**Institution:** University of Cambridge

**Unit of Assessment:** UoA17B

**Title of case study:** Understanding and Reducing Human-Elephant Conflict in Africa

**1. Summary of the impact** (indicative maximum 100 words)

Research (2006-10) led by **Adams** and **Graham** on the management of human-elephant conflict – a significant problem with wider implications for livelihoods and conservation – had direct effects on policy-making and practice in the project area (Laikipia), in Kenya nationally, and across East Africa. Specific impacts included:

- Adoption of farm-based deterrents against elephant crop raids in the project area (Laikipia);
- Adoption of protocols for electric fence management along 84km of the West Laikipia Fence;
- A significant reduction in elephant crop raiding;
- Foundation of a new non-governmental organisation, *Space for Giants*, and its subsequent work with stakeholder communities in applying the insights from the pioneering research in Kenya;
- Influencing policy on international collaboration and trans-frontier arrangements for elephant conservation in East Africa.

**2. Underpinning research** (indicative maximum 500 words)

Biodiversity loss and poverty are both critical targets of public policy, but biodiversity conservation and poverty alleviation are often in conflict. In sub-Saharan Africa, a significant example of such conflict is the problem of crop raiding by elephants, which contributes to the complexity of elephant conservation in shared landscapes.

Research in the Department of Geography, University of Cambridge, funded by the Defra Darwin Initiative (2006-10), investigated elephant movements, and explored integrated and sustainable community-based approaches to the alleviation of human-elephant conflict in Laikipia, Kenya. Laikipia contains extensive smallholder farms, large private ranches and smallholder gazing land. Crop raiding here is the worst in Kenya, and both illegal poaching and legal killing of elephants are significant. The research, designed from the outset to have impact, was led by **Adams** (Moran Professor of Conservation and Development, 2004- ) and **Graham** (Postdoctoral Research Associate, 2006-2009), with Ochieng and Kahiro (locally employed project staff), and collaborators Lee (University of Stirling), Notter (University of Berne), and Hamilton (Save the Elephants NGO). Research-into-use partners were the Kenya Wildlife Service, Laikipia Wildlife Forum, Ol Pejeta Conservancy, Save the Elephants, Safaricom Ltd, Wireless ZT and Nokia, the Nokia Siemens Networks.

Particularly innovative elements of Adams' and Graham's research were original field-based studies of elephant movement in a land-use mosaic (using GPS collars to provide data on diurnal and nocturnal movements – see Section 3 (iv)), and of patterns of crop raiding in space and time, using data from field surveys (see 3 (v)). These studies demonstrated the adaptability of elephants in human-dominated landscapes (e.g. their use of wooded and ranch land as daytime refuges) and highlighted opportunities and challenges for conservation.

From this fundamental knowledge base, landscape-scale research investigated:

1) *The effectiveness of methods to deter crop raiding* (including, for example, chilli grease rope fences and chilli smoke briquettes, solar powered spotlights, watchtowers, banger sticks, and trip-wire alarms). These were tested both in experimental plots and through farmer-managed experiments in affected communities (see 3 (ii) and (iii));
2) *The effectiveness of human-elephant conflict early warning systems*. The use of mobile phone technology to harness local knowledge about elephant crop raiding led to improved coordination of responses to conflict, bridging problematic relationships between different stakeholders (see 3 (vi)).
3) *The effectiveness of electric fences to deter crop raiding using an automated elephant early warning system*. GIS-based GPS/GSM collars, fitted to known crop-raiding elephants, sent automatic text messages to warn ranch managers, who could then scare the elephant away using vehicles, lights and thunderflashes (see 3 (i) and (ii)).
4) *Novel local economic activities*, including production of chillies, honey, and elephant dung paper,

which could provide for livelihoods in a landscape with free-roaming elephants (see 3 (iii));
5) *The social context of conflict management*. Public attitudes to elephants, crop raiding and electric fences were assessed through surveys, and the capacity for fence management (physical infrastructure and voltage) by local smallholder communities and ranchers was analysed through participatory research (see 3 (v)).
6) *Community attitudes to elephants and crop raiding:* these were tested through action research, as part of the development of a novel communication strategy to improve community understanding of elephant movement and local institutions, using, for example, comic books, poster and essay competitions, and drama. Plays written by the research team for a local drama group were performed in local communities, schools and administrative centres to open up discussion of human elephant conflict and wildlife management.

**3. References to the research** (indicative maximum of six references)

The research led to numerous publications of international standing, including papers in international peer-review journals, for example:


i. Lee, P. C. and Graham, M. D. (2006) 'African elephants and human-elephant interactions: implications for conservation', *International Zoological Yearbook* 40: 9–19.
ii. Graham, M. D. and Ochieng, T. (2008a) 'Uptake and performance of farm-based measures for reducing crop raiding by elephants *Loxodonta africana* among smallholder farms in Laikipia District, Kenya', *Oryx*, 42: 76-82.
iii. Graham, M. D. and Ochieng, T. (2008b) 'Human-elephant conflict mitigation in Laikipia District, Kenya', in M. Walpole and M.Linkie (eds.) *Mitigating human-elephant conflict: case studies from Africa and Asia*, Fauna and Flora International, Cambridge, pp. 83-95.
iv. Graham, M., Douglas-Hamilton, I., Lee, P. C. and Adams, W. M. (2009) 'The movement of African elephants in a human-dominated land use mosaic', *Animal Conservation* 12: 445-455.
v. Graham, M. D, Notter, B., Adams. W. M., Lee, P. C. and Ochieng, T. N. (2010) 'Patterns of crop-raiding by elephants, *Loxodonta africana*, in Laikipia, Kenya, and the management of human-elephant conflict', *Systematics and Biodiversity* 8: 435–445.
vi. Graham, M. D., Adams. W. M.. and Kahiro, G. N. (2012) 'Mobile phone communication in effective human-elephant conflict management in Laikipia County, Kenya', *Oryx* 46: 137-144.



The research was funded by two competitively won grants:

- **Adams** and **Graham** (co-PIs), *Building capacity to alleviate human-elephant conflict in north Kenya.* UK Defra Darwin Initiative, 2006-09; £260,909.
- **Adams** (PI) *Darwin Fellowship: Samuel Mutisya (Senior Ecologist Ol Pejeta Conservancy, now* Department of Geography, University of Nairobi). UK Defra Darwin Initiative, 2009-10; £31,910.


**4. Details of the impact** (indicative maximum 750 words)

The research helped alleviate human-elephant conflict and promoted tolerance of elephants in Laikipia, with long-term benefits for biodiversity conservation. Significant impacts transcend the project area. Policies derived from the research have been adopted at national level in Kenya; and impacts have reached internationally into other countries in the region. Specific impacts include:

***1) Changed farm-based conservation practice and reduced incidence of crop-raiding***

The farm-based methods to reduce crop raiding on smallholder farms, identified and trialled by the research, were promoted by the Laikipia Elephant Project and adopted widely in Laikipia (Section 5, Source 1). The effectiveness of the research was shown by a reduction in elephant crop raiding from its previous level (3640 incidents, October 2006 - September 2007) to 1646 incidents (October 2008 - September 2009) (see 3 (ii) and (iii)). The *Wildlife Conservation Strategy for Laikipia County 2012—2030* (see 5.2) states that 'these methods [chilli fences, loud noise makers, watchtowers with spotlights, chilli smoke] are likely to grow in importance in Laikipia in areas not supported by the presence of an effective electric fence' (p. 49).

***2) New strategies for community engagement***

The Vice Chairman of the Laikipia Wildlife Forum (LWF) has confirmed that the research 'was critical in showing that community engagement is the secret of success to lowering human/elephant conflict' (see 5.6). The team's development of community drama proved highly

effective as a means of maximising research impact. The *Wildlife Conservation Strategy for Laikipia County 2012-2030* (see 5.2) states that: '[e]xperience of the use of plays in human-wildlife conflict management efforts in Laikipia has been extremely promising' (pp. 49-50); and that 'Laikipia could benefit from its continued use, both in assisting with community involvement in human-wildlife management and with broader conservation challenges' (p. 50). The interactive character of the drama is central to its success: one actor commented 'the drama has a lot of influence, because it is just like talking in action' (see 5.8, 1:40). Other ways of involving the community, such as good information flow, joint data collection, rapid response teams, and the 'particularly innovative' use of mobile phones were also noted for their effectiveness by the Vice Chairman of LWF (see 5.6).

a. Making a chilli fence to deter elephants

b. Banger Stick Training

**3) *New approaches to human-elephant conflict mitigation – the West Laikipia Fence***

The research (see 3 (iv, v and vi)) was directly employed by the Laikipia Wildlife Forum in the design and implementation of the 84km electric fence constructed in 2009 to separate the elephant range from areas of intensive smallholder agriculture. According to the Vice Chairman of LWF, the research 'was fundamental to the approaches LWF now takes in relation to the West Laikipia Fence' (see 5.6). Innovations flowing from its findings since 2008 include:

i. Local adoption of methods (developed and tested by the research) for the effective design, maintenance and management of electrified fences to deter elephants;
ii. Creation of a network of community scouts to collect systematic data on fence breakages and voltage;
iii. Adoption among local scouts and wildlife managers of a protocol for using mobile phone text messages for early warning of incidents of human-elephant conflict;
iv. Deployment of mobile rapid response teams to scare elephants away from electrified fences and/or crops in response to early warning text messages;
v. Identification and monitoring of persistent fence-breaking elephants by a trained elephant researcher to enable informed management action to take place;
vi. Enhancement of local capacity to manage fences through creation of local fence management committees (comprising farmers, government officials and ranch managers) and a human-elephant conflict management committee comprised of the Kenya Wildlife Service, the Laikipia Wildlife Forum and the Ol Pejeta Conservancy.

The nature and success of the work of the Laikipia Wildlife Forum and the Laikipia Elephant Project are shown in sources 5.3 and 5.5.

**4) *Creation and subsequent work of a non-governmental organisation, Space for Giants***

After completion of the research, Graham founded *Space for Giants* (2010), a charity registered in Kenya and the UK (no: 1139771), and governed by a volunteer Board of Trustees (see 5.3). The current Chairman writes that the charity, "tackle[s] elephant conservation by directly applying the findings of the research done by the Cambridge team" (see 5.9). Applications include:

i. mitigating conflict – working with stakeholder communities along the West Laikipia Fence to identify and solve problems of fence and elephant management;
ii. securing space – working with large landholders on innovative collaborative land management

institutions;
iii. training, using the grassroots drama pioneered during the research;
iv. preventing the illegal killing of elephants through a network of community scouts, organised and collecting data using the protocols developed during the research.

**5) *Adoption of research findings nationally and internationally***

The reach of the research impact has been secured and extended in a number of ways, e.g:

i. In 2009, the project team contributed to a national workshop run by the Kenya Wildlife Service, a government agency, to discuss a new *Conservation and Management Strategy for the Elephant in Kenya 2012-2021* (see 5.4). The Workshop fed the research on elephant movement, crop raiding and conflict management into strategic thinking by the Wildlife Service about the survival of elephants outside protected areas. The *Strategy* adopted the project's findings on crop deterrence in proposing Action 4.2.4 – '[t]rial deterrents (disturbance methods, watch towers, fires, chilli fences, beehive fences, innovative technologies) to determine potential effectiveness in different sites' – to address Target 4.2: 'Protection from elephant damage of crops and property on the boundaries of elephant distribution range significantly improved'. It also took up the recommendations on training in adopting action 4.5.1: 'Develop and implement HEC [human-elephant conflict] training program (including conflict resolution, community engagement and [problem animal control])'.
ii. As well as adopting its findings in Laikipia, the Kenyan Wildlife Service 'has applied the results of [the] research … nationally and internationally' (Assistant Director, Mountain Conservation Area, Kenya Wildlife Service – see 5.7). This wider reach was facilitated, for example, by a training workshop on human-elephant conflict mitigation in East Africa (2009) run by **Graham** for the Kenya Wildlife Service. The Workshop brought wildlife managers from across East Africa – Kenya, Tanzania, Uganda and Southern Sudan – to review the experiences of the Darwin Project team and consider applications of the research in different contexts. Delegates heard scientific presentations from Graham, Ochieng and Adams and took part in a performance of a play written by the project team and performed widely within local communities. The *Kenyan Conservation and Management Strategy for the Elephant* reflected the importance of this international outreach, especially in relation to transfrontier arrangements. It noted, for example, the need to work with neighbouring countries in pursuit of 'coordinated approaches' on human-elephant conflict and community-based natural resource management: 'Inter-governmental organisations should promote more inter-regional dialogue and collaboration' (see 5.4, p. 18).

**5. Sources to corroborate the impact** (indicative maximum of 10 references)


1. Youtube video on crop raiding and farm deterrence, *Crop Raiding*, at: http://www.youtube.com/watch?v=mbYz0aJQMGs. It is not easy to persuade busy governmental and non-governmental workers in Kenya to write formal statements about the research, but this video, and the one cited in 8 below, provide an alternative view. (Also available from UoA.)
2. *Wildlife Conservation Strategy for Laikipia County 2012-2030*, Laikipia Wildlife Forum (a local NGO representing all landowners). Hard copy available from UoA.
3. *Space for Giants* Annual Reports, http://spaceforgiants.org/?q=publications/published-papers, and website (http://spaceforgiants.org/).
4. Litoroh, Omondi, Kock and Amin (2012) *Conservation and Management Strategy for the Elephant in Kenya 2012-2021*, Kenya Wildlife Service, Nairobi. Hard copy available from UoA.
5. Monthly Reports of the Laikipia Wildlife Forum http://www.laikipia.org/resources/downloads link to 'downloads'.
6. Letter from person 1 (Vice Chairman, Laikipia Wildlife Forum/Director, Mpala Research Centre).
7. Letter from person 2 (Assistant Director, Mountain Conservation Area, Kenya Wildlife Service).
8. Youtube video on interactive drama, *Education*, at: http://www.youtube.com/watch?v=8uhvicegIvk (Also available from UoA.)
9. Letter from person 3 (Chairman of Space for Giants and Director of the Centre for Training and Integrated Research for ASAL Development).