

# An Assessment of Elephant-Compatible Livelihoods: Trials of Beekeeping, Chilli Farming and the Production of Dung Paper in Laikipia, Kenya

Laikipia Elephant Project  
Working Paper 3



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**An Assessment of Elephant-Compatible Livelihoods:  
Trials of Beekeeping, Chilli Farming and the Production of Dung Paper in Laikipia, Kenya**

**Max Graham<sup>1,2</sup>, Susie Wren<sup>3</sup> and William M. Adams<sup>2</sup>**

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*1.Laikipia Elephant Project, Private Bag, Cape Chestnut, Nanyuki, Kenya.*

*2.Department of Geography, University of Cambridge, Cambridge, UK.*

*3.Laikipia Wildlife Forum, PO Box 764, Nanyuki, Kenya.*

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## Executive Summary

Human-elephant conflict is a significant problem in Kenya. In this paper we share experience of introducing alternative income generating activities for poor rural households to community based organisations in Laikipia District in north-central Kenya in 2007. The activities assessed are chilli farming, elephant dung paper production and beekeeping. We worked with five community groups: Mwirere Beekeepers; Riafaji Laikipia Group; Urumwe Beekeepers, Waimungu Self Help Group; and the Mukogodo Women's Elephant Group. The different activities and projects had different levels of success, but our experience shows that attempts to establish new livelihood activities in a rural African context is challenging and often not successful. For the small-scale farmers living on marginal land that were targeted under this project, honey, chillies and elephant paper production represent potentially useful complimentary income sources, but will not be a significant source of revenue.



## Introduction

Where people and large wild mammals in rural Africa share space they come into conflict over scarce resources. Such conflict can be severe, resulting in damaged crops and property, human injury and mortality, and retaliatory killing of wild animals (Woodroffe et al. 2005). There are also a whole range of hidden social costs resulting from human-wildlife conflict, such as the imposition of curfews by large dangerous animals and/or exposure to diseases as a result of guarding crops/livestock at night, which are more difficult to quantify (Hill 2004; Naughton-Treves 1997). Increasingly the challenge for conservationists is how to reduce these direct and indirect costs to tolerable levels among the people who will ultimately decide if wildlife has a future in rural Africa. Conventional efforts have focussed on minimising the costs of human-wildlife conflict through the creation of barriers such as electrified fences (Thouless and Sakwa 1995).

More recently there has been a move to develop simpler and cheaper conflict mitigation tools such as farm-based deterrents in the case of elephants (Osborn and Parker 2003) and predator proof corrals for the protection of livestock at night (Ogada et al. 2003). This body of work is helping human-wildlife conflict practitioners to understand what can minimise costs resulting from sharing space with wildlife. However one of the major constraints with this approach is that it is based on the premise that rural livelihoods and wildlife are not compatible and therefore need to be kept separate as best as possible. As a consequence while the development of these tools can reduce costs, they do little to make wildlife anymore compatible with current livelihoods. Furthermore a cost-minimising approach does little to enhance the value of wildlife among the rural people who will ultimately decide if such wildlife has a future at all. As a consequence, the conservation of wildlife remains an enormous challenge in the rural African context.

The issue of the mismatch between those who benefit from wildlife and those who incur costs inspired a range of community-based conservation initiatives across Africa, such as CAMPFIRE in Zimbabwe (Hulme and Murphee 2001). Most of these have been based on benefit sharing through revenue generated by hunting and game ranching. While these initiatives have not been without their problems, such programmes have created a value for wildlife which has been difficult to secure in the absence of non-consumptive photographic safaris (Dickson et al. 2009). Where the latter are not possible or provide an unreliable revenue source across time, such as in the case of Kenya, it might be sensible to support local livelihoods that are more compatible with wildlife than conventional livelihoods. In the case of elephants this concept has led to the trial and promotion of chilli farming as elephants do not eat chillies (Parker and Osborn 2006) and trials and promotion of beekeeping as elephants will avoid being stung by bees (King et al. 2009).

In this paper we assess the potential for elephant-compatible revenue generating activities on the Laikipia plateau in north-central Kenya. Alternative income generating activities were introduced to community based organisations in Laikipia in 2007. The activities investigated were chilli farming, elephant dung paper production and beekeeping.

## Study Area

The Laikipia Plateau (9,700 km<sup>2</sup>) comprising three districts, is located in north-central Kenya at an elevation of 1700-2000m above sea level northwest of Mt. Kenya and northeast of the Aberdare highlands. Rainfall in Laikipia falls in two seasons, the 'long rains', between April and June, and the 'short rains', between October and December, although rain showers may fall at any time of year. Annual rainfall falls along a steep gradient from between 750 mm in the

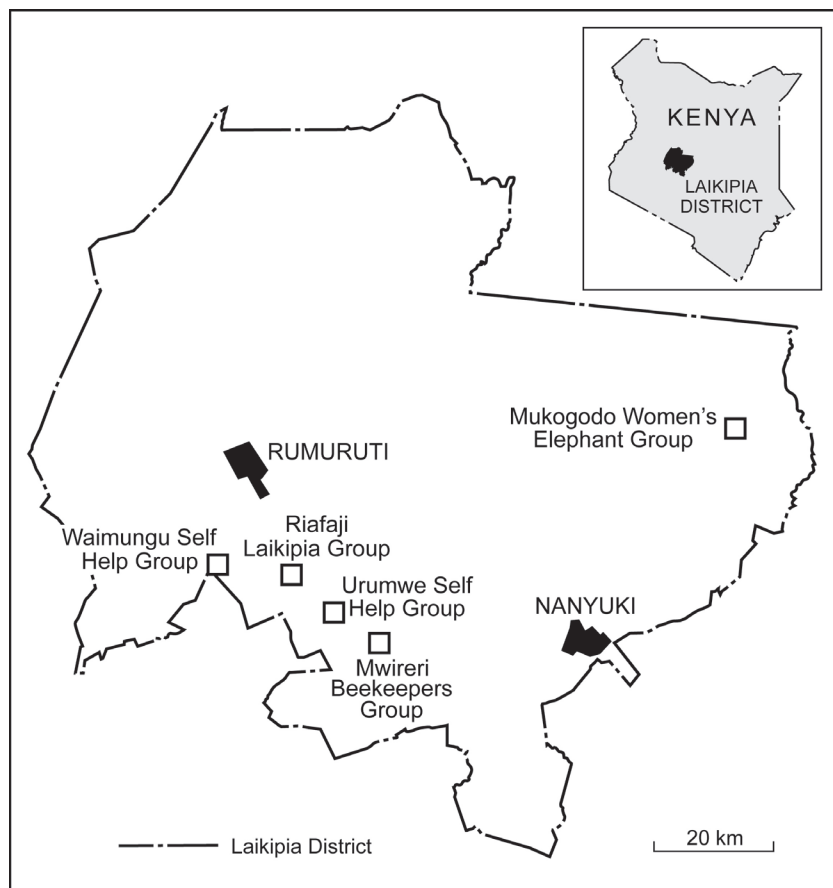


southern part of the plateau near the massifs of Mt Kenya and the Aberdares to 300 mm in the lower, northern part of the plateau (Berger 1989; Gichuki et al. 1998).

The variation in altitude and rainfall across the plateau is associated with marked changes in land use, from protected upland forest, through a belt of smallholder cultivation to savannah under large-scale commercial ranching, to traditional transhumant pastoralism and wildlife conservation. There is extensive commercial wheat and irrigated flower and vegetable cultivation in Eastern Laikipia, near the growing urban centre of Nanyuki. Unusually for a landscape without government gazetted wildlife areas, Laikipia hosts the second highest densities of wildlife in Kenya, after the Maasai Mara, including the country's second largest population of elephants (Georgiadis et al. 2007; Omondi et al. 2002). Tourism based on this wildlife resource plays an increasing role in the local economy. Today there are wildlife-based tourism enterprises on 18 of the 41 large-scale ranches (2000 to 93,000 acres) which cover 42% of the district, and five of the nine communally owned group ranches which collectively cover 11% of the district (Graham et al. in press).

An aerial survey of Laikipia in 2002 recorded 3,036 elephants (Omondi et al. 2002). Some of these elephants contribute to high levels of human-elephant conflict, particularly crop-raiding, on smallholder farms in the south of the plateau (Thouless 1994; Graham 2007). In 2007, funds were secured by a local NGO, the Laikipia Wildlife Forum, to construct 163 km of fence across the southern part of the plateau to separate smallholder cultivation where elephants are not tolerated from large-scale ranches where elephants are tolerated.

## Methods



### Community Groups

In 2007 we identified five community based organisations (CBOs) to support in developing elephant-compatible livelihoods: Mwireri Beekeepers; Riarfaji Laikipia Group; Urumwe Beekeepers, Waimungu Self Help Group; and the Mukogodo Women's Elephant Group (Fig 1; Table 1). The former four groups were chosen on the basis that they lived in areas with high incidence of human-elephant conflict and were easily accessible by road. The Mukogodo Women's Elephant Group was more remote but was identified as a priority group to work with by a local partner organisation (The Symbiosis Trust). Of the five CBOs all existed before our project started with the exception of Riarfaji

Figure 1: Location of Community Groups

(Continued over page)

which was created with support from project staff at the request of local farmers. Each of these groups was registered or provided with support to be registered with the Department of Social Security as a community-based organisation and each group had elected a chairman, treasurer and secretary.

*Table 1: Community based organisations*

Name	No. Members	Location	Year Established	Activities
Mwireri Beekeeper's Group	25	Ex-Erok, Laikipia East District	2004	Beekeeping, Tree planting
Urumwe	15	Mutara, Laikipia East District	2004	Beekeeping, livestock husbandry
Riafaji Laikipia Group	30	Pesi, Laikipia West District	2007	Grow crops that elephants don't eat
Waimungu Self Help Group	15	Salaama, Laikipia West District	2001	Buying corrugated iron sheets for roofing, tree planting, beekeeping and HIV awareness
Mukogodo Women's Elephant Group	34	Mukogodo Forest, Laikipia East District	2005	Production of elephant dung paper

## Data Collection

The performance of elephant compatible livelihoods was monitored through field observations following their introduction, and through secondary information made available by project partners. Perceptions of the performance of the livelihoods activities were assessed through semi-structured interviews with members of the CBOs involved. For this purpose a simple check list of topics was prepared prior to the interview. Interviews were carried out between February and March 2009.

## Elephant-Compatible Enterprises

### Chilli Farming

Modern food crops have been subjected to successive selective breeding until their natural and physical defences have been reduced and nutritive value is high and are therefore vulnerable to depredation by wild animals. As a consequence human-wildlife conflict practitioners have proposed using less palatable crops, either as a buffer between cultivated farms and wildlife refuges or as an alternative to conventional crops where human-wildlife conflict is severe (Parker and Osborn 2003). In one study in Zimbabwe chilli peppers were found to perform favourably against cotton, maize and sorghum in terms of survival from mammalian damage and economic yield (Parker and Osborn 2003). Furthermore chilli peppers have been used with some success as a crop-raiding deterrent in both Zimbabwe (Osborn and Parker 2003) and Kenya (Sitati and Walpole 2006; Graham and Ochieng 2008). This previous body of work provided justification for supporting Riafaji and Waimungu CBOs to propagate chilli pepper on their members' farms.

'Bird's eye' chilli pepper seeds were sourced locally and provided to 15 farmers from Waimungu CBO and 12 farmers from Riafaji. In addition technical support for chilli farming was provided by an agricultural extension officer working with a local partner organisation, the Kenya Horticultural Development Programme (KHDP), in September 2007. A market for harvested chillies

was secured locally, through MAIZE foods, based in Eldoret, prior to engaging farmers in trialling chilli farming.

## Dung Paper



The origins of papermaking have been traced to China in about 105 AD and the use of paper for writing became widespread by the third century. Paper was made by hand until the development of the Fourdrinier machine, created in the early 1800s in Europe, which produces a continuous roll of paper rather than individual sheets (*Needham 1986; Biermann 1993*).

Elephant dung paper is produced in a similar way to that of normal handmade paper, involving making a dilute suspension of fibres, in this case elephant dung mixed with recycled paper in water with wood glue. This suspension is then drained through a wire screen in a wooden frame, called a deckle, so that a mat of randomly interwoven fibers is laid down. Water is removed from this mat of fibers by pressing and drying on a stretched sheet (felt or cotton) to make paper.

Production of elephant dung paper today occurs in many elephant range states in both Asia and Africa, resulting in a range of products from simple writing sheets, to diaries and large scrap books. The curio market in tourist areas across both continents provides an opportunity for artisans to generate revenue through the presence of elephants.

Members of the Mukogodo Women's Elephant Group were trained on how to make elephant dung paper in 2005. Initially members of the Mukogodo Women's Elephant Group were trained to

make simple writing paper sets with envelopes. Subsequently they were trained to make much larger pieces of paper to order. The Symbiosis Trust, a partner organisation provided inputs, a work station, quality control, marketing support and book keeping.

## Beekeeping

Results from research carried out in Kenya showed that the presence of bees and even unoccupied beehives in trees provides some degree of protection from browsing by elephants, suggesting that African bees offer potential as an elephant deterrent (Vollrath and Douglas-Hamilton 2002). However the limited trials carried out to test the deterrent effect of bees in preventing crop-raiding by elephants were inconclusive (Karidozo and Osborn 2007, though see King et al. 2009). Furthermore there are numerous practical challenges to using African bees as a crop-raiding deterrent such as the threat they pose to people, their diurnal ecology and the resources required to create beekeeping capacity among vulnerable farmers. Further experimental trials are needed to test the performance of bees as an elephant deterrent (King et al. 2009). Beekeeping does, however, represent an elephant-compatible livelihood enterprise for rural Africans sharing space with elephants. It was on this basis that we provided some training and support to Waimungu, Urumwe and Mwireri self help groups to improve their existing beekeeping activities. In 2007 Waimungu and Urumwe beekeeping groups were taken for a field day to the Ngare Ndare Forest in north-east Laikipia where they were provided with training on beekeeping by the Ngare Ndare Forest Association which operates a highly successful community beekeeping project. In 2007 Mwireri Beekeepers whose members were suffering extensive crop depredation by elephants were introduced to Lucy King, a PhD student from Oxford University, who is investigating the deterrent effect of bees. The group was provided with eight beehives (for beehive experiments) bringing the total the group own collectively to 23. The group was provided with training on beekeeping through a field day provided on site (see King et al. 2009 for more details).

## Performance of Elephant-Compatible Enterprises

### Chillies

Five of the 15 nurseries established by Waimungu farmers were destroyed by frost. The remaining seedlings took a very long time to germinate resulting in some farmers abandoning their nurseries altogether. Just three farmers from the original 15 managed to transplant chilli seedlings into their fields. However most of these seedlings didn't survive the dry conditions in this rain-fed area and so there were very few plants that reached maturity.

Of the 12 nurseries established by Riafaji farmers, seeds germinate in only seven. Three nurseries and transplanted seedlings were destroyed by flooding of riparian land. The chilli plants that were successfully transplanted produced very small fruits and took a long time to reach maturity with the result that just 20kg of chillies were eventually harvested.

The problem of germination and the slow growth rate of the seedlings experienced by farmers from both community groups suggest that the seed supplied was flawed. Other problems experienced with propagation of the chilli seeds such as frost, flooding and lack of water suggest that the extension services provided were either too little too late or simply did not give the farmers sufficient knowledge to deal with the challenges of growing chillies in their respective environments. The selection of community groups on the basis of their vulnerability to human-elephant conflict, rather than their suitability for chilli farming, may have also compounded the challenges faced in establishing successful chilli plants on farms.



## Beekeeping

Within a few months of the provision of training by the Ngare Ndare Forest Association, six of ten hives at Waimungu were colonised where as previously this group had no hives colonised. Similarly, after the field day to Ngare Ndare Forest, Urumwe beekeepers successfully succeeded in colonising 10 out of 19 hives as compared to just two previously. However by March 2009 the number of hives colonised had reduced to just three among Waimungu members and six among Urumwe members. Waimungu beekeepers reported that they have never actually successfully harvested honey from their hives, despite the provision of training on how to do so. Urumwe members now harvest on average about 20kg a year, and the honey is sold locally for Ksh 300 (\$ US 3.8) per kg.

In March 2009, Mwireri beekeepers reported that just one of their 23 beehives was colonised, with many of the previously colonised hives having been abandoned by as a result of persistent drought. When conditions are more favourable the group reported that they harvest honey from their hives approximately once every two years with most of the honey consumed locally or sold for approximately Ksh 200 per kg.

## Dung Paper

The Mukogodo Womens's Elephant Group entered into a partnership with the Symbiosis Trust, creating elephant dung paper products on demand. In total ksh 70,000 (approximately \$ US 1,000) was generated for the women's group over an 18 month period. However the cost of production was subsidised by the provision of pro-bono extension services and outreach support by The Symbiosis Trust. The Trust collected waste paper and other dung paper inputs (such as wood glue, wooden frames, nets, etc), delivered this to the production site in the Mukogodo Forest, collected and packaged finished products and delivered these to the market. In addition the Symbiosis Trust helped support the group with book keeping and resolving internal disputes. Insufficient revenue was generated to cover the cost of this support, suggesting that the enterprise was not financially viable at the levels of production achieved. As a consequence in 2008 The Symbiosis Trust withdrew extension support from the project as it could no longer afford to provide free labour and transport to subsidise the production and sale of dung paper. The Mukogodo Women's Elephant Group have not produced or sold any more dung paper since the trust withdrew its outreach support.

## Barriers to the Uptake and Performance of Elephant Compatible Livelihood Options

The performance of the livelihood enterprises supported during the project period was mixed but clearly a great deal more support would be required if these enterprises were to be successfully taken up by these and other community groups in Laikipia. This support would need to overcome a number of barriers identified during the follow up field assessment. These are summarised here.

## Environmental

Lack of rainfall was cited as a problem by both Mwireri Beekeepers Group and Waimungu. In the case of the former this resulted in the absence of water and forage for bees, leading to the group's hives being abandoned and harvests taking place just once every two years. Furthermore any potential for engaging this group with any other appropriate livelihood activity such as trialling dry land crops will be constrained by the absence of water as the aquifer occurs at a

depth of 300m or more. People from Waimungu complained that lack of rainfall has led to the failure of their chilli crops. However as this group lives in the vicinity of the Rumuruti Forest and associated permanent water bees are not affected by dry spells in the same way as at Ex-Erok where Mwireri Beekeepers live.

People from Riafaji have access to permanent water from the Pesi River and use this to irrigate their crops. They are therefore well positioned to propagate chilli plants. However Laikipia has suffered from recurrent drought in recent years and the issue of water abstraction from rivers for agricultural use is leading to reduced dry season flow and problems for downstream users. As a consequence any future work undertaken with Riafaji should ensure the group has secured appropriate water permits from the local water management authority, use irrigation methods that optimise water use and minimise wastage and create dry season water storage.

## Organisational

Problems of internal rivalry and pressure from external groups lead to leadership conflicts within the Waimungu Self Help and Mukogodo Women's Elephant Group. In both cases this had led to the break up of the groups in the recent past. In the case of the Waimungu group perceptions over lack of benefits generated through membership had led to some members defaulting on regular 'merry-go-round' contributions. While income generating activities were relatively limited among all the groups surveyed, it was clear that, beyond cursory governance structures, there is a lack of capacity in bookkeeping, recording systems, governance and transparent financial handling. Capacity needs to be developed in all of these areas to build confidence among group members.

With the exception of the Mukogodo Women's Elephant Group, women were under represented in the livelihood groups surveyed possibly reflecting social conditions that limit opportunities for women to be involved in commercial enterprises.

## Commercial

Achieving adequate product volume and product quality is the biggest barrier to securing markets for the elephant-compatible products trialled among the livelihood groups surveyed with the exception of Riafaji group which is well positioned to produce chillies on a commercial basis. While for some groups this barrier might be overcome with adequate training and out-reach support, such as with beekeeping and chilli farming, there are other constraints that are leading to barriers to production of adequate volume and quality for market entry. For example environmental conditions are unsuitable for consistent production of honey among the Urumwe beekeepers group. Furthermore limited access to land and labour makes the opportunity cost of trialling new crops very high among all livelihood groups, limiting opportunities for initial uptake and reducing quantities produced. Lastly opportunities to improve cooperation among different groups for the purpose of increasing bulk and achieving economies of scale are limited by lack of resources for transport, coordination and communication.

Without access to financial support and training on business skills the livelihood groups surveyed have little opportunity to add value to raw products, limiting supply to local rather than regional, national and international markets.

## Discussion

### Beekeeping

Significant investments would be required to develop the capacity of the dryland smallholder groups surveyed (Waimungu and Riafaji) to generate honey for the market and associated revenue in any significant quantity. This is clearly expensive and difficult to achieve which has been a major barrier to attempts at successful honey production among the smallholder groups surveyed. It is important to note that during the course of our interviews we were informed that there were many other groups in southern Laikipia comprised of immigrant small-scale farmers who had also tried and failed to produce honey on any commercially viable scale. In each case it appears initial investment and support was provided by an outside organisation only for this organisation to stop providing support with the beekeeping enterprise eventually confined to a few households or collapsing altogether. Given this history of failure to achieve commercial honey production among smallholder groups in southern Laikipia it may be more feasible to support the resident traditional beekeeping groups who already produce honey in large quantities but operate outside of the formal commercial market.

There is a strong tradition of beekeeping among the Mukogodo Maasai living within and around the Mukogodo Forest in north Laikipia. This is illustrated by the large and active membership of the Lotoro Sieku Group (200+ members) who were opportunistically interviewed during the course of the fieldwork undertaken in March 2009 for this working paper. We therefore strongly recommend that any future investment in honey production should begin here, where sustainability might be more easily achieved, before taking on the more difficult challenge of establishing commercial honey production among smallholders in southern Laikipia.

### Chilli Production

Of the community groups surveyed the Riafaji Group is ideally placed for growing chillies due to members' access to perennial water (the Pesi River) and their high levels of organisation. Members of this group are already engaged in intense horticulture for good returns as they have set themselves up as out growers for a commercial partner, Homegrown Ltd. The group's interest in growing alternative crops such as chillies is therefore to create a hedge against the risks associated with human-elephant conflict. It is unfortunate that the initial trials were hampered by the provision of poor quality seed and inadequate outreach support. If these two issues can be addressed, then this group will be well placed to produce chillies on a commercial scale.

### Elephant Dung Paper Production

The Mukogodo Women's Elephant Group achieved a great deal with very little financing, largely due to the enthusiasm of the project instigator and the local women involved. However the dung paper making enterprise remains operational at a very small scale. This is largely due to a lack of financial capacity to invest in equipment, training, marketing and management assistance. Given that the volumes produced were very low and the investment required in quality control and product development is high, it would be more cost-effective and practical to encourage a commercial partner to produce elephant dung paper in Nanyuki town to reduce travel costs. If and when a larger market is secured for the dung paper products generated and sufficient revenue flows are achieved then it might be possible to extend production to groups further afield. However transport costs to these sites are likely to continue to be a barrier to profitable production unless carried on the back of other enterprise activities occurring in such remote sites (e.g. honey production).

Given that honey production in and around the Mukogodo Forest already occurs at a large scale, albeit not for commercial purposes, it would be worth providing support and training so that

members of the Mukogodo Elephant Women's Group can be involved in value added activities for local honey producers.

For the small-scale farmers living on marginal land that were targeted and interviewed under this project, in particular Mwirere beekeepers, beekeeping represents at best a useful complementary income source but will never be a significant source of revenue given the shortage of water and associated shortage of forage for bees. Given that these groups appear to be moving to livestock production as a major source of household income, it might be better to help support and develop this enterprise. Trialling the cultivation of non-palatable dry land crops may also be worth pursuing but only if sufficient resources can be made available to cover opportunity costs among farmers involved in trials, extension services, upscaling production, quality control and marketing.

## Bioenterprises on Laikipia

In 2009, a multimillion dollar (\$US) bioenterprise project was developed by the Laikipia Wildlife Forum with support from USAID, the African Wildlife Foundation and the Royal Netherlands Embassy with implementation to begin in late 2009. With the intention of supporting local livelihoods through conservation-compatible enterprises this LWF driven bioenterprise project intends to trial, develop and market natural products in Laikipia in partnership with local community groups on a large scale. This new LWF initiative will effectively take on or adapt the activities described in this working paper where appropriate and feasible. However our results and discussions with community groups demonstrate that attempts to establish new livelihood activities in a rural African context is challenging and often not successful. We hope that the results and experiences described here will inform the design and planning of the LWF driven initiative.

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## Laikipia Elephant Project Working Papers

1. The Use of Electrified Fences to Reduce Human Elephant Conflict:  
A Case Study of the Ol Pejeta Conservancy, Laikipia District, Kenya (2009),  
*Max Graham, Nathan Gichohi, Francis Kamau, George Aike, Batian Craig,  
Iain Douglas-Hamilton, and William M. Adams.*
2. The Use of 'Push to Talk' Mobile Phone Technology to Reduce Human Elephant Conflict,  
Laikipia District, Kenya (2009)  
*Max Graham, Christine Greenwood, Gabriel Kahiro, William M. Adams.*
3. An Assessment of Elephant-Compatible Livelihoods: Trials of Beekeeping, Chilli Farming  
and the Production of Dung Paper in Laikipia, Kenya (2009)  
*Max Graham, Susie Wren and William M. Adams*

# Building Capacity to Alleviate Human-Elephant Conflict in North Kenya

DEFRA Darwin Initiative Grant 741

This project aims to enhance the conservation and management of Kenya's second largest elephant population (over 5,000 animals) and the ecosystem they inhabit through the implementation of an integrated and sustainable community based approach for alleviating human-elephant conflict (HEC).

The purpose of this project is to alleviate human-elephant conflict and promote tolerance of elephants in Laikipia District, Kenya.

The project works to support local partners in the following activities:

- Research on the development of systems to provide early warning of human-elephant conflict using local knowledge, Mobile phone ('push-to-talk') technologies and GPS/GSM collars;
- Dissemination of information on elephant conservation and human-elephant conflict management in vulnerable communities and local conservation organisations and land managers;
- Assess the feasibility of establishing economic activities that promote sustainable livelihoods and reduce negative human-elephant conflict;
- Promote the establishment of strategy and revenue streams to support for long term human-elephant conflict management in Laikipia;
- Support local organisations in the development of the institutional capacity to manage the West Laikipia Elephant Fence.

The project's partners are:

CETRAD

Elephant Pepper Development Trust

Kenya Wildlife Service

Mpala Research Centre

Ol Pejeta Conservancy

Rivercross Technologies

Save the Elephants

Symbiosis Trust

The Laikipia Wildlife Forum

[www.laikipiaelephantproject.org](http://www.laikipiaelephantproject.org)

[www.geog.cam.ac.uk/research/projects/heccapacity/](http://www.geog.cam.ac.uk/research/projects/heccapacity/)



Laikipia Wildlife Forum



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People living with elephants