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Wildlife

Ken Campbell[*]*, Martin Loibooki*[‡]

Cameo 1 - Saiga antelope in Central Asia

Covering roughly 260 million hectares, the vast rangelands of Central Asia form the world's largest contiguous area of grazing and are home to the nomadic Saiga antelope (*Saiga tatarica*). *S. t. tatarica* occurs in Kazakhstan and in Kalmykia, Russian Federation, and *S. t. mongolica* in Mongolia. Horns are borne by males only and are highly valued in traditional Chinese medicine. Following heavy hunting pressure during the 19th century, a complete and well-regulated ban on hunting allowed populations to recover. Controlled hunting for meat commenced during the 1950s and continued for the remainder of the Soviet period. Following the collapse of the Soviet Union, state and collective livestock herds were divided among small landowners. Privatisation was accompanied by an end to input subsidies, disintegration of marketing networks, lack of winter forage, and poor maintenance of infrastructure, all factors leading to a decline in livestock numbers. Rural poverty, unemployment, loss of livestock, and a lack of funding for Saiga management have resulted in uncontrolled and large-scale poaching for Saiga meat, which formed an important contribution to many people's livelihoods. By 1998 Saiga population numbers had collapsed to about 5 per cent of numbers ten years previously. Selective hunting of adult males for their horns has resulted in over 100 females per adult male. It is likely that a lack of males has caused a serious reduction in conception rates which, in addition to the high mortality from unregulated hunting, has resulted in a population collapse. Saiga antelope are now listed as Critically Endangered on the 2002 IUCN Red List and are also listed on Appendix II

[*] Principal author
[‡] Consulting author

of the Convention on Migratory Species (Milner-Gulland *et al.,* 2001; 2003). With the collapse of the Saiga populations, dependence on Saiga is clearly unsustainable and a rebuilding of the rural economy, the livestock sector in particular, is an essential prerequisite to conservation of the Saiga antelope.

Cameo 2 - Serengeti, Tanzania

The main feature of the Serengeti ecosystem of northern Tanzania is an annual migration of large herds of ungulates, primarily wildebeest (*Connochaetes taurinus*). Over 2 million people to the west of Serengeti derive important benefits from Serengeti's wildlife, largely in the form of illegally hunted meat. The meat, hunted mainly by the resource-poor using largely traditional methods (snares, bow and arrow), is dried and sold locally or outside the area, at an estimated market value of about US$ 1 million per year (Campbell *et al.,* 2001). Growing human populations coupled with increasing household cash requirements, result in a situation where the 'safety net' provided by illegal hunting of wildlife constitutes one of the only support mechanisms and sources of cash for the poorest members of the community. Populations of many of the larger wildlife species have declined and hunters now travel greater distances and increase their hunting effort. A change in the age profile of hunters was recorded between 1992 and 2000, with a statistically significant increase in the 25 to 45 year age bracket – the main household income earners. The poorest households have few or no livestock, and there is a clear relationship between illegal hunting and lack of small stock in particular (poultry, sheep and goats). In these areas, hunting and utilisation of wildlife is not a long-term sustainable solution to the problem of rural poverty. Experiences of pro-poor tourism and community wildlife management projects, often seen as solutions in wildlife-rich areas, suggest that benefits accrue to the wider community, with few benefits directed at the poorest community members. Instead, poverty reduction and rural development may require integrated programmes with strong small stock components targeted at the poorest members of the communities – enabling and sustaining livestock ownership by the resource-poor.

Background

Resource-poor communities throughout the world experience a variety of interactions with wildlife species. For the purposes of this chapter, wildlife is defined as any wild animal, including mammals, birds and fish. In areas where

resource-poor communities live adjacent to significant populations of wild herbivores there may be competition for grazing, predation of stock and transmission of disease to livestock. With growing numbers of people to feed, it is natural that planners are more oriented towards agricultural development than to the maintenance and establishment of natural reserves and conservation of wildlife. However, wildlife also provide a source of both food and income for the poor, particularly during times of hardship when crops may fail and domestic stock die.

Interactions between larger wildlife, livestock and livestock-keepers are necessarily limited to those areas where wildlife and livestock co-exist or live in reasonably close proximity. Worldwide, the numbers of resource-poor livestock-keepers are considerable. What is the potential scale of interaction, which livestock systems, and which groups of resource-poor livestock-keepers are most likely to be involved in these interactions? Thornton *et al*. (2002) showed that a majority of resource-poor livestock-keepers are to be found in mixed rain-fed production systems in arid/semi-arid and sub-humid/humid climatic zones in Sub-Saharan Africa and South Asia (see also Chapters 2 and 3). This chapter therefore focuses on interactions between wildlife and the rural poor of mixed systems in Sub-Saharan Africa, where significant populations of large wild ungulates still exist, where there are traditions of hunting and using wildlife, and where wildlife and wild areas remain important to the livelihoods of the rural poor. It is in these same areas that attempts at wildlife utilisation have been made. It is also worth noting that a significant part of the wildlife-rich areas in Sub-Saharan Africa is also home to the tsetse fly (*Glossina* spp.), vector of trypanosomiasis in domestic stock and of human sleeping sickness, and that the presence of tsetse is of some importance for wildlife conservation.

Interactions between wildlife and humans or livestock in different livestock production systems are varied and inevitably depend on individual circumstances. Nevertheless useful generalisations can be made. In livestock-only or range-based systems the predominant negative interactions are likely to be competition for grazing and browse, and potential disease transmission. Prins (2000) suggests there is little evidence of livestock numbers being reduced by competition with wildlife. On the other hand, wildlife numbers are negatively affected by livestock. Predation of domestic stock occurs but has declined due to reduced wildlife and predator populations. Direct benefits from wildlife include revenues from eco-tourism and commercial hunting, as well as the potential for wildlife ranching. Mixed systems include agro-pastoral and crop-based systems, with the latter characterised by greater human densities, more intensive production and few large wildlife. In crop-based systems, damage to standing and stored crops from pest species may be significant. Competition for grazing may occur near to protected

areas, but favours livestock. Benefits include the use of wildlife as food and for cash (legally or illegally), and may also include tourism/eco-tourism. Landless or land-independent systems have little or no contact with large wildlife, whilst impact from pest species on stored feed may be significant. Compared with livestock-only systems, mixed rain-fed production systems support greater human populations. Where wildlife occurs, there is usually a steep gradient from high-density human settlement and low-density wildlife to low-density settlement and high-density wildlife.

Values of wildlife

Many wild species provide benefits to humans. In an economic context wild populations are often treated as economic goods, with utilisation through harvesting resulting in a net benefit. This is particularly true for wild fish populations, which constitute a large part of the diet of much of the world's population. Wild species may also result in economic loss, especially where resource-poor rural communities depend on crops and livestock for their livelihoods. A majority of contributions to livelihoods of the rural poor that have been attributed to livestock (Carney, 1998) can also be attributed to wildlife. These typically include a range of direct use, indirect use and non-use values, much of it non-marketed:

- a source of food and, in some instances, clothing or bedding
- an important source of cash income from the sale of bushmeat and other wildlife products
- a means of allowing the resource-poor to capture private benefits from common property resources
- a source of livelihood security by diversifying risk and buffering against low crop yields, livestock mortality and stock theft, particularly in drought-prone environments
- cultural well-being, and a variety of related functions, including use as medicines or rituals
- consumptive (trophy or sport hunting) and non-consumptive (photo-tourism or game viewing, and eco-tourism) tourism.

To this list one can add additional values of a wide variety of non-wildlife products that may also be directly gathered from the same natural environments. Examples

include thatching grass, building poles, fuel wood, wild honey, and medicinal plants, to name but a few. It is therefore clear that there are potentially significant contributions from wild areas in general to the livelihoods and security of the rural poor. It is notable that the potential value of wild fish species is widely recognised and their exploitation for food and/or cash income is encouraged, whilst the exploitation of wild ungulates is usually strictly controlled, and under normal circumstances is not legally available as a resource to poor communities.

Biodiversity as a whole provides immense benefits to society (Koziell and Saunders, 2001; OECD, 2003) but they are difficult to quantify and largely ignored in national economic-accounting systems. As a result, markets undervalue biodiversity, thereby promoting its depletion, either directly or indirectly (Barbier, 1997; Tacconi, 2000). A major problem in considering the value of wildlife to the rural poor, and thus in making economic comparisons and policy decisions, lies in the exclusion of economic transactions from national statistics, as well as the techniques of valuation. Some exclusions from available statistics are deliberate, e.g. goods and services produced by women working at home are rarely included in national accounts. Other types of production are omitted because they are unpriced, unmarketed or unrecorded, or because producers or consumers have good reason to hide activities (e.g. illegal logging or hunting). Many of these activities are of particular importance to the poorest people, but the real value of wildlife and wild areas to resource-poor communities is overlooked. For example, estimates of crop damage are seldom compared with the benefits obtained from use of these same wildlife populations, irrespective of the legality of such utilisation. The consequences of crop damage are easily quantified, but hunting and the sale of wildlife products can result in significant unquantified benefits.

A similar problem is found in assessing the real value of rangelands. Typically, rangelands tend to be undervalued due to assessments that: i) are restricted to a specific sector, commonly livestock production; ii) biased towards a single marketed product, e.g. beef sales; and iii) exclude non-use values. The resulting undervaluation contributes towards poor rangeland management or a transformation to a monoculture, such as livestock alone, and leads to inappropriate policy recommendations. In some areas significant livestock farming subsidies make it more economic to keep cattle than to generate revenue from wildlife. In Botswana, Arntzen (1998) showed that livestock, wildlife and gathering, each make a significant contribution to the total direct use value, with hunting and gathering amounting to about a third of the total. Arntzen concluded that policies should pay greater attention to non-marketed products when assessing optimum uses for rangelands. Similarly, despite its often unlawful nature, DFID (2002) concluded that the bushmeat industry is important in securing the livelihoods of the rural

poor, and that wildlife - poverty linkages are under-represented, in both poverty reduction strategies and country strategy papers.

In practice, economic utilisation of wildlife depends on utilitarian or aesthetic values, or both, and on policies regarding wildlife ownership and wildlife utilisation. Child (1995) discusses the history and evolution of wildlife utilisation in Zimbabwe and shows that large wild ungulate species are not significantly more efficient at converting grazing and browse into meat and hides than are livestock. In Zimbabwe, in areas where natural wildlife populations were dominated by a small number of species of bulk roughage feeders, these species have now been replaced by domestic cattle which have for centuries been bred for survival, with some meat production. Importantly, the behaviour of domestic stock enables them to be easily integrated into livestock production systems, unlike the great majority of wildlife species. However, the dressed weight of African wild animals is found to be 50 to 63 per cent of live weight, of which 2.5 per cent is typically fat, compared with 44 to 50 per cent of live weight in domestic stock, of which up to 40 per cent is fat (Ntiamoa-Baidu, 1997). In general, therefore, wild animals provide more lean meat than domestic animals. In addition, given an enabling policy environment, wildlife can be used in more ways than livestock. Their charismatic values allow them to be sold more than once through game viewing, providing an added-value that is clearly impossible with livestock-based production systems. These additional economic values can provide wildlife-based land uses, or integrated wildlife and livestock, with a competitive advantage over livestock-only systems. Child (1995) also demonstrated that there was little difference between costs of meat production using cattle or wildlife, but the latter became very competitive once safari hunting was introduced.

Problem animals

Problem animals and problem animal control have been a major focus of the wildlife - livestock and wildlife - agriculture interfaces. Indeed, many of Africa's wildlife management agencies started out with the primary aim of controlling problem animals, and even today many local communities in Africa view large wild mammals largely as a nuisance (Kiss, 1990). The extent and nature of the problem depends on the relevant production systems, as well as the wildlife species and frequency of contact. Crop and livestock damage includes direct consumption of crops and of grazing or browse, predation on livestock, rooting (e.g. by wild pigs), trampling, damage or flattening structures such as fences, and acting as carriers of weed species, parasites and diseases (Hone, 1994). Table 26.1 provides examples from the literature of types and costs of damage attributed to wildlife,

much of which is caused by rodents. Wildlife damage to agriculture, by both rodents and larger wild herbivores, affects the production base of households. Such losses can make livelihoods that may already be insecure, become increasingly marginal in economic terms. Compared with rodents, large wildlife species generally result in smaller losses, particularly when considered on a national basis.

Table 26.1 Examples and cost estimates of problem animal damage

Locality	*Species*	*Damage*	*Reference*
China	Rodents	Loss of 15 million tonnes of cereals and vegetables	Stenseth *et al.,* 2003
East Africa	Multimammate rat, *Mastomys natalensis*	Loss of 5-15% annual maize crop: cost US$ 60 million. Up to 80% loss during outbreaks	Makundi *et al.*, 1999; Leirs, 2003; Skonhoft *et al*., 2003
Kenya	Ground squirrel *Xerus* spp.	Loss of 9.7% planted maize seed	Stenseth *et al*., 2003
Malawi	Large wildlife	All damage: estimated national cost US$ 17.3 million	Emerton, 1999a
Malawi	Large wildlife	Disease transmission: national cost US$ 27 million	Deodatus, 2000
Malawi	Predators	Predation of cattle: national cost < US$ 19,000	Deodatus, 2000
Morocco	Shaw's jird *Meriones shawi*	Loss of 40-70% cereal and vegetable crop during outbreaks	Stenseth *et al*., 2003
Namibia	Large wildlife	All damage: US$ 757 per village in East Caprivi	Emerton, 1999a
Uganda	Large wildlife	All damage: national cost US$ 20 million	Emerton, 1999a

Pastoralists and wildlife have co-existed in African rangelands for hundreds of years. In the past, human and livestock populations were relatively small and widely dispersed, whilst livestock were managed to minimise predation and disease transmission risks by avoidance, for example, of particular areas or contact with certain species during specific periods. Today, however, competition for grazing and water resources is increasing, and the potential for conflicts between wildlife managers and livestock owners is growing, as both pastoralists and agro-pastoralists move into new areas and/or live in the vicinity of protected areas (Boyd *et al.,* 1999; Prins, 2000). Factors driving these changes include population increase, an increasing urgency to protect the remaining wildlife and biodiversity resources and, perhaps most importantly, an

expansion of cultivation into areas that formerly contained prime livestock-grazing resources, thereby reducing the total annual grazing resources available to livestock-keepers, and resulting in increased competition with livestock.

Pastoralist or transhumant societies typically view wildlife as predators, as a disease risk, or as competitors for scarce grazing resources or for water. Despite this, the costs attributed to predation are relatively low and, according to Grootenhuis (2000), the economic consequences of disease transmission to livestock from wildlife are generally overestimated. Although predation is no longer a significant threat, individual instances of predation, for example by lion or hyaena, can nevertheless be serious for the individual households involved.

Disease

Whenever wildlife and livestock share the same environment there are risks of disease transmission, and conflicts between livestock owners and wildlife managers are partly based on differing attitudes to disease control in livestock. In livestock-only systems (both ranching and pastoralism) the perceived risks to livestock of disease transmission from wildlife reservoirs has in the past led to large-scale eradication of larger wild herbivores over extensive areas in attempts at disease control (e.g. trypanosomiasis). However, there is little evidence that a reduction in wildlife has led to reduced incidence of disease or to lower costs of disease control in East Africa (Grootenhuis, 2000). It is clear that agents of disease are not confined to wild or domestic species, and transmission occurs in both directions. Disease transmission from livestock to livestock is more frequent, represents a far greater problem, and results in greater costs than wildlife to livestock disease transmission. Furthermore, disease problems are bi-directional at the wildlife/livestock interface, and livestock diseases may pass to wildlife and establish or re-establish wild reservoirs.

Some diseases are uncommon (or are rarely diagnosed); others are common but have little impact, whilst relatively few wild animal diseases are of major economic importance (Bourn and Blench, 1999). In practice, few diseases are transmitted between wild and domestic animals. Bengis *et al.* (2002) identify 12 diseases commonly transmitted from wildlife hosts to domestic livestock worldwide, four of which are identified as being of major economic importance. Similarly, Grootenhuis (2000) lists 19 diseases in Africa, of which four were considered of major economic importance: foot and mouth disease, rinderpest, East Coast fever, and trypanosomiasis, all of which have very effective domestic maintenance hosts (Table 26.2). According to Grootenhuis (2000), only three true wild maintenance and carrier hosts were identified from over 100 large wild animal species: warthog (African swine fever), wildebeest (malignant catarrhal fever), and bushbuck (bovine petechial fever).

Table 26.2 Examples of diseases transmissible between wild and domestic stock in Africa

Disease	*Domestic animals affected*	*Wild maintenance hosts*	*Typical domestic maintenance hosts*	*Control measures*
African swine fever	Pigs	Warthog, Bushpig	None	Avoid contact, resistant breeds
Anthrax	All livestock except poultry	None, abiotic soil phase (spores)	None	Surveillance, vaccination, cremation and burial of carcasses
Bovine petechial fever	Cattle	Bushbuck	None	Treatment, avoid risk zones
Brucellosis	Cattle (all livestock except poultry)	African buffalo, hippopotamus, waterbuck	Cattle, goats	Avoid contact, vaccination, stamping out
East coast fever	Cattle	Buffalo	Cattle	Tick control, vaccination, treatment
Foot and mouth	Cattle, pigs, sheep, goats	African buffalo	Domestic ruminants, especially cattle	Vaccination, movement control
Malignant catarrhal fever	Cattle	Wildebeest	None	Avoid contact
Newcastle disease	Poultry	Wild birds	Chickens	Surveillance, vaccination
Rabies	All livestock except poultry	Carnivores, bats	Dogs	Vaccination of dogs
Rinderpest	Cattle	None	Cattle	Vaccination, movement control
Trypanosomiasis	Cattle, horses, pigs, sheep, goats, dogs	Ruminants and pigs	Ruminants, carnivores	Vector control, chemoprophylaxis, treatment
Tuberculosis	Cattle	Buffalo and other wildlife species	Cattle	

Source: adapted from Grootenhuis (2000); Bengis *et al*. (2002); Perry *et al.* (2002)

Disease control is both possible and practical in domestic stock, but is usually impossible in wildlife. Furthermore, if control measures are poorly implemented in domestic stock, transmission to available wildlife reservoirs will inevitably occur. In such situations, the presence of disease in livestock will to a large extent mask the presence of wild reservoirs. It is only in countries with efficient veterinary services and where diseases amongst livestock are well controlled, that such wildlife reservoirs as do occur may become apparent. An important wildlife host is the African buffalo, but in their absence diseases are effectively maintained by cattle except in those situations where efficient control of disease in livestock exists. Rinderpest, for example, can be effectively controlled by vaccination of cattle, which results in the disappearance of this virus in wildlife (Bourn and Blench, 1999). The transmission of infectious agents from domestic disease reservoirs to sympatric wildlife is of particular concern (Daszak *et al*., 2000). This spill-over effect can result in significant morbidity and mortality of wildlife in contact with infected livestock, and is of particular threat to endangered species, where it may lead to local population extinctions.

Community wildlife management

Control of the most important cattle diseases may not be cost-effective in some semi-arid rangelands (Grootenhuis, 2000), prompting a re-examination of current land-use pressures and development of more sustainable or more productive land-use options. Such analysis has already favoured the use of wildlife in many Southern African countries. These approaches, described for example by Child (1995), focus on the use of sparsely populated rangelands for wildlife or combined wildlife-livestock enterprises – typically on large-scale ranches or game conservancies (Barnes and de Jager, 1995) – with investment capital requirements far beyond the normal capacities of resource-poor livestock-keepers. Wildlife utilisation within a mixed crop and livestock smallholder farming system is also highly impractical for a variety of reasons, chief amongst which are that crops and wildlife are incompatible, and that commercial hunting, so far a major economic support of wildlife-oriented production, is both impractical and dangerous within a smallholder agricultural environment.

Community Wildlife Management (CWM) is an initiative that focuses on equipping resource users with the tools for sustainable use of available natural resource base in their jurisdictions. The premise of CWM is that communities will manage local resources in a sustainable manner if:

- they are assured of their ownership of the natural resources
- they are allowed to use the resources and/or benefit directly from others' use of them
- are given a reasonable level of control over management of the resources.

The first large-scale wildlife related CWM programme in Africa was established in Zimbabwe in the early 1980s, and is described by Child (1995). To protect wildlife, notably elephants, from excessive poaching, the government of Zimbabwe set up the CAMPFIRE programme (Communal Areas Management Programme For Indigenous Resources). Under this programme, authority over wildlife was given to Rural District Councils (RDCs). Conceived as an extension of game ranching to Zimbabwe's Communal Areas, the programme is of fundamental significance to natural resource conservation in the savannas of Africa. It has been emulated elsewhere, for example, the Luangwa Integrated Research and Development Project (LIRDP) and the Administrative Management Design for Community Based Wildlife management (ADMADE) in Zambia; and on communal land conservancies in Namibia (Child, 2000; Roe *et al.,* 2000). CAMPFIRE encourages sustainable trophy hunting of big game and revenue from fees paid by hunters goes to RDCs, a portion being distributed to lower administrative levels and/or individual households. Each RDC determines its own policy for the use and distribution of funds. Direct payments to households vary according to these policies and the availability of the most prized species of big game, e.g. elephant, buffalo, lion and leopard. Studies of selected wards show increases in wildlife populations and habitat retention and these were considered indictors of success (Getz *et al.,* 1999). The programme provides revenue that can make significant contributions to community livelihoods and provides motivation to conserve wildlife habitat and associated biodiversity.

Despite CAMPFIRE, local attitudes by smallholders in Zimbabwe towards wildlife generally remain negative (Campbell *et al.*, 1999). Roe *et al*. (2000) suggest that there are serious flaws in the implementation of these CWM models. Wildlife damage crops, are viewed as responsible for livestock mortality, and also pose dangers to human life. The CAMPFIRE programme is also seen as remote from individual aspirations, and as a government initiative, not a tool for empowerment. Much of the benefit goes towards community development initiatives, many previously funded by Government. Research shows that in the Sengwa area it is 5-10 times more lucrative from a household perspective to illegally hunt an animal than wait for the CAMPFIRE dividends (Campbell *et al*., 2000). A study of LIRDP and ADMADE projects in Zambia (Gibson, 1999) concluded that illegal off-take

of wildlife continued at pre-project levels, partly because individual returns from hunting greatly outweighed an individual's share in benefits from the projects. Such approaches are unlikely to be sustainable alongside mixed smallholder agriculture. In particular, where revenues depend on hunting, the lucrative wildlife species represent threats to smallholder agriculture and livestock. Nevertheless, there is evidence from elsewhere indicating positive ecological impacts from CWM and that it has enhanced the livelihood security of participating communities (Kothari *et al.*, 2000).

Wildlife – poverty linkages

Prevailing physical and socio-economic conditions in wildlife-rich areas generally mean that sources of employment, income and subsistence are relatively scarce and livelihoods are insecure. This is particularly so in the case of households in semi-arid areas engaged in mixed rain-fed production systems. Furthermore, settlements situated close to protected areas are typically less well-served by roads, infrastructure, markets and other services than settlements further away. As a result people tend to engage in a wide range of economic activities in search of secure livelihoods, and these impact on wildlife, e.g. by over-exploitation of resources, through both legal or illegal hunting, and secondary impacts resulting from land clearance for agriculture.

As a general rule, in mixed rain-fed production systems, land is a basic determinant of wealth, with livestock a valuable contributor, and the proportion of food needs derived from 'own crop production' increases with wealth. The smaller the area cultivated and fewer numbers of livestock managed, the poorer the household will be and the greater expenditure on food as a portion of household budget. Examples include: 70.4 per cent on food in Kitui district, Kenya (Barnett, 2000); and 40 per cent in Mchinji district, Malawi (Save the Children UK, 2001). The advantages of using cheaper or no-cost sources of protein are therefore considerable. Despite a lack of information on consumption of wildlife meat or 'bushmeat' and its total production, bushmeat is highly valued and a preferred animal protein in both rural and urban diets in many parts of Africa, and resource-poor people have a greater reliance on bushmeat than generally assumed (Ntiamoa-Baidu, 1997; DFID, 2002). In parts of East and Southern Africa bushmeat, either legally or illegally obtained, is regarded as the most important source of meat to households (Barnett, 2000). Critical factors include affordability relative to domestic sources, relative accessibility in wildlife-rich areas and, in Western Africa, cultural preferences.

In several areas bushmeat is now regarded as an important contributor to gross domestic product and national revenues (Barnett, 2000). Keita (1993) recorded a 10 per cent contribution of bushmeat to GDP in the Central African Republic. Bushmeat consumption in Côte d'Ivoire was estimated at 83,000 tonnes in 1990, valued at US$ 117 million (Feer, 1993) and three quarters of Liberia's meat production comes from bushmeat, with subsistence hunting yielding 105,000 tonnes of meat annually (Ntiamoa-Baidu, 1997). Near Korup National Park, Cameroon, hunting provided 56 per cent of total village income (Roe *et al.,* 2000). The extent and value of the bushmeat trade is also illustrated by the emergence of an illegal market for West African bushmeat in a number of European capitals with estimates of 10 tonnes a day passing through London's Heathrow airport, and 1.4 tonnes seized from a single flight (Bowen-Jones *et al.,* 2002). By contrast, in East and Southern Africa, the importance of bushmeat has been relatively poorly documented and its role in resource-poor households is less well understood, due to the largely illegal nature of consumptive utilisation of wildlife in these areas. However, Barnett (2000) underlines the importance of wildlife to many Eastern and Southern African societies. Despite the difficulty of obtaining data on what are essentially illegal activities, in Tanzania the utilisation of bushmeat was found to represent the largest economic value of wildlife, significantly greater than legal hunting, trophy values, or tourism (ITC and IUCN, 1998). DFID (2002) estimated that for forest and savanna systems, bushmeat is worth over US$ 1.5 billion a year as a source of food for the resource-poor of Sub-Saharan Africa alone. Declining wildlife populations will therefore present a major threat to livelihoods and food security. Furthermore, the value of wild products compares favourably with domestic livestock. In a study centred on Lake Mburo National Park, Uganda, Emerton (1999b) found that 61 per cent of the value was provided by livestock and 39 per cent by wild products, of which 41 per cent was from hunting. Since many activities were illegal, these figures may underestimate the real values of wildlife to households.

Illegal hunting has reduced wildlife populations of Tanzania's Serengeti ecosystem (Campbell and Borner, 1995). Reduced wildlife populations may in turn undermine local livelihoods partly dependent on this resource. Hofer *et al*. (2000), Campbell *et al*. (2001) and Loibooki *et al*. (2002) examined illegal hunting from the twin perspectives of conservation and livelihoods. The primary value of wildlife to resource-poor households was realised as dried meat sold within the local community or urban markets, and the funds used to purchase other goods and services. Cash was the most important contribution of wildlife to the rural poor, especially in times of hardship (e.g. poor rainfall, or stock theft). In these mixed crop-livestock production systems, hunting in wild areas represents a viable and profitable means for resource-poor people to generate cash incomes. For a villager,

a day's hunting may produce an income equivalent to over 100 days of potential earnings through formal employment (Hofer *et al.*, 2000).

Participatory research and household surveys indicated that hunting was closely identified with the poorest people (Campbell and Loibooki, 2000). In particular, hunters had fewer livestock (or none) than the general village population. Information from arrested hunters demonstrated that the main reasons for hunting (75 per cent of arrests) were economic, rather than for food. Almost 80 per cent of the income from hunting was needed to pay taxes, village development contributions or levies, fees for education, and purchase of clothing (Table 26.3), clearly emphasising the need for cash. Based on recorded household consumption, the value of bushmeat in areas to the west of Serengeti was estimated at US$ 800,000 per annum. Including the likely trade to urban areas increased the value to US$ 987,000 per annum (Barnett, 2000). In strong contrast, it was estimated that legal community wildlife cropping schemes could, if extended to all villages north-west of Serengeti, reach a value of US$ 13,500 (Barrow *et al.,* 2000). Emerton and Mfunda (1999) estimated economic impacts of wildlife on landholders west of Serengeti to be roughly US$ 1 million per annum, but excluded benefits from illegal hunting of wildlife.

Table 26.3 Reasons given by hunters arrested in Serengeti National Park for needing a cash income provided by illegal hunting

Reason	*% of responses*
Taxes	32.8
Contributions/Levies, including schools	31.1
Clothes	15.1
Poverty	8.4
Debt	4.8
Medicine	3.5
Food or hunger	2.8
General purchasing needs	1.1
Other reasons	0.4

Source: Adapted from Campbell *et al*. (2001).

A number of factors were found to influence the probability of involvement in illegal hunting, itself strongly linked to poverty (Campbell *et al*., 2001). The four most significant factors were:

- Distance to urban areas: Fewer hunters closer to urban areas and markets due to the increased income generating opportunities presented

- Distance to nearest main road: Fewer hunters closer to all-weather roads
- Livestock ownership: Livestock owners less likely to be involved in hunting. This effect was strongest for poultry, followed by sheep and goats. Cattle ownership had little or no effect
- Cash crops: Cash crop income reduced the necessity for hunting.

These results illustrate the importance of rural income diversification, and especially small stock ownership, to the reduction of rural poverty. Furthermore, the implications are that development initiatives must be specifically targeted at the poorest members of rural communities, many of whom have no livestock, but for whom its ownership is desirable. Encouraging livestock ownership, improved husbandry, cash crops and market access as parts of an integrated package of measures are likely to reduce poverty levels and to increase livelihood security. Without these combined measures, illegal hunting of wildlife to generate much needed cash will continue to provide a vital, although increasingly unsustainable, means of support for the poorest households.

Further reading

Campbell, B. M., Sithole, B., Frost, P., Getz, W., Fortmann, L., Cumming, D., du Toit, J. and Martin, R. 2000. CAMPFIRE experiences in Zimbabwe. *Science* 287(5450): 42.

Child, G. 1995. *Wildlife and people, the Zimbabwean success*. Wisdom Foundation, Harare, Zimbabwe and New York, USA.

Gibson, C.C. 1999. *Politicians and poachers: The political economy of wildlife policy in Africa*. Cambridge University Press, Cambridge, UK.

Kiss, A. (ed.). 1990. *Living with wildlife: Wildlife resource management with local participation in Africa*. World Bank Technical Paper No. 130, The World Bank, Washington, D.C., USA.

Kothari, A., Pathak, N. and Vania, F. 2000. *Where communities care: Community based wildlife and ecosystem management in South Asia*. Evaluating Eden Series, No. 3, International Institute for Environment and Development, London, UK.

Koziell, I. and Saunders, J. (ed.). 2001. *Living off biodiversity: Exploring livelihoods and biodiversity issues in natural resources management*. International Institute for Environment and Development, London, UK.

Ntiamoa-Baidu, Y. 1997. *Wildlife and food security in Africa.* FAO Conservation Guide 33, Food and Agriculture Organisation of the United Nations (FAO), Rome, Italy. http://www.fao.org/docrep/w7540e/w7540e00.htm

Prins, H.H.T., Grootenhuis, J.G. and Dolan, T.T. (ed.). 2000. *Wildlife conservation by sustainable use*. Kluwer Academic Publishers, The Netherlands and USA.

Roe, D., Mayers, J., Grieg-Gran, M., Kothari, A., Fabricius, C., and Hughes, R. 2000. *Evaluating Eden: Exploring the myths and realities of community based wildlife management*. Evaluating Eden Series, No. 8. International Institute for Environment and Development, London, UK.

Tacconi, L. 2000. *Biodiversity and ecological economics*. Earthscan Publications, London, UK.

Author addresses

Ken Campbell, Formerly of Natural Resources Institute (NRI), University of Greenwich at Medway, Chatham Maritime, Kent ME4 4TB, UK

Martin Loibooki, Tanzania National Parks, P.O. Box 3134, Arusha, Tanzania