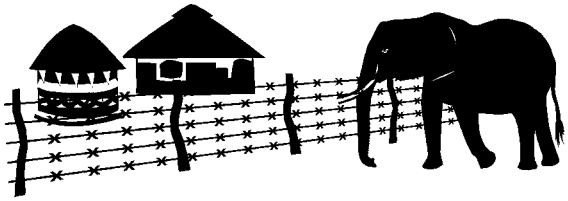
AfESG Website HEC Section
TECHNICAL BRIEF SERIES
Richard Hoare 2003

FENCING AND OTHER BARRIERS AGAINST PROBLEM ELEPHANTS



Physical barriers, although an expensive option, are seen by many people as potentially a permanent solution to an elephant problem. Several types of barriers have been tried against elephants, most commonly electrified wire fences. In practice, long-term success with anti-elephant fences has often fallen well below expectation. This is sometimes because of layout or design but more frequently simply because of deficiencies in meeting the considerable demands of meticulous routine maintenance. The latter usually reflects a management or 'institutional' problem, not a technological one. The conventional model of an elephant fence project is being questioned by trying smaller projects with simpler fence designs.

Experience with elephant fences

There is often a temptation to put up elephant fences anywhere where human-elephant conflict is deemed to be severe. But fences are not appropriate for all situations. There should be sufficient and reliable prior information on the damage caused by elephants to justify *both* the considerable expense of constructing a fence *and* the commitment to continual maintenance that any fence requires. Carefully planning the layout and design of fences, for example, is especially important for non-target species[1]. The local ecology and movement pattern of elephants must be reasonably well known since disregarding established movement routes may put a fence under such severe challenge that the maintenance demand cannot be met. Commercial fencing contractors or people with relevant experience should always be consulted when erecting wildlife fencing.

As a general rule for fencing, the smaller the project the less it costs and the better it works. An encircling fence layout is best since it avoids 'funneling' elephants around the open end of a fence. Enormously expensive fencing projects have failed completely against elephants by disregarding the simple observation that elephants encountering a fence will often merely walk along it until they reach the end [2, 3]. This of course exacerbates problems for people who live near the end (see Model 4 below). As problem elephants appear not to be 'deflected' from their target, the only option is to identify that target and keep them out. Thus a small, encircling fence

around a valuable resource (e.g. an irrigated field, a water point or a food storage facility) has the best chance of success both in terms of reduced elephant damage and overall cost-effectiveness [3, 4, 5].

Electric fencing technology is simple and definitely deters elephants - if it is continuously kept under good management. Fences need electrification in most savanna elephant ranges or where crop raiders are determined and persistent [3, 4, 6]. Fences may not need electrification as much in the forest elephant range where elephants appear not to be so persistent at crop raiding. One study [7] demonstrated clear deterrence of forest elephant crop raiding using single strand non-electrified fencing to encircle small plots of cultivation in rainforest in Gabon.

The expectation is that a fence will eliminate elephant problems. This is never true in practice. Some elephants that are 'habitual fence breakers' do exist and these may need to be removed or eliminated if they can be individually identified [8, 9].

Maintenance is the number one problem with any type of wildlife fencing. A fence is only as good as its maintenance, which has to be continual and meticulous. Collective maintenance of an electric fence by a rural community has often failed because it involves a long chain of responsibility, which easily collapses at the weakest link[3]. Even in countries where wildlife management schemes operate at a local level, the results of electric fencing projects have often been disappointing for reasons almost always attributable to maintenance deficiencies [3, 10]. This is an institutional problem not a technological one, so with improved discipline it can be rectified [3].

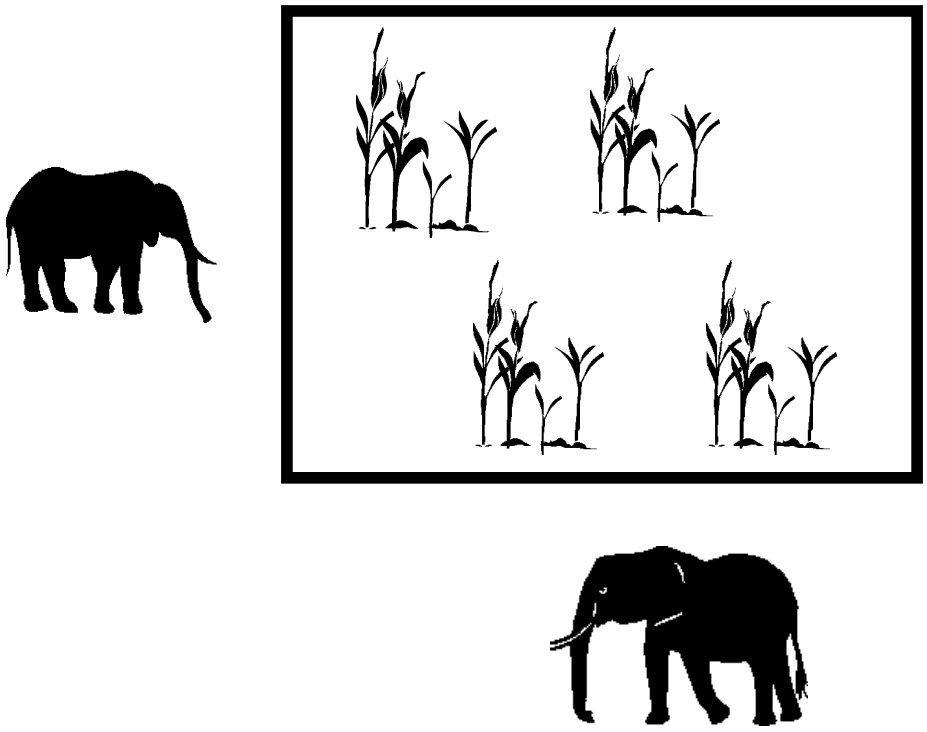
The most serious maintenance problems with electric fences are nearly always associated with the power supply, especially if this involves the use of solar panels and batteries, as opposed to mains electric power that is seldom available in rural areas. Vandalism and theft of components (particularly solar panels, energizers and wire) is extremely common in community managed fences. Not only does this inactivate the fence but frequently creates the knock-on effect of the maintenance demand outstripping its budget, leading to total collapse of the project [3, 9]. Keeping vigorous growth of vegetation clear of a fence line in the growing season is a perennial problem that characterizes the management of electric fences. Vegetation contact causes power leakages and overgrowth conceals the fence from being an obvious barrier to elephants

Constant high voltages (> 5Kv) in electric fences will deter most elephants but low voltage, a frequent manifestation of poor maintenance, may merely irritate a determined elephant that may then destroy a section of the fence. Because each electric fence energizer powers several kilometers of fencing, disruption of the power supply at one point inactivates a long section of fence. If power is not restored promptly the adverse conditioning associated with the barrier is lost, and long sections of the conflict boundary quickly become porous to elephants.

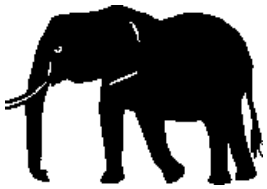
An evaluation of several years' usage of anti-elephant fencing under various management regimes in Zimbabwe[3] is particularly informative. In that country the models for constructing elephant fences are (in order of size of project):

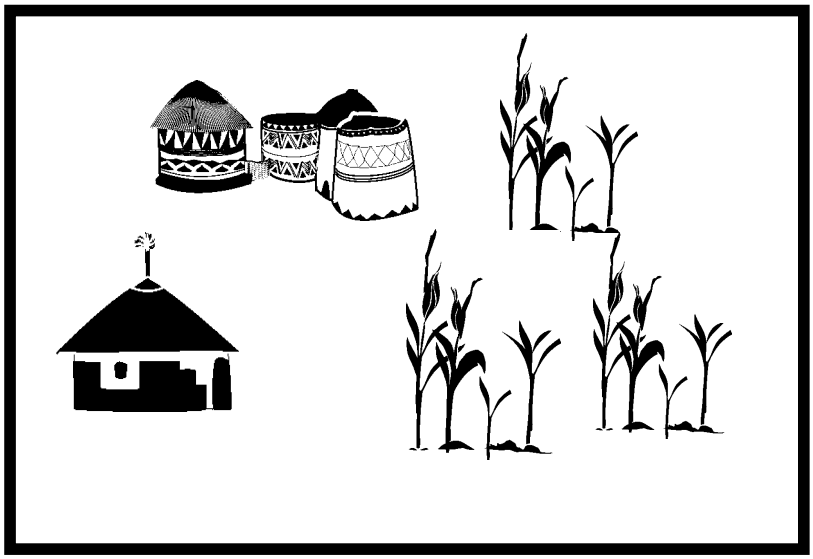
MODEL 1 Around a field (Crop protection fence only)
MODEL 2 Around a household and its fields (Household fence)
MODEL 3 Around a community and its facilities - school, clinic church etc (Community fence)
MODEL 4 Around an elephant range or along an elephant/people interface (Extended fence)

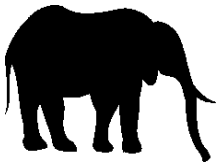
MODEL 1 CROP PROTECTION FENCE



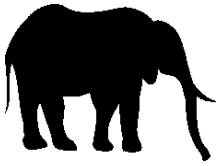
MODEL 2 HOUSEHOLD PROTECTION FENCE

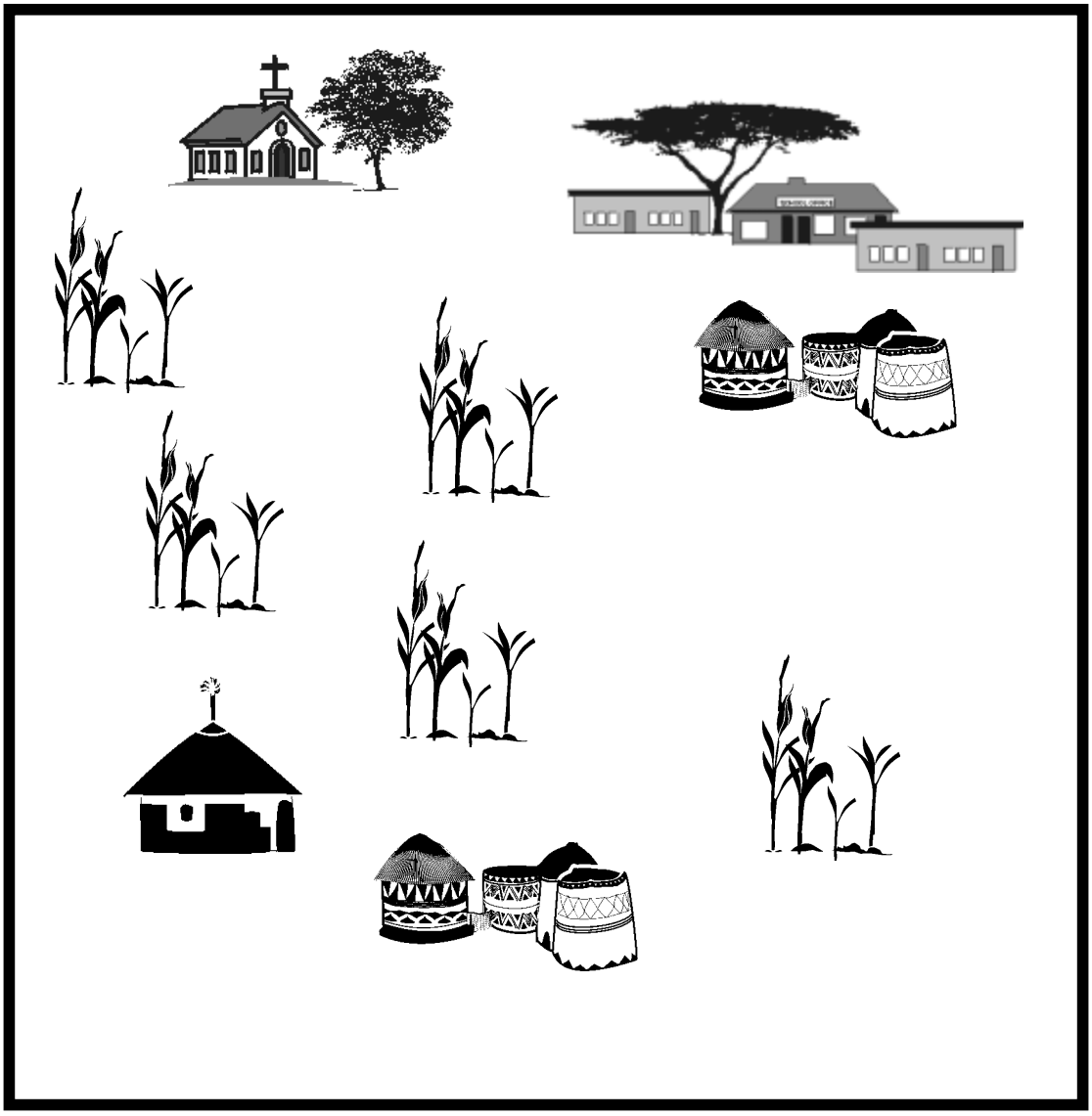


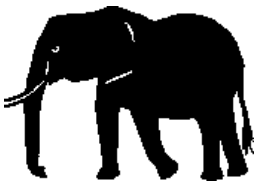




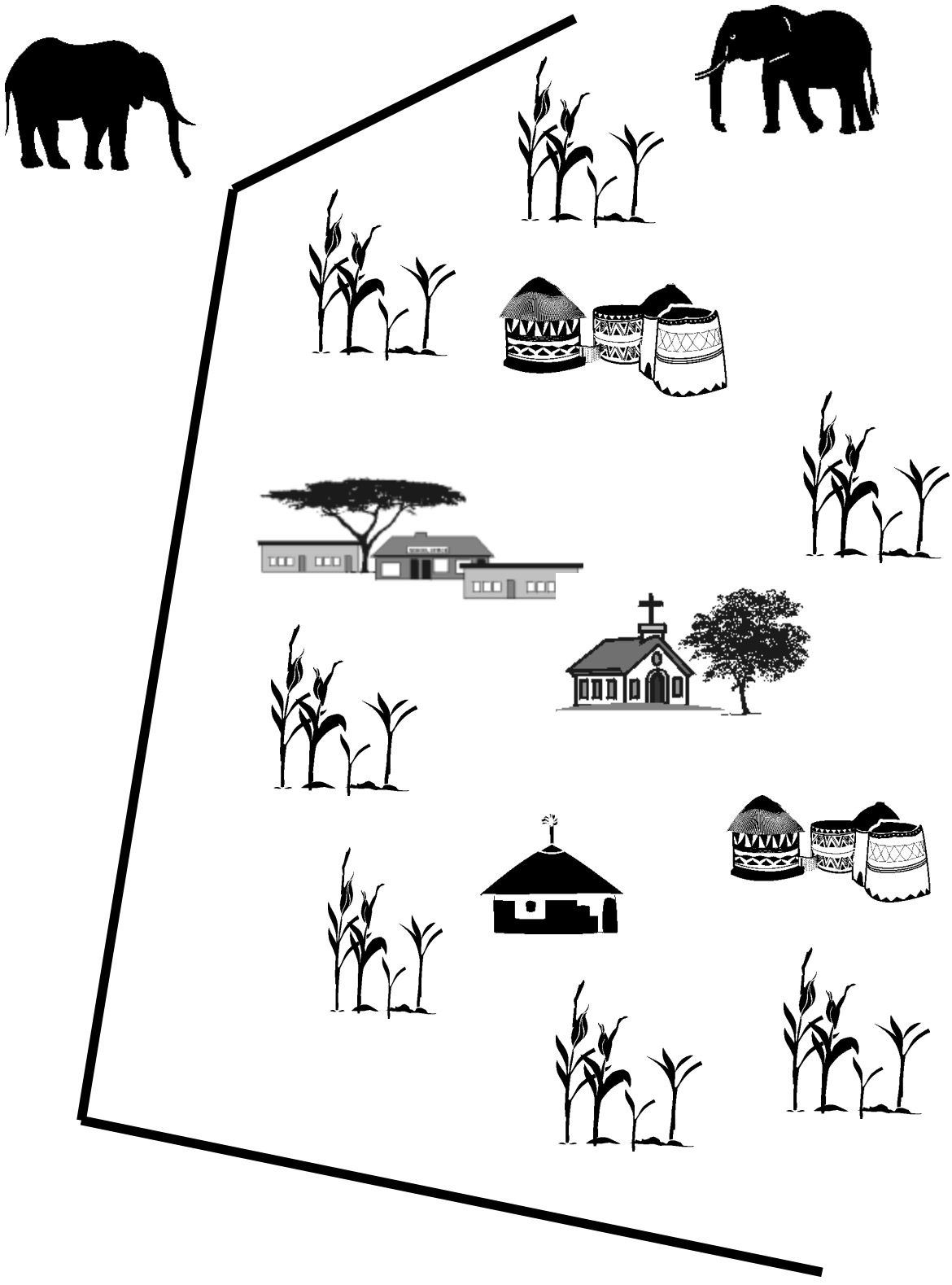
MODEL 3 COMMUNITY PROTECTION FENCE (ENCIRCLING)



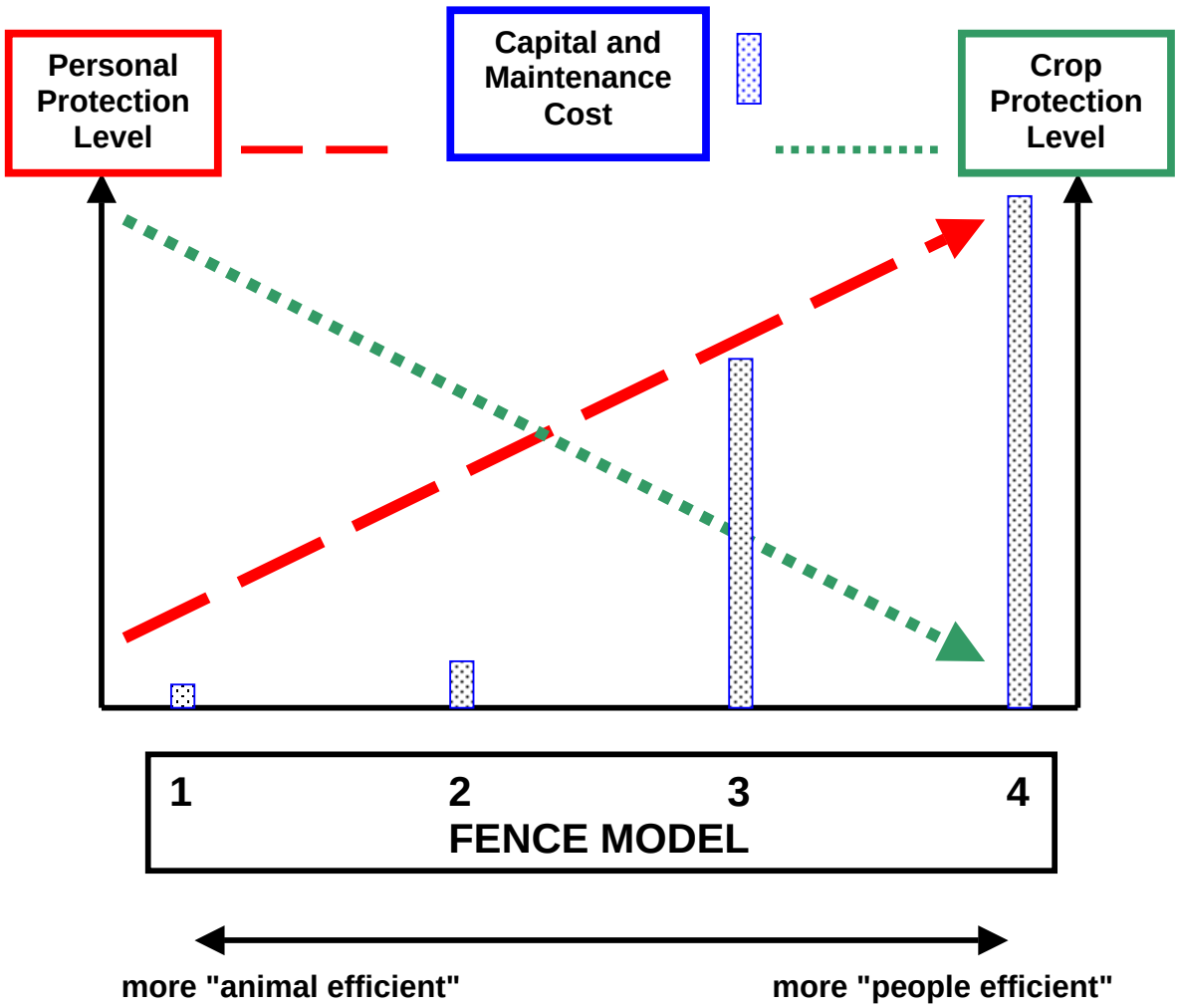




MODEL 4 COMMUNITY PROTECTION FENCE (EXTENDED OPEN)



Source: IUCN African Elephant Specialist Group www.iucn.org/afesg



SIMPLIFIED SCHEMATIC COMPARISON OF FENCE MODELS[3]

Addressing the problems with elephant fences

The conventional model of an electric fence against problem wildlife species (mainly the larger mammals) has suffered from the twin problems of high capital cost and routine maintenance deficiencies. Strategies that might be able to overcome capital cost requirements or maintenance deficiencies in conventional electric fences designed to deter elephants are being considered and tried at present. These include:

- Very stoutly constructed and thus expensive fences that act as barriers even if the power supply is interrupted. This strategy has been employed by some national wildlife authorities (e.g. in Kenya) on the boundaries of protected areas

- Private sector involvement in routine fence maintenance. Private sector wildlife fencing projects are generally successful and sustainable

- Simple designs (e.g. one or two strands situated 1 -1.5 meters above ground). This arrangement is often used in traditional fences[11]. With an electric fence low specification makes construction cheaper, routine maintenance including clearance of vegetation easier, and allows smaller, non-target animals to pass unhindered.

- Small, individually owned fencing projects - for example protecting one household's fields and dwellings. These can be electrified with small power units and the fence layout can be changed according to crop rotation. Practical in relatively good farming areas.

- Abandonment of both fence electrification and the idea that wildlife fences have to involve large externally funded projects. Combining the last two points (individual ownership and simple, cheap design from local materials) and employing additional low cost deterrents on the fence (e.g. grease containing irritant chilli extract; cow bells to act as alarms). Showing promise in some poor, subsistence agricultural areas[11]. For more detail see the **linked website**: www.elephantpepper.org.

Barriers other than fences

Ditches and moats have been used against Asian elephants with somewhat limited success. They have had very little application in Africa [12]. Problems with ditches or trenches are the massive investment required both to construct them and maintain them, the latter because of their extreme vulnerability to soil erosion. Elephants learn to kick in the sides of trenches and cross them and are also undeterred by narrow stretches of water.

Stone walls, although expensive to build, have been quite effective as an elephant barrier in parts of Kenya [6, 9] particularly if used as a strong base for a simple electric fence. Unfortunately

the application of stone walls to many other areas is limited by insufficient quantities of useable stone.

Buffer crops relatively unpalatable to elephants (e.g. tea, timber, tobacco, sisal) have been planted around food crops in some places to try to protect the latter. In one study that examined this critically, no beneficial effect was noted [12], apparently because elephants simply traversed the buffer crop to reach their target crop beyond. Spines on sisal are no deterrent and elephants have been recorded eating the plant. Long barriers of cactus (*Opuntia* spp.) suffer from sufficiently vigorous growth being inconsistent. Timber plantations of tree species exotic to Africa (e.g. *Pinus* spp.) have also suffered considerable commercial damage from elephants. This is both by trampling saplings and serious debarking of adult trees. Chillies as a buffer crop may show some promise but only if used in conjunction with many other simultaneous defence measures[11].

For a full evaluation of other human-elephant conflict measures see the 'Decision Support System' **advertised on this website**.

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These references are abstracted in the African Elephant Library (see AEL section). Hard copies are kept at the AfESG secretariat in Nairobi but a reprint service is not currently on offer. Publications in journals (underlined) may be obtained from libraries that have the relevant journal while an unpublished report may be obtained from the organization listed as producing it.