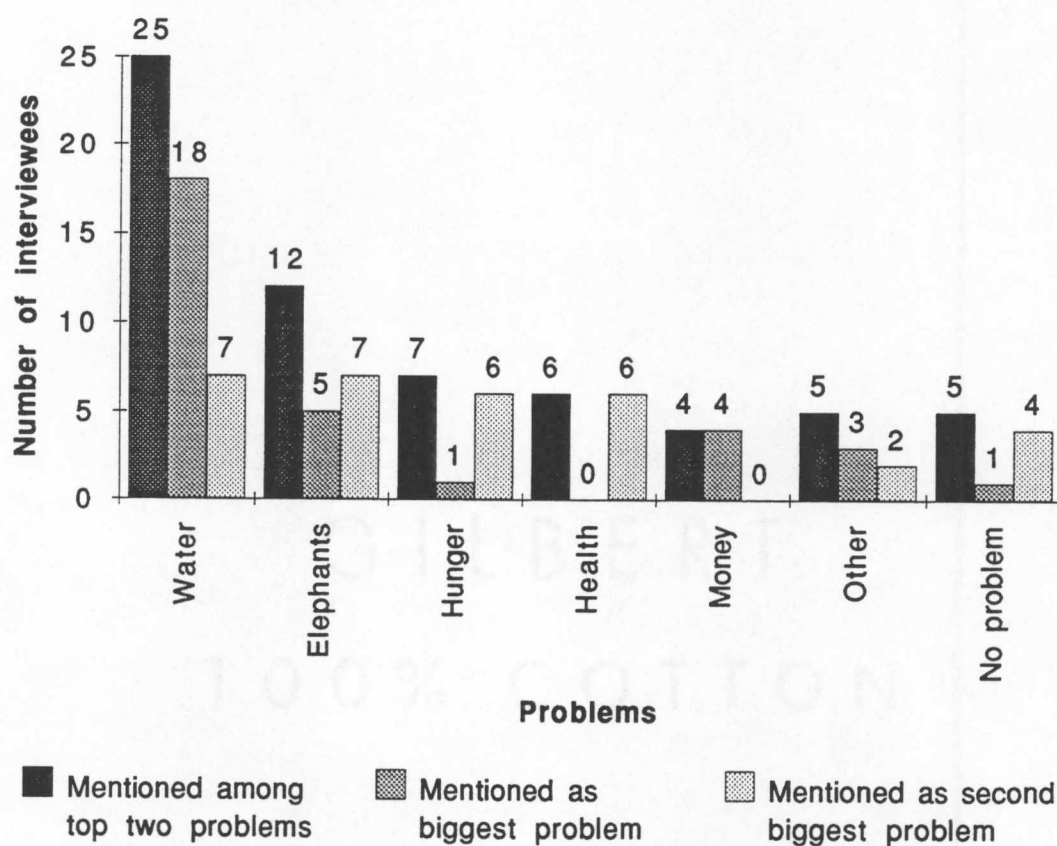


Figure 23. Problems of Residents in Rimoi Sublocation. (N = 32.) "Water" includes a lack of water or rain for domestic use, crops, and livestock. Hunger was mentioned among the top two problems by 63% of interviewees, but most broke down that problem into specific causes, such as lack of rain (water) or destruction by elephants. In this figure, hunger was only counted as a problem when no other cause was given. Kenya, 1996.

concerns, including the distance to hospitals and the existence of diseases such as malaria, were mentioned by 19 % (6/32). Money (in 3 out of 4 cases specifically school fees) was mentioned by 13% (4/32). Other problems included a lack of transportation, a lack of good land ("soil better in the reserve"), an inability to own land for non-Keiyos, as mentioned above, and predation of livestock by leopards. Sixteen percent (5/32) were not able to list two problems, perhaps either because they have only one major problem, have no problems great enough to mention, feel that everything is difficult, or were not sure what we meant by "problems". (In Byers [1996] it is suggested that in some situations, difficulties are considered facts of life and not problems.) The problems mentioned during our interviews are some of the same ones brought up by community members during the ASAL *PRA* (1995), although ranking of problems in the *PRA* was different, with the "wildlife menace" ranked as the most severe overall problem "...causing food shortages, destruction of environment and killing both livestock and humans". A lack of water was listed as the number one problem in the agriculture, livestock, and water sectors, however.

3. Local attitudes

a) Attitudes toward wildlife

Many people have negative views toward wildlife. When asked directly what they think of it, 59% of those interviewed (19/32) indicated that wildlife is bad (Figure 24). Thirty-four percent (11/32) said that it is good and bad. However, 50% (16/32) mentioned benefits associated with non-elephant wildlife species (Figure 25). Of these, 19% (6/32) mentioned the harmlessness of some species, 19% (6/32) mentioned an appreciation of the aesthetic value of animals, and 13% (4/32) mentioned the potential for tourism. One person described a certain bird as "beautiful," and some said that they like to see dikdik. People sometimes mentioned that they wanted animals to be around for future generations to see.

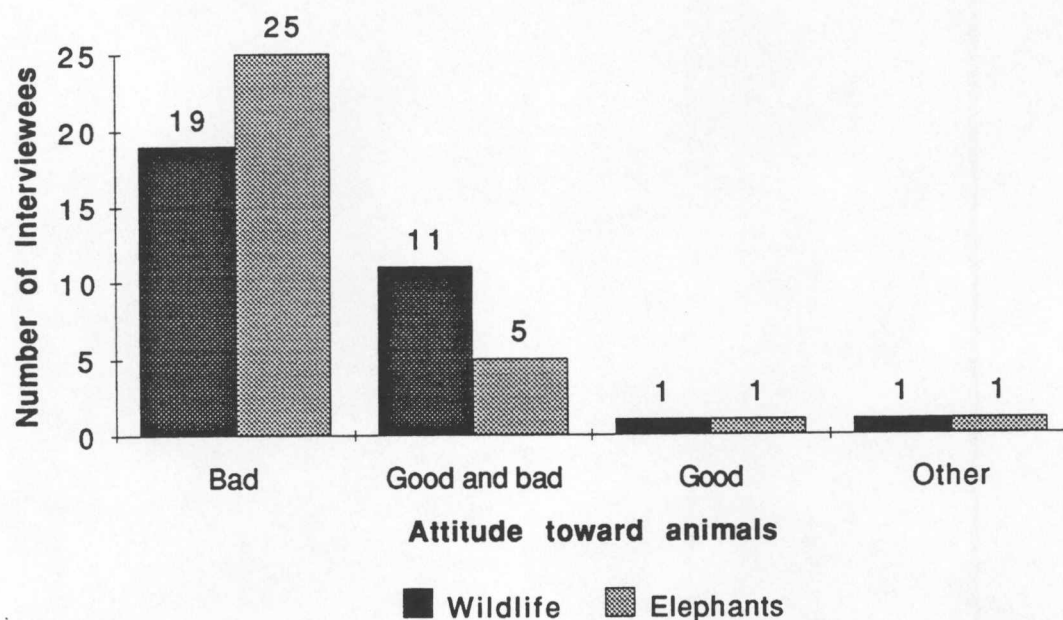


Figure 24. Attitudes toward Wildlife and Elephants in Rimoi Sublocation. (N = 32. More than one response per interviewee possible.) "Danger to humans" includes 3 responses that school children are delayed at home on mornings when elephants are in the vicinity. "Other" was the response that wildlife is not a concern of the interviewee. Kenya, 1996.

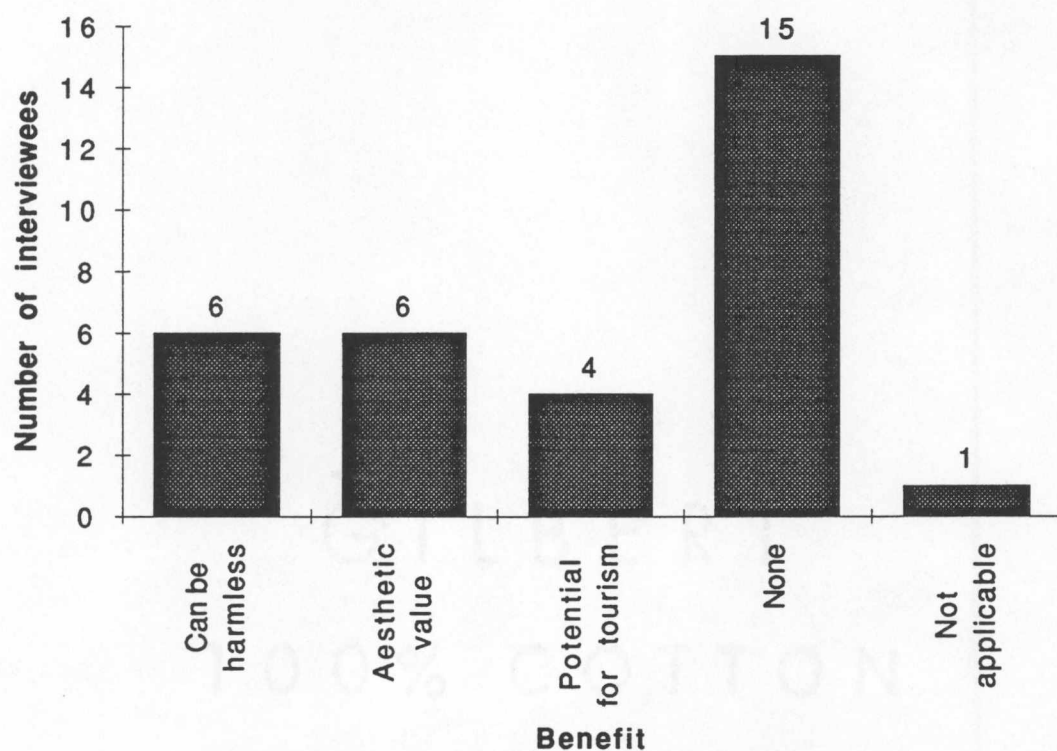


Figure 25. Benefits Associated with Wildlife in Rimoi Sublocation. (N = 32.) "Can be harmless" includes the responses that some animals are harmless and that animals are okay if they stay away. "Aesthetic value" includes the responses that birds are good, it will be good for children to see animals in the future, and that animals are nice to look at. Kenya, 1996.

In the five ASAL *PRA* interviews, wildlife was associated either with no benefits or with community infrastructural support or potential jobs that KWS will bring.

People listed non-elephant species that cause problems. Leopards were mentioned by 53% of the interviewees (17/32), wild dogs (probably jackals or hyenas) by 28% (9/32), baboons by 16% (5/32), and pythons by 13% (4/32) (Figure 26). All of these animals were considered a problem because of their killing of livestock, which was listed as the fifth most important wildlife concern in the ASAL (1995) *PRA*. Other problem animals included monkeys other than baboons, squirrels, and porcupines, for their crop destruction, and buffalo for their danger to humans. One person mentioned his concern about disease transmission from wildlife to domestic livestock, a concern listed in the ASAL *PRA* as the fourth most important wildlife problem.

It might be noted that children did not seem to know local wildlife species very well. On the other hand, they, and the adult residents and rangers, were very interested in the pictures of African animals in our identification guide.

b) Attitudes toward elephants

Most interviewees view elephants negatively (Figure 24). Seventy-eight percent of the interviewees (25/32) described them as bad, many exclaiming, "Mbaya kabisa!" (Very Bad!). Many referred to elephants as "the cows of the Game people" that should be "put into a boma" (a fenced enclosure used to restrict livestock movement). Sixteen percent (5/32) stated that there were both good and bad aspects to elephants. Additional evidence of some positive feeling towards elephants might be that one man wore a hat with an elephant design on it, and another named his open-air tea shop the "Ndovu (elephant) Hotel".

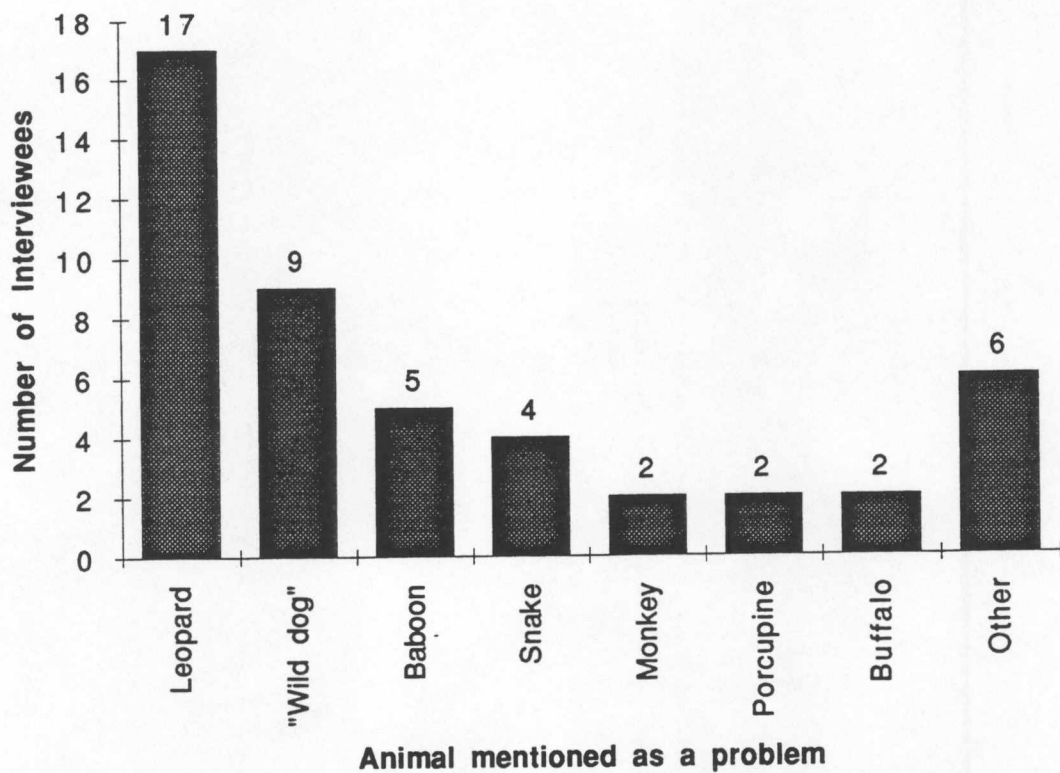


Figure 26. Non-elephant Problem Animals in Rimoi Sublocation. (N = 32. More than one response possible per interviewee. Some interviewees mentioned no non-elephant problem wildlife.) For comparison it might be noted that 94% of interviewees mentioned problems associated with elephants. "Other" includes a raptor which preys on chickens, "all animals", squirrels, and "lion". Kenya, 1996.

Problems associated with elephants were mentioned by 97% (31/32) of the interviewees. The problem of greatest concern was crop destruction, which was mentioned by 75% of the interviewees (24/32) (Figure 27) and was listed as the number one wildlife problem by the ASAL (1995) *PRA*. Thirty-four percent (11/32) mentioned danger to humans, and this was mentioned as the second most important wildlife concern in the ASAL *PRA*. Nineteen percent (6/32) mentioned destruction of trees, one referring to the loss of beehives in trees and another mentioning soil erosion, which matches the *PRA* listing of destruction of the environment as the third most important wildlife concern. Six percent (2/32) mentioned other problems. One of these people said that elephants chase livestock away and the other said that elephants destroy buildings. (It should be noted that sometimes more than one problem associated with elephants was mentioned, and scored, per interviewee.)

Benefits associated with elephants were mentioned by 22% (7/32) of the interviewees (Figure 28). These included the harmlessness of some individuals or of elephants if they stayed away or were upwind, the idea that people liked to see them, and the provision of goat forage by elephants that pushed down trees -- an impact that we observed.

c. Attitudes toward KWS

Few residents of Rimoi Sublocation feel that KWS is very helpful in dealing with human-elephant conflict (Figure 29). Sixty-two percent of those that responded (16/26) said that they helped little or not at all. The complaints were that the rangers are not able to keep elephants out of their fields because the fields are many and the rangers are few or because "the rangers just sit in the kiosk (tea-shop) all day", that KWS does not compensate for damage done to farms, instead "they just write reports and nothing happens," and that the only thing that the rangers do is "protect their wildlife from people". We experienced people's frustration with KWS when those whose farms had been damaged by wildlife

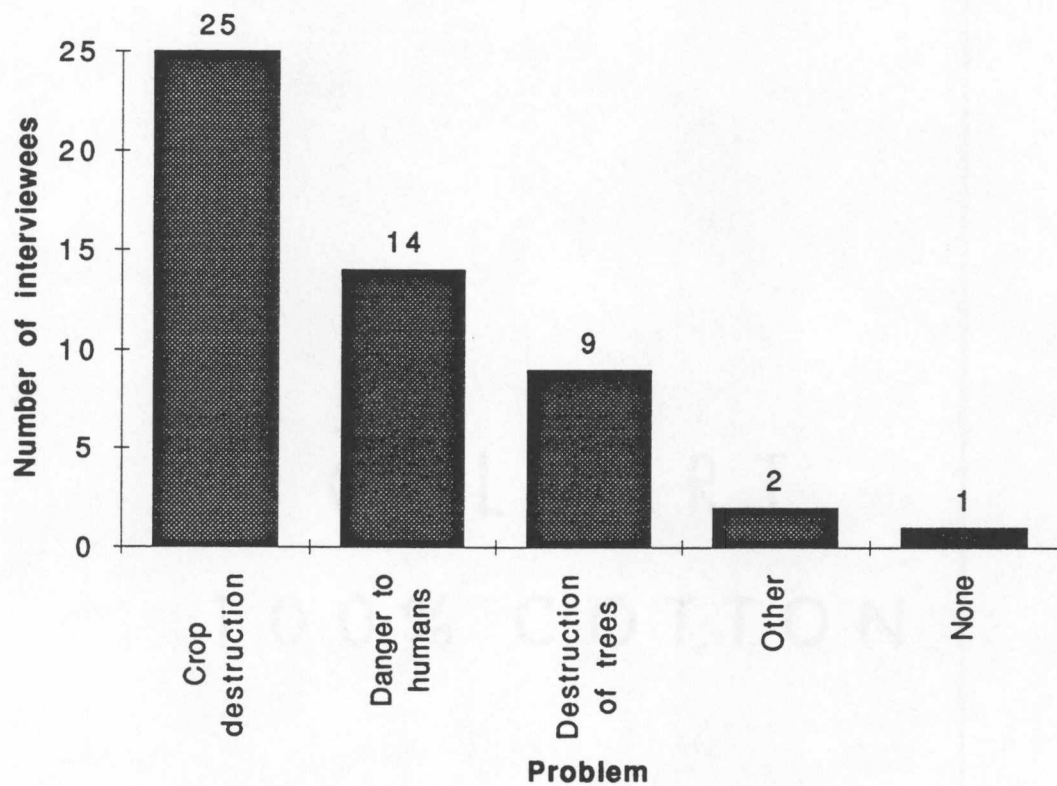


Figure 27. Problems Associated with Elephants in Rimoi Sublocation. (N = 32.) "Other" includes the chasing away of livestock and the destruction of buildings. Kenya, 1996.

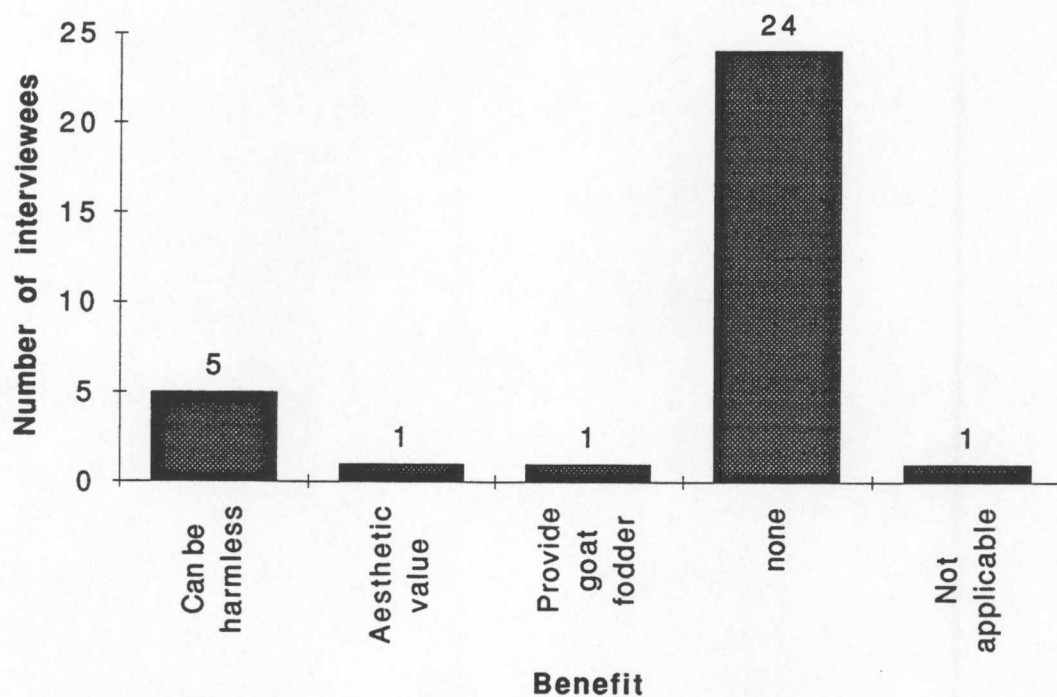


Figure 28. Benefits Associated with Elephants in Rimoi Sublocation. (N = 32.) "Can be harmless" includes the responses that an interviewee has not been threatened personally by elephants, that elephants are okay if they stay away, that certain individuals are harmless, and that if one is downwind there is no danger. "Aesthetic value" was stated in terms of people enjoying seeing elephants. Kenya, 1996.

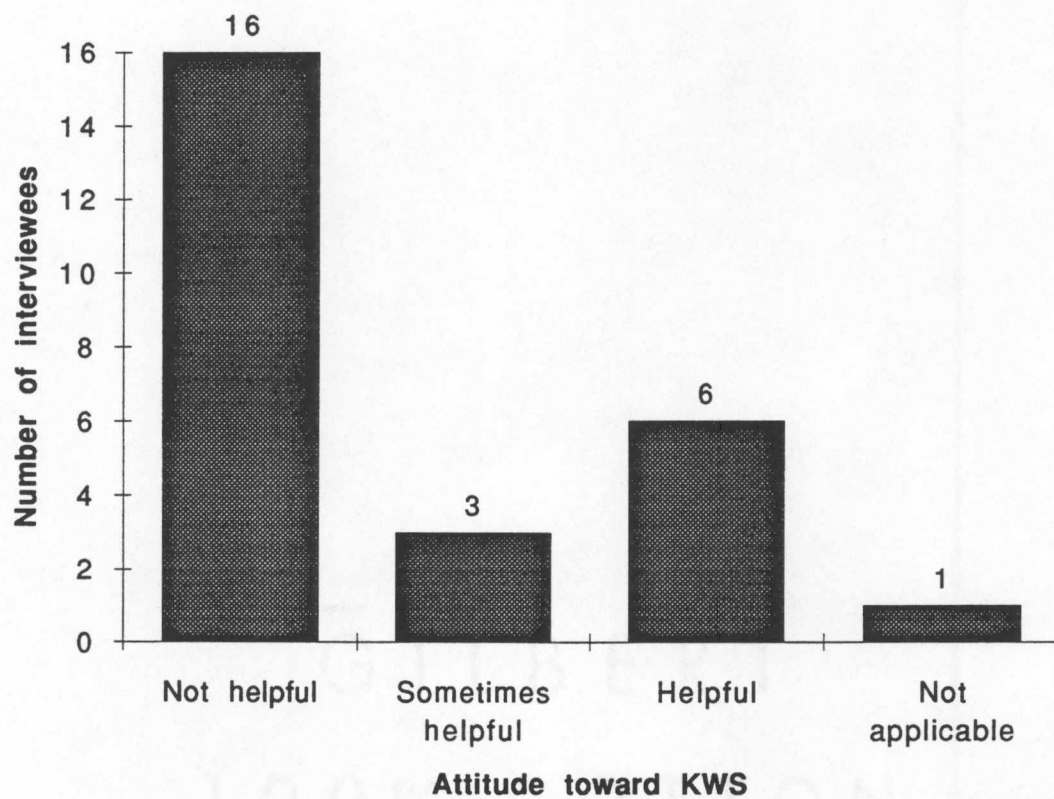


Figure 29. Attitudes toward KWS Assistance in Rimoi Sublocation. (N = 26. Missing data = 6.) Kenya, 1996.

expressed their anger to the rangers or other KWS staff. To local people who want to continue residing or walking through the reserve lands as they have done in the past, KWS may represented a threat of arrest, trials, fines, and jail. Twelve percent (3/26) expressed more positive feelings toward KWS and said that the rangers help protect people's property from elephants sometimes, "if they are around, and they can not be in all places at once". Twenty-three percent (6/26) said that KWS does help. Most of these mentioned that the rangers help by scaring elephants away. Two people mentioned that KWS helps in other ways -- by donating money towards a local cattle dip, and by educating people about wildlife.

Regarding attitudes toward KWS, it might be noted that during our stay, no residents expressed anger about the forced move out of Rimoi National Reserve. Perhaps this was because there was enough empty land onto which to move. In addition, the reserve is not completely off limits to locals, and so some of the reserve's resources are still available to them. One community leader said that he is thankful for the reserve because it serves as emergency grazing grounds during the dry season when pasture elsewhere is depleted. He offered that Rimoi residents are able to have healthier cattle than those owned by Kamnarok residents because of this extra grazing area. Other people talked about the reserve as a place to hang beehives or a route for getting to Baringo District where they could market produce. (According to the KWS and Keiyo County Council [n. d.] the initial feeling that the reserve was local people's rightful land dissipated as people became hopeful that the development of the reserve will bring them tourist dollars, but this is not really reflected in our findings -- only 13% mentioned tourism as a benefit associated with wildlife).

4. Solutions

a) Solutions suggested by locals

When asked what should be done about the problem with elephants, fencing the reserve was mentioned by 48% of the interviewees (15/31) (Figure 30). Nineteen percent (6/31) said that it would be best to increase the number of rangers. Six percent (2/31) seemed to suggest that killing elephants would help. Nineteen percent (6/31) had other responses, including the following. One young man suggested hiring local people to act as scouts to help rangers chase elephants out of farms and back into the reserve. He felt that locals could do the job well because they know the land better than the rangers that come down from their homes up on the plateau. Another person suggested compensation for loss, which was a sentiment echoed by many people that we encountered. One said that KWS should scare away elephants and fence in the *farm* land. One said that making big fires was enough, and another said that there is not enough farming in this area to bother doing anything to protect the fields. ASAL (1995) PRA results paralleled ours, with fencing the reserve listed as the preferred solution, followed by "providing more Game scouts", and "training".

b) Views toward fencing the reserve

When asked directly whether fencing the reserve would be a good idea, many interviewees liked the idea, but others had concerns (Figure 31). Sixty-nine percent (22/32) said that it would be very good as it would ensure the safety of their crops and person. Sixteen percent (5/32) said that it would be bad because it would create problems of lack of livestock access to the reserve area for grass, water, and salt, as well as cutting off human access to Baringo District. Two older men were concerned about preventing the movement of elephants, one adding that the elephants would quickly destroy their area and die. Another older man asked, "Would a fence really hold them?" Thirteen percent (4/32) said

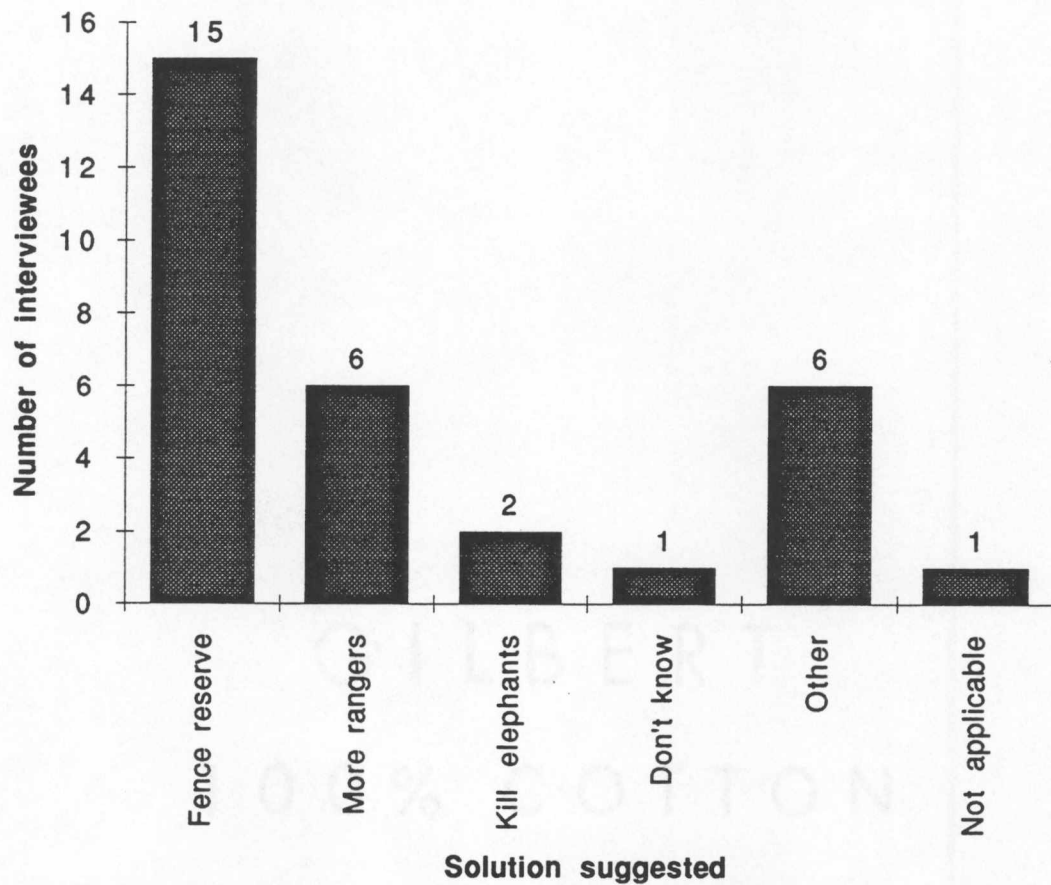


Figure 30. Suggestions for Solutions to the Elephant Problem in Rimoi Sublocation. (N = 31. Missing data = 1.) Solutions under "other" include government compensation for damage, KWS fencing of farms instead of the reserve, KWS employment of local scouts, farmers building big fires, and a comment that too little farming is done in the area to worry about elephant damage. Kenya, 1996.

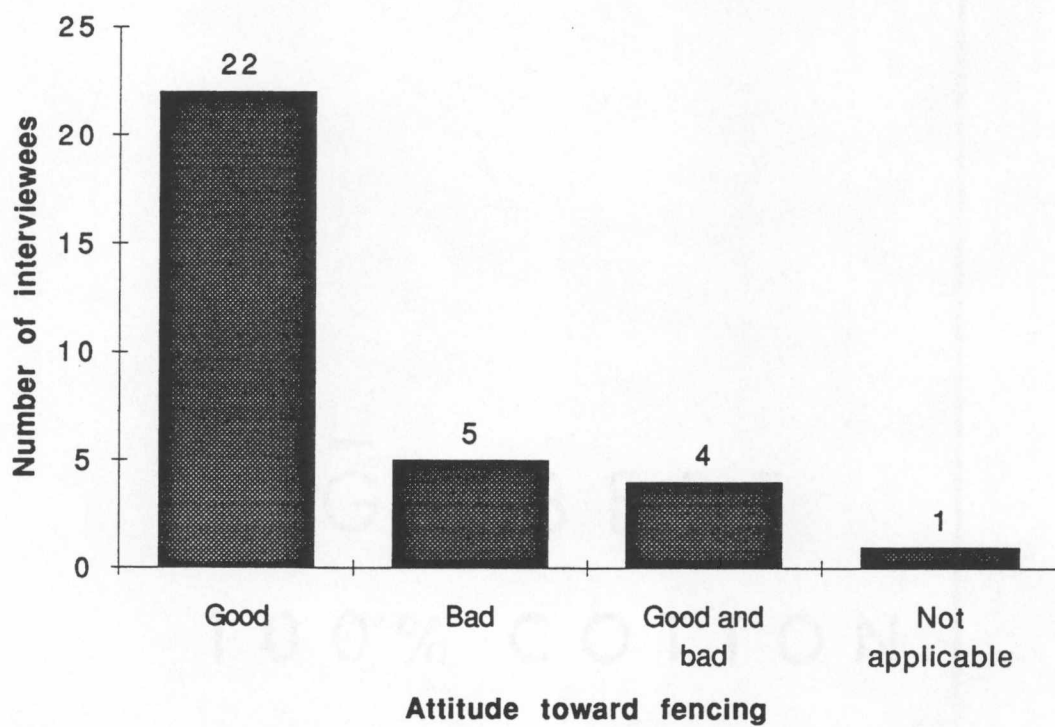


Figure 31. Attitudes toward Fencing the Reserve in Rimoi Sublocation.
(N = 32.) Kenya, 1996.

that a fence would be good and bad, due to those problems and benefits mentioned above. Several people suggested that a gate allowing cattle access into the reserve would make a fence acceptable.

B. Neighboring Areas: Kabulwa, Biretwo, and Kamnarok Reserve

1. Kabulwa

a) Socio-economic context, elephant activity, and human response

Four residents of Kabulwa were interviewed. From these interviews it appears that the way of life and concerns here are similar to those of people in Rimoi Sublocation, although elephants seem to be somewhat less of a problem. As in Rimoi, elephants come into farms when it rains (Figure 32). It was suggested that the elephants venture up from the Rimoi area instead of being resident in the Kabulwa area. Elephants entered one of the four interviewee's farms twice last year, and one of the farms once so far this year. The same techniques are used for scaring away elephants.

b) Attitudes toward elephants and other wildlife

All interviewees think that elephants are bad due to crop destruction and one person mentioned danger to human life. However, none of the interviewees mentioned elephants when asked about their biggest problems. They did mention a lack of water or rain, and a lack of money, as well as hunger, which was associated with (and scored as) a lack of rain or money (Figure 33). Two people could not list more than one problem. People think that wildlife in general is bad, due to crop destruction by porcupines, warthogs (bush pigs?), squirrels, wild dogs, and monkeys, as well as beehive destruction by ratels (*Mellivora capensis*).

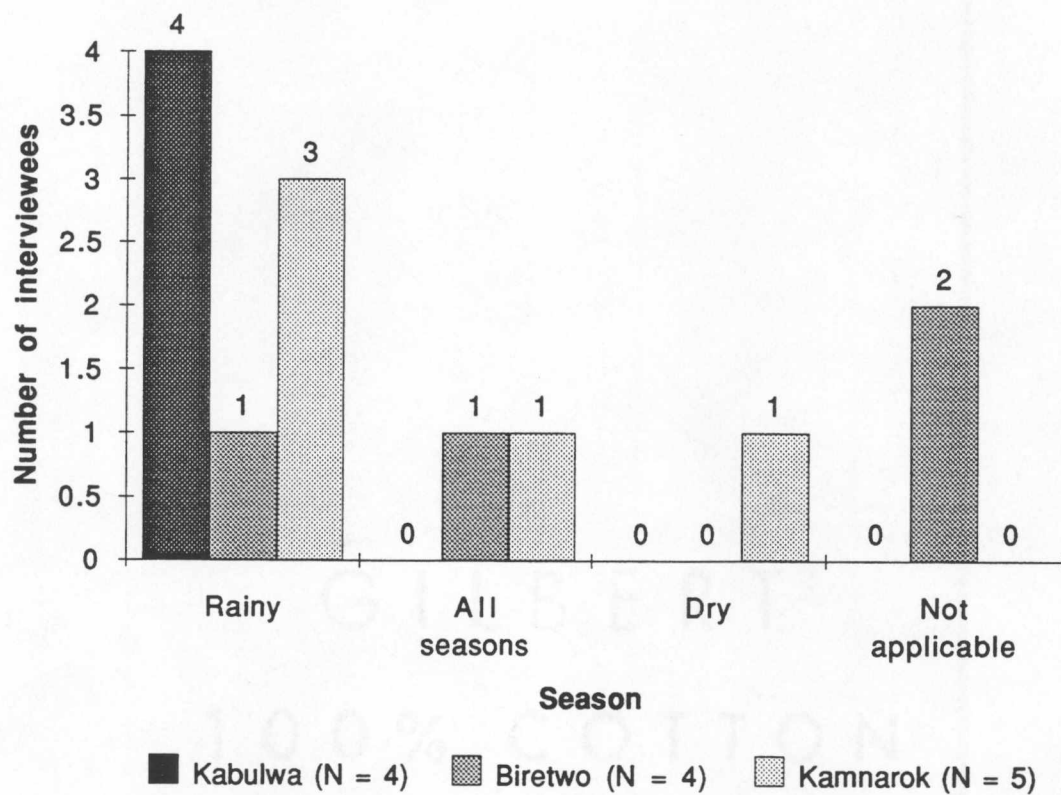


Figure 32. Season of Elephant Encounters in Kabulwa, Biretwo, and Kamnarok Reserve. Kenya, 1996.

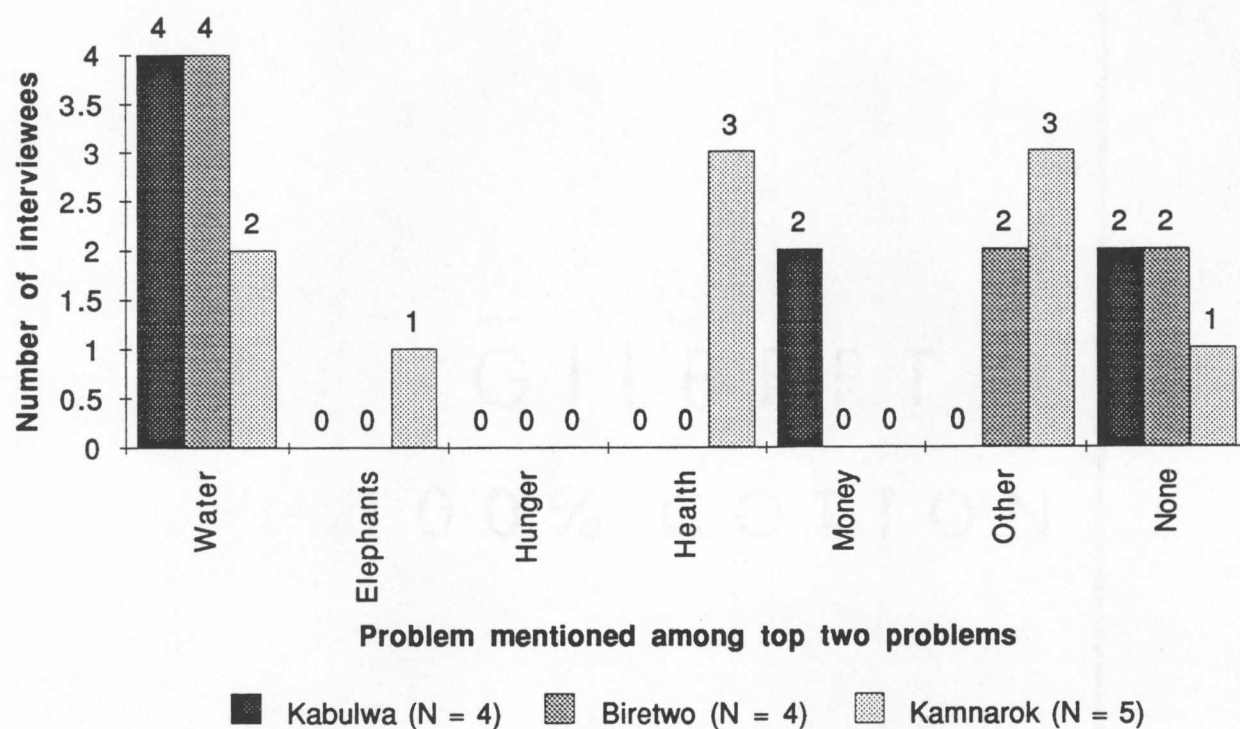


Figure 33. Problems of Residents in Kabulwa, Biretwo, and Kamnarok Reserve. "Water" refers to a lack of water or rain. Kenya, 1996.

c) Attitudes toward KWS, and solutions

Three of the four interviewees said that they receive little or no help from KWS. The fourth, who lives at the reserve boundary, said that the rangers help him scare away elephants when he asks them to come. The same person was the only one who did not suggest fencing the reserve, and felt that to do so would be bad due to loss of grazing grounds. He felt that the best solution was to continue scaring elephants away when they come near farm fields.

2. Biretwo

a) Socio-economic context, elephant activity, and human response

Four people in Biretwo were interviewed. Farm fields seem to be larger here, and they are not all fenced in as they are in Rimoi. Instead the livestock is fenced in. People here are farther from the reserve and apparently see less elephant activity than those in Rimoi or Kabulwa. Interviewees said that elephants are only seen in fields that are next to the Kerio River. The elephants walk along the river on their way down toward the fluorspar mines to the south where they seek out food, water, and salt. Elephants no longer come near Biretwo itself (where the houses of all the interviewees were located) because of the denser human population. One person said that elephants come to his riverside field in all seasons, but only if there is no rain (Figure 32). With rain, there is enough food and water in the reserve and they stay there, he said. He hires three people to guard against elephants during harvest times and they scare the elephants away by making noise. Although elephants approached the area, none entered his 50-acre field in 1995 or thus far in 1996. Another interviewee's 2-acre riverside field was visited by elephants several times last year. He called the rangers, who chased the elephants out, however the elephants came back. Fields next to the houses are not disturbed by elephants.

b) Attitudes toward elephants and other wildlife

Interviewees in Biretwo view elephants as bad due to destruction of crops and danger to humans but none mentioned elephants when asked about their biggest problems. All interviewees listed lack of rain as their number one problem, and not all could come up with a second problem (Figure 33). Two or 3 of the 4 people interviewed mentioned problems with porcupines, monkeys, or warthogs as crop raiders, and one person mentioned squirrels and baboons.

c) Attitudes toward KWS, and solutions

Interviewees feel that KWS helps them. As a solution to conflict with elephants, interviewees suggested fencing the reserve or having rangers scare the elephants. Most think that a fence would be beneficial, although one said that it would be even more useful if KWS supplied water to the people and to the elephants inside the reserve.

3. Kamnarok Reserve

a) Socio-economic context, elephant activity, and human response

In the Lake Kamnarok area, 5 people were interviewed, 4 of whom live within the reserve. Farms appear to be slightly larger than those in Rimoi and even people that appear quite poor rent tractors. Cotton is a common crop, "because it does well with dryness". People were a bit more wary of us, perhaps due to the pre-MOU status of the reserve.

Interviewees said that elephants come during dry season to drink from Lake Kamnarok, and come in wet season (in July and August) to eat crops that are mature (Figure 32). Four of the 5 interviewees said that elephants had entered their fields and consumed all their crops last year. The fifth said that elephants came near his farm many times but did not enter his field. This year only one field had been entered by elephants. People use the

same noise-making techniques to scare away elephants as well as whistling with the lips, or they stay inside and hide.

b) Attitudes toward elephants and other wildlife

Although elephants affect people quite a bit in Kamnarok, other problems appear to be of greater concern. The most frequently mentioned problem in Kamnarok was malaria (health), which is probably especially problematic near the lake, where 4 of the 5 interviewees live (Figure 33). One person did state that elephants are his biggest problem, and referred to their destruction of crops and danger to human life. Other problems included the killing of livestock by leopards and crocodiles, lack of rain, and lack of employment. Other problem animals mentioned were hyenas, which occasionally eat sheep and goats, and buffalo, which kill people. Two of the 5 interviewed said that wildlife, including elephants, have good aspects. One older man said that wildlife was good because it just goes on its way without harming anyone. A young man said that it was good for future generations to see. Another said that wildlife is bad generally, but that dikdiks are okay.

c) Attitudes toward KWS, and solutions

Most (four out of five) in Kamnarok said that KWS does not help them, and one mentioned that after an elephant is poached rangers harass them and blame them for the killing. One person said that KWS helps through contributions to a cattle dip, health center, and school. Some think that the creation of the reserve is good because it will bring roads, electricity, and jobs. Some feel that the reserve is okay because people are still allowed to live there. One person feels that the reserve is bad because it means damage caused by wildlife. Another said that the reserve is only good for KWS. Most feel that fencing the reserve

would be bad because it would mean that people would have to abandon their homes and would lose grazing land.

V. DISCUSSION

A. Summary

As pastoralists with small subsistence farms, the residents of Rimoi Sublocation struggle to produce enough food to feed themselves. Though the population is sparse, it appears to be growing due to immigration from Marakwet and Baringo Districts. More people means more livestock, and the resulting overgrazing is causing severe erosion. That combined with the semi-arid nature of the area makes cultivation a challenge. When rains do come, they bring elephants that eagerly feed on the farmer's crops. Lack of drinking water and rain, hunger, and crop raiding by elephants are people's main concerns.

In the days when the Keiyo killed crop raiding animals to protect their farms and then used the meat to feed their families, elephants and other wildlife species may have been more welcome cohabitants. Today benefits associated with wildlife species are less tangible and benefits associated with elephants in particular are mentioned by few. Wildlife is considered an entity belonging to KWS. However, some interest in wildlife as part of the aesthetic environment of the people exists, and certainly people's interconnection with the natural world, and their awareness of it, is probably far greater than that found amongst people living in more "developed" environments.

People are frustrated that KWS protects wildlife but does not control wildlife to protect people and property. Suggestions for ways to control elephants to reduce damage included approaches that KWS has considered for Rimoi, such as fencing and more rangers, as well as some that have not been considered, such as employment of local scouts. Although many residents feel that fencing the reserve would be beneficial, they may not realize that

this would put an end to livestock and human access into the reserve. Some people explicitly mentioned this concern.

In other communities near Rimoi National Reserve, lifestyles are similar, although farm sizes vary. In all areas concerns include a lack of rain and water for domestic use. Elephant-caused destruction seems to be much less important than other problems in these areas, apparently because of less elephant activity or because other problems are more important. The timing of elephant-caused destruction appears to differ in different regions as well, with crop raiding by elephants occurring in both dry and rainy seasons near Lake Kamnarok and the river-side area of Biretwo. Most people interviewed in these areas had fairly negative views of wildlife and elephants in particular, although some positive aspects were mentioned by people in Kamnarok. Most people felt that wildlife managers were not helpful, although those in Biretwo, where conflict with elephants is minimal and proximity to the main road may make life easier, said that KWS was helpful. Fencing the reserve was generally viewed positively, except by those who fear eviction or the loss of grazing land. A number of people suggested that scaring away elephants was the best way to deal with them.

It might be noted that hunting was not mentioned as a possible solution to human-elephant conflict or other problems by any people interviewed during this study. In Kenya, hunting has been illegal for twenty years. During the last decade a shoot-to-kill anti-poaching (killing for ivory) policy was put into place. Local people probably avoided any discussion of hunting for fear of being suspect of illegal hunting. Because elephant herds were decimated by poaching in the 1970's and 1980's, KWS does not consider any type of elephant hunting, whether subsistence or safari hunting, as a wildlife management option. Herds only began their recovery in 1989, following the CITES ban on ivory trade and the

replacement of the inefficient Wildlife Conservation and Management Department with the KWS. The Kenyan government and KWS support the CITES ivory ban, which they feel is necessary for the recovery of elephant populations in East and Central Africa. Were this not the national situation, carefully regulated subsistence hunting of elephants by local people might be acceptable, if actually controllable. On the other hand, safari hunting by wealthy foreigners might be offensive to local people who do not have a tradition of killing animals for sport. In addition, the message that comes with safari hunting is that once again it is only the outsiders who can afford to hunt local game.

B. Our Findings Compared to Those of Other Studies

The circumstances of human-elephant conflict in Rimoi Sublocation (and other areas near Rimoi National Reserve) are similar to those found in other parts of the world. It is subsistence farmers who are vulnerable to destruction caused by elephants in this and other studies. They grow food crops that are appealing to elephants, they live in areas that are sparsely populated, they have few means with which to protect their crops, they use buildings that are easily destroyed by elephants, and loss of crops results in hunger, not only income loss. As elsewhere, crop raiding in Rimoi Sublocation occurs seasonally and at night. Destruction of trees and granaries and human deaths are other impacts of elephants on locals. Raiders appear to include both bulls and family groups. People try to deter elephants using noise, fire, and tree platforms, as elsewhere, as well as whistles. No interviewees mentioned asking rangers for help as one of the means for protecting crops, although farmers were seen doing this. Views toward the reserve appear to be more positive than views toward wildlife managers, as was found in the study by Newmark et al. (1993) and Newmark and Leonard (1991). In contrast to the results of the study by Tchamba (1996) in Cameroon in which almost half of those interviewed mentioned benefits associated with elephants, only 22% of Rimoi residents mentioned benefits.

Those mentioned by Cameroon residents were utilitarian in nature and included meat, ivory, and skin, as well as tourism and employment. Consumptive uses of wildlife are not available to Rimoi residents, however the potential for tourism was mentioned by a few Rimoi interviewees regarding the benefits of wildlife in general. Farmers in both studies were unclear about compensation policies. The most frequently given suggestion for mitigating human-elephant conflict was fencing for both Rimoi residents and Cameroon interviewees, although in the case of the Rimoi residents, the suggestion did not involve translocating the elephants first.

C. Implications

Several findings may be considered in terms of the implications for approaches to dealing with human-elephant conflict near Rimoi National Reserve.

Reducing crop raiding:

1. Raiding is seasonal. On the western side of the reserve, most crop depredation by elephants occurs during the rainy season when crops are nearing maturity. This suggests that in this area the control of elephants is only necessary part of the year, and hence scaring may be as cost effective as building and maintaining a fence. The addition of more rangers and the employment of local scouts during rainy season might be the most effective and efficient way to combat crop raiding. Occasional dry season raiding by bulls may be reduced if particular problem individuals are identified and killed.
2. Human-elephant conflict appears to be less of a problem to the south of the reserve than it is directly to the west. If a north-south fence is built along the western boundary of the reserve, as is planned, this is likely to channel elephants toward these ends, and simply move the problem.

Improving attitudes:

3. Attitudes toward wildlife and particularly elephants are quite negative. However, some young people expressed an aesthetic concern for wildlife and an interest in learning about it, and some older people expressed traditional conservation-oriented views. In response to this situation, programs should tap into this curiosity and this wisdom, and encourage a sense of pride in knowing about local flora and fauna. Community wildlife programs could encourage school children to learn about local animals through simple observational research and by interviewing their elders. Information compiled in this way by the community, including local names for animals, the shape of their tracks, their importance to the culture, and their behavior in the wild, could be made into posters that are displayed at the education center at the reserve gate. This type of activity would create a sense of pride in, and ownership of, local wildlife. Employment of local scouts to assist rangers in locating elephants would also encourage a sense of pride in local wildlife-related knowledge, as well as offering locals direct financial benefits from the presence of elephants. This might send a better message than the creation of a fence, which both physically and psychologically separates people from wildlife. Regulated hunting might also be helpful in improving attitudes, and reducing hunger.
4. Attitudes toward KWS are quite negative. KWS needs to clarify the importance of their role, while improving their ability to help farmers protect their livelihood. Increased communication with the community, which an increased number of rangers and the employment of local scouts should provide, will help. Rangers should be trained to deal respectfully with local people, and should be willing to give and receive information on local wildlife to and from residents. In addition, outreach programs that include a forum for exchange of local wisdom regarding environmental interactions and KWS knowledge about the importance of protected lands in today's densely populated Kenya may help

people understand the role of KWS. This combined with improved success in keeping elephants out of farms should improve attitudes toward KWS.

5. Positive views toward the reserve are related to continued access to the reserve. If utilization of reserve lands for dry season grazing and salt licks, placement of beehives, and routes to markets in Baringo is stopped, attitudes toward the reserve may suffer and life may be more difficult. Erosion outside the reserve may increase. Perhaps some access to the reserve might be allowed to residents. This special treatment might not only ease their situation but might give them a sense of pride in the reserve as their own. (Greater presence of rangers and scouts may reduce the likelihood of potential poaching problems.) Otherwise, access granted to visitors, but not residents, is likely to create negative feelings. In terms of impacts on the tourism experience, visibility of beehives and other signs of local culture can be presented as a strength, instead of a weakness, of the reserve.

Other items of potential concern:

6. The cultural dependence on livestock has led to overgrazing. Overgrazing has encouraged the replacement of grasses with woody vegetation. By completely excluding elephants, one of the natural forces that tends to discourage woody growth will be removed. Management that does not completely exclude elephants from the areas outside the reserve, but controls their movements, might allow for some of this natural balancing activity to occur. In addition, if elephants have access to areas outside the reserve, the likelihood of excessive tree destruction within the reserve may be reduced.

7. There are risks associated with allowing people into the reserve, as was evidenced by the deaths of two people who surprised elephants in the reserve in 1996. Although this is not a new risk to local people, it is a risk that KWS would like to minimize, in part because KWS is seen as the party responsible for wildlife and the damage it causes and because the government has a policy of financial compensation for human death. To reduce these

risks, local people's access to the reserve could be limited to daytime. Access could also be guided according to the location of elephants, which an increased staff, combined with local scouts, could more easily keep track of.

8. Immigration into the Rimoi National Reserve area has been increasing. At the same time, agricultural and infrastructural improvements are planned by ASAL and KWS. These changes may make life easier to people in many ways, including providing them with much needed additional water sources. However, potential negative impacts should be considered, such as the increased attraction to elephants of healthier crop fields, and the increased attraction to human immigrants (and therefore increased pressure on the land) that improved infrastructure may create.

9. People suffer from economic hardship in Rimoi Sublocation. With the planned development of the reserve, opportunities for local people to sell items or services to visitors may be beneficial and eagerly embraced. However, in other areas of Kenya unplanned tourist-related activities have had negative impacts, including harassment of tourists and a loss of local culture. Community wildlife programs described above may help preserve local culture. Harassment of tourists and other problems may be precluded with meetings that help local people organize their entrepreneurial ventures.

D. Strengths and Limitations of the Study

Because the means for selecting households to interview was not random, caution should be used when generalizing results to the broader population. However it is likely that information obtained from interviews in Rimoi Sublocation are representative of the community due to our purposive selection process and the limited socio-economic variation of the population. In addition, observations and less structured conversations with locals and officials suggested that information that was recorded during interviews was representative. Another limitation associated with the interviews is that people may have

overestimated the frequency of crop raiding, as has been the case in other studies (Sukumar 1992). Because KWS records of reported damages were not available for 1995 and 1996 we could not balance people's estimates with these data. However, the frequent movements of elephants out of the reserve was certain as was the actual destruction of crops in fields that we observed.

Another limitation of this study is the small number of interviews at Kabulwa, Biretwo, and Kamnarok. However, interviews in these areas were not intended to be conclusive. They appear to indicate trends some of which are also supported by observation, but further studies would need to be undertaken to make definitive statements about these places.

It is possible that because this study was undertaken during the season when elephant destruction is the greatest in Rimoi Sublocation, and during a year when the rains occurred late, the concern with elephant destruction and lack of water may have been particularly strong for residents. However, the results from our interviews correspond to those from other sources, such as the ASAL (1995) *PRA*, which was undertaken during a different season of a different year.

Because interviews were undertaken without the use of an interpreter, total control over the way questions were asked was maintained. In addition, there was no concern that any existing relationship between an interpreter and an interviewee would effect the willingness of the interviewee to give honest answers. However, because interviews were conducted in a language in which neither I nor some of the interviewees were totally fluent, some complexities were beyond our language abilities. For this reason detailed information

about some topics, such as the presence of a conservation ethic in traditional and present day culture, was more than I was able to attempt.

Because this type of research was new to my assistant and I, errors resulted in missing data in some cases. On the other hand, our familiarity with rural Kenya, Ki-Swahili, and Kalenjin culture, which we had acquired over several years while living in a nearby district, allowed us to more easily interact with local people and understand their daily challenges. This may have helped us succeed in being accepted by the local community, which was important to the undertaking of this study.

E. Further Research Needs

To best deal with human-elephant conflict near Rimoi National Reserve, KWS may be interested in pursuing studies that will complement the information provided here. Research might include further studies on elephant activity and local attitudes in the three neighboring areas covered only briefly by this study as well as other regions in the vicinity of the reserve. In addition, more detailed cultural studies that investigate the presence of traditional culture in today's society might be useful. Studies that quantify actual damage done by elephants would provide a baseline for comparison following changes in management. Research that identifies individual elephants responsible for the raiding may help identify those that cause a disproportional amount of the damage, or that may be particularly aggressive toward people. If control kills are to be used in response to identification of problem individuals, the efficacy of this practice could be monitored in terms of any changes in frequency of conflict.

VI. CONCLUSIONS AND RECOMMENDATIONS

1. Residents living next to Rimoi National Reserve struggle economically. For food they largely rely on grains grown in small plots that are vulnerable to drought and elephants.
2. People use noise and fires and other techniques to keep elephants out of their fields, but elephants do much damage despite their efforts.
4. Although people mostly associate wild animals with crop and livestock depredation, some positive associations do exist.
5. The rangers' limited success in helping farmers keep elephants out of their fields makes many people feel that KWS protects wildlife but not people.
6. Fencing the reserve and increasing the number of rangers were among the most frequently mentioned suggestions for reducing conflict with elephants. Other information, however, suggests that fencing the reserve may reduce benefits that people associate with the reserve and may create new problems.

Based on these conclusions, the following actions are recommended:

1. Increase the number of rangers near Rimoi National Reserve, making sure that rangers are trained to deal with the community as well as with elephants.
2. Employ local scouts during the rainy season to assist in locating and scaring elephants.
3. Use community wildlife programs to create a sense of ownership of wildlife and a feeling of pride in local culture.
4. Allow continued utilization of the reserve area to locals, incorporating local culture as part of the attraction to the reserve.
5. When the reserve begins to be developed, assist local entrepreneurs by offering training workshops that direct the way in which local tourism-related ventures develop.

REFERENCES

REFERENCES

- Abalu, G.O.I., N.M. Fisher and Y. Abdullahi. 1987. Rapid rural appraisal for generating appropriate technologies for peasant farmers: Some experiences from northern Nigeria. *Agricultural Systems* 25: 311-324.
- ASAL Development Programme. n.d. *Elgeyo-Marakwet: Plan of operations phase III 1995-1999*. Ministry of Land Reclamation and Water Development, Kenya.
- ASAL Development Programme. 1995. *PRA exercise: Rimoi Sublocation (draft)*. Ministry of Land Reclamation and Water Development, Kenya.
- ASAL Development Programme community meeting on reforestation. 1996. June 26, Rimoi Elementary School.
- Babbie, Earl, 1995. *The practice of social research*. Seventh edition. Wadsworth Publishing Company, USA,
- Baskin, Yvonne. 1994. There's a new wildlife policy in Kenya: Use it or lose it. *Science* 265: 733-734.
- Buss, Irven O. 1990. *Elephant life*. Iowa State University Press, Ames.
- Byers, Bruce A. 1996. *Understanding and influencing behaviors in conservation and natural resources management*. Biodiversity Support Program. Westend Press. Washington, D.C.
- Conway, Gordon R. and Jennifer A. McCracken. 1990. Rapid rural appraisal and agroecosystem analysis, in *Agroecology and small farm development*. Miguel Altieri and Susanna Hecht, editors. CRC Press, Boca Raton.
- Davis-Case, D'Arcy. 1990. *The community's tool box: The idea, methods and tools for participatory assessment, monitoring and evaluation in community forestry*. Food and Agriculture Organization, Rome.
- Damiba, Theophane, E. and Ernest D. Ables. 1993. Promising future for an elephant population -- a case study in Burkina Faso, West Africa. *Oryx* 27(2): 97-103.
- Denzin, Norman K. 1989. *The research act: A theoretical introduction to the sociological methods*. Prentice-Hall, Inc., New Jersey.
- DiSilvestro, Roger L. 1991. *The African elephant: Twilight in Eden*. The National Audubon Society. John Wiley & Sons, Inc., New York.
- Douglas-Hamilton, Iain. 1993. You can help elephants. *Wildlife Conservation* 96:74-75.
- Dublin, H.T., T. Milliken and R.F.W. Barnes. No date. *Four years after the CITES ban: Illegal killing of elephants, ivory trade and stockpiles*. A Report of the IUCN/SSC African Elephant Specialist Group.

- Dudley, J.P., A.Y. Mensah-Ntiemoah, and D.G. Kpelle. 1992. Forest elephants in a rainforest fragment: preliminary findings from a wildlife conservation project in southern Ghana. *African Journal of Ecology* 30:116-126.
- Eltringham, S.K. 1982. *Elephants*. Blandford Books, Ltd., UK.
- Emerton, L. and S. Majiwa. 1992. *A survey to assess the damage caused by wild animals to farm households adjacent to the Aberdares Forest Reserve*. KIFCON report, Nairobi.
- Ford, Richard, Francis Lelo, Chandida Monyadzwe, and Richard Kashweeka. 1993. *Managing resources with PRA partnerships: A case study of Lesoma, Botswana*. Clark University's Program for International Development in association with Egerton University's PRA Project.
- Grudah, Othello. 1995. Initiatives to resolve human-wildlife conflict: Kenya wildlife supplement. *East African Standard*. July 18, Nairobi.
- Hammond, Elysa. 1996. Personal communication. New York Botanical Gardens, New York.
- Jacobsohn, Margaret. 1993. Conservation and a Himba community in western Kaokoland, in Dale Lewis and Nick Carter, editors, *Voices from Africa: Local perspectives on conservation*. World Wildlife Fund, Washington, D.C.
- Joint preparation by Kenya's National Environment Secretariat, Clark University, Egerton University, and Center for International Development and Environment of the World Resources Institute. 1991. *Participatory rural appraisal handbook: Conducting PRAs in Kenya*.
- Kassagam, Johnstone. 1992. The Marakwet: Natural Conservators. *Kenya Past and Present*. Kenya Museum Society. Nairobi.
- Kerio Valley Development Authority. 1980. *Background study of the Kerio Valley*. Kenya.
- Kipkorir, B.E. 1978. *People of the Rift Valley*. Evans Brothers, Ltd., London.
- Kipkorir, B.E. and J.W. Ssenyonga, editors, 1986. *Sociocultural profile of Elgeyo Marakwet District*. Institute of African Studies. University of Nairobi.
- Kipkorir, B.E., and F.B. Welbourn. 1973. *The Marakwet of Kenya: a preliminary study*. East African Literature Bureau, Nairobi.
- KWS and Keiyo County Council. n.d. *Rimoi (Kerio Valley) National Reserve sub-ecosystem management plan 1995-2000 (draft)*. Kenya.
- KWS and Keiyo County Council. 1995. *Rimoi National Reserve: An agreement between Kenya Wildlife Service and County Council of Keiyo Marakwet for the management of Rimoi National Reserve*. Kenya.

- Lewis, Dale and Nick Carter, editors. 1993. *Voices from Africa: Local perspectives on conservation*. World Wildlife Fund, Washington, D.C.
- Lewis, Dale, Gilson Kweche, and Ackim Mwenya. 1990. Wildlife conservation outside protected areas -- Lessons from an experiment in Zambia. *Conservation Biology* 4(2):171-180.
- Lahm, Sally. 1996. A nationwide survey of crop-raiding elephants and other species in Gabon. *Pachyderm* 21: 69-77.
- Litoroh, Moses. 1994. *Elephant survey: Kamnarok/Rimoi National Reserves and Nasalot/South Turkana National Reserves: May 1994 aerial count*. A Report to KWS, Kenya.
- Lofland, John and Lyn Lofland. 1984. *Analyzing social settings*. Wadsworth Publishing Company, Belmont, CA.
- MacKinnon, John and Kathy, Graham Child and Jim Thorsell, compilers. 1986. *Managing protected areas in the tropics*. IUCN, Gland, Switzerland.
- Massam, J.A. 1968. *The cliff dwellers of Kenya*. Frank Cass and Co. Ltd., London.
- Ministry of Finance and Planning. No date. *Elgeyo Marakwet District development plan 1984-1988*. Kenya.
- Mulama, Martin and John Waithaka. 1995. *The status of human-elephant conflict in Samburu, Baringo, Keiyo and Laikipia Districts: An overview of the trends*. KWS, Nairobi.
- Munene, Patrick. 1996. Report to KWS, June 12, Iten.
- Munyugi, James. 1996. Personal communication. KWS Community Wildlife Service.
- Murphree, Marshall W. 1993. Decentralizing the proprietorship of wildlife resources in Zimbabwe's communal lands, in Dale Lewis and Nick Carter, editors, *Voices from Africa: Local perspectives on conservation*. World Wildlife Fund, Washington, DC.
- Mwangi, Patrick. 1995. The struggle between our wildlife and human beings continues. *East African Standard*, August 23, Nairobi.
- Mwenya, Ackim N. 1993. Redefining conservation in African terms, in Dale Lewis and Nick Carter, editors, *Voices from Africa: Local perspectives on conservation*. World Wildlife Fund, Washington, D.C.
- Newmark W.D. and N.L. Leonard. 1991. Attitudes of local people toward Kilimanjaro National Park and Forest Reserve, in W.D. Newmark, editor, *The conservation of Mount Kilimanjaro*. IUCN, Gland, Switzerland

- Newmark, William D., Nancy L. Leonard, Hashim I. Sariko, and Deo-Gratias M. Gamassa. 1993. Conservation attitudes of local people living adjacent to five protected areas in Tanzania. *Biological Conservation* 63: 177-183.
- Newmark, William, David Manyanza, Deo-Gratias Gamassa, Hashim Sariko. 1994. The conflict between wildlife and local people living adjacent to protected areas in Tanzania: Human density as a predictor. *Conservation Biology* 8(1): 249-255.
- Nsanjama, Henri. 1993. Introduction, in Dale Lewis and Nick Carter, editors, *Voices from Africa: Local perspectives on conservation*. World Wildlife Fund, Washington, D.C.
- Olindo, Perez. 1991. An African perspective, in Ronald Orenstein, editor, *Elephants. The deciding decade*. Sierra Club Books, San Francisco.
- Orenstein, Ronald, editor. 1991. *Elephants. The deciding decade*. Sierra Club Books, San Francisco.
- Parker, I.S.C. and A.D. Grahām. 1989. Men, elephants, and competition. *Symposium of the Zoological Society of London* 61: 241-252.
- Research Administration. 1990-1991. *Working with human subjects: Understanding the UTK review system*. CRP flier series. University of Tennessee, Knoxville.
- Ross, Doran H., editor. 1992. *Elephant: The animal and its ivory in African culture*. Fowler Museum of Cultural History, University of California, Los Angeles.
- Shaner, WW, P. F. Philipp, and W.R. Schmehl. 1982. *Farming systems research and development guidelines for developing countries*. Westview Press, Boulder, CO.
- Snook, Ann. 1996. Personal communication. ICRAF, Chetumal, Mexico.
- Sukumar, R. 1992. *The Asian elephant: Ecology and management*. Cambridge University Press, Cambridge.
- Sykes, Sylvia K. 1971. *The Nature of the African elephant*. American Elsevier Publishing Company, Inc., New York.
- Tchamba, M.N. 1996. History and present status of the human/elephant conflict in the Waza-Logone region, Cameroon, West Africa. *Biological Conservation* 75: 35-41.
- Tchamba, Martin N. and Prosper M. Seme. 1993. Diet and feeding behavior of the forest elephant in the Santcho Reserve, Cameroon. *African Journal of Ecology*. 31:165-171.
- Thouless, Chris. 1994. Conflict between humans and elephants on private land in northern Kenya. *Oryx* 28(2): 269-281.
- Thouless, Chris and J. Sakwa. 1994. Shocking elephants: fences and crop raiders in Laikipia District, Kenya. *Biological Conservation* 72: 99-107.

- Van der Walle, John. 1996. Personal communication. ASAL, Iten.
- Waithaka, John. 1996a. Personal communication. KWS Elephant Programme, Nairobi.
- Waithaka, John. 1996b. Letter from Kenya. *Wildlife Conservation* 99:6,66.
- Western, David. 1991. When the forest falls silent, in Ronald Orenstein, editor, *Elephants. The deciding decade*. Sierra Club Books, San Francisco.
- Western, David. 1993. The balance of nature. *Wildlife Conservation* 96: 52-55.
- Western, David and Helen Gichohi. 1993. Segregation effects and the impoverishment of savanna parks: the case for ecosystem viability analysis. *African Journal of Ecology* 31(4): 269-281.
- Western, David and R. Michael Wright, editors, Shirley Strum, associate editor. 1994. *Natural connections: Perspectives in community-based conservation*. Island Press, Washington, D.C.
- Wildlife Conservation and Management Department. Ministry of Tourism and Wildlife. 1985. *Kerio Valley (Rimoi) National Reserve management plan*. Kenya.

**APPENDIX
INTERVIEW FORMS**

INTERVIEW FORMS

Household Data Form

Name _____
Code _____
Date _____
Area _____

Interviewee's position in household _____

Sex _____

Marital status _____

Number of wives _____

Highest level of education for interviewee _____

spouse _____

Tribe of interviewee _____

spouse _____

Place of origin of parents _____

grandparents _____

Number of children _____

Size of farm field here _____

elsewhere _____

Type of house _____

Type of tools used for farming _____

Sources of income _____

Interview Questions

Code _____

1. a. What crops are grown? b. What livestock is kept? c. Bees?
2. a. What is the biggest problem you face in your life? b. What is the second biggest?
3. a. What do you think of wildlife? Good? Bad?
 - b. What species cause you problems or are beneficial, and how?
 - c. What about elephants?
4. When do you see elephants? a. Season? b. Time of day? c. Location?
5. Describe the elephants you see. a. How many? b. Old and young?
6. Are the elephants the same every year?
7. a. How many times did elephants enter your farm last year?
 - b. How many times did elephants enter your farm this year?
8. a. What do you do when elephants come? b. What do the elephants do in response?
9. a. Was the relationship with elephants the same long ago?
 - b. If different, why?
10. What should be done about the problem with elephants?
11. Is fencing the reserve a good idea?
12. Do the Game people help you?

VITA

Helen Snook was born in Tripoli, Libya, in 1959. There family adventures in the Sahara Desert and along the Mediterranean Sea gave her an appreciation of the marvels of nature and of different cultures. A trip to East Africa overwhelmed her with the incredible scenic beauty, amazing animals, and wonderful people. Helen and her family moved back to the United States in 1969. Following high school in Connecticut, Midwest roots brought her to Wisconsin for her undergraduate studies in history at Lawrence University. Studies abroad included three months in the Soviet Union and Eastern Europe and a semester learning Italian in Perugia, Italy. After graduation, Helen studied French during a two-year residence in Montreal, Canada. Trips to visit her ecologist sisters brought her to Mexico and Central America and other parts of Africa. In pursuit of an animal-related career, Helen moved to Chicago where she became a zookeeper at the Brookfield Zoo. There she worked for five years with primates and other animals in a tropical rainforest building. She met her future husband, Steve Stratakos, who worked as an artist in the zoo's Design Department.

In 1988, Steve and Helen left the zoo to reside with Steve's relatives in a Greek village for the summer. From there Helen left for East Africa where, as a WorldTeach volunteer, she had the great pleasure of teaching Kenyan high school children biology and agriculture in a beautiful rural setting. After two and a half years, Helen returned to Chicago to be with Steve, who had been commuting between Chicago and Kenya during Helen's Africa stay. They both returned to full time jobs at Brookfield Zoo, Helen in the Primate Department, then in the Pachyderm department -- where she fulfilled a dream of working with elephants, and finally in the Conservation Biology Department. In 1993, Steve worked on an African exhibit at the zoo, and arranged for a friend from Kenya to come to the zoo to build a traditional mud house. Steve and Helen escorted their friend back to Kenya at the end of the project. The same year, Steve and Helen were married in Brookfield, and then moved to Knoxville, Tennessee, where Steve had work with the local zoo. Helen enrolled at the University of Tennessee, and eventually began her studies in the Department of Ecology and Evolutionary Biology. Helen's longtime interest in human-elephant conflict became the focus of the study that brought Helen and Steve back to Kenya. Following graduation, plans include time with family, teaching or conservation work, and at some point a return to Africa.