

# Wildlife utilization and biodiversity conservation in Namibia: conflicting or complementary objectives?

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This paper surveys different economic aspects of biodiversity conservation in Namibia's wildlife sector. One of the main causes of biodiversity loss has been the conversion of wildlife habitat to other land uses, notably livestock and crops. However, wildlife utilization strategies potentially yield significantly higher economic rates of return compared to these traditional land uses. Historically, the move towards land use patterns more favourable to wildlife has been hampered by a number of policy and institutional constraints. Since Namibia's independence, many of these constraints have now been removed or are in the process of reform. These moves are already encouraging investment in wildlife utilization, most notably in wildlife tourism and related activities. Some forms of wildlife utilization, particularly ecotourism and photographic safaris, will certainly complement the national and international commitment to biodiversity conservation. Consumptive uses may be economically attractive in some areas and will discourage further habitat conversion. However, uses which involve specialized management for the production of a few species may alter the species composition and functioning of ecosystems, causing conflict between the aims of wildlife utilization and biodiversity conservation. Less tangible components of biodiversity may remain under threat even under a well-designed wildlife utilization policy.

*Keywords:* biodiversity; wildlife; Namibia; valuation.

## Introduction

Biodiversity is generally understood at three levels – genetic, species and ecosystem diversity. The ecosystem level relates to the spatial scale and pattern of habitat and species combinations, whereas the species and genetic levels encompass the range of species and variation within them (UNEP, 1994). The economic value of diversity largely relates to the value of reducing ecological and economic uncertainty. The costs of uncertainty can be particularly catastrophic in the ecologically fragile environments which characterise much of the wildlife habitat in Namibia. There are many examples of how genetic, species and ecosystem diversity can affect economic values, but relatively few studies have actually attempted to assign monetary estimates to this diversity *per se*. For example, studies relating tourism revenues to the presence of charismatic game species (Brown and Henry, 1989) often do not attempt to attach value to the wide range of species on which these 'economically valuable' species depend. In fact, no in depth valuation of genetic, species and ecosystem diversity in the context of wildlife and its habitat has ever been attempted, either in Namibia or elsewhere. This paper does not attempt to fill this gap, but it does draw together a range of empirical studies which estimate the economic contribution of different aspects of wildlife and its habitat in Namibia, and examines whether the move towards greater economic use of wildlife is also compatible with broader biodiversity

objectives. The paper concludes with a discussion of the different types of policy initiatives which may help to cement a potential partnership between economic development and biodiversity conservation.

### **Wildlife utilization and biodiversity conservation**

In both the commercial and communal lands of Namibia a number of key species have been threatened with extinction in recent years. For example, large mammals have become virtually extinct in the communal north-central districts (Lindeque *et al.*, 1991); and in commercial lands, predators and scavengers such as lion *Panthera leo*, wild dog *Lycaon pictus*, whiteheaded vulture *Trigonoceps occipitalis*, bateleur *Terathopius ecaudatus* and Cape vultures *Gyps coprotheres* are threatened or already extinct species (Brown, 1988; Nowell, 1996). Habitat conversion, loss and degradation are the main causes of terrestrial species extinction and biodiversity loss worldwide (Pearce *et al.*, 1993). In Namibia, agriculture (crops and livestock) is the main habitat-displacing activity (Ashley, 1996).

However, at the same time, wildlife as an economic asset is increasing in importance in Namibia. The economic values relating to wildlife are many, ranging from direct use values (consumptive and non-consumptive tourism, meat, furs and other wildlife related products) to existence values that are unrelated to current or future use. Many tourists come to Namibia rather than other safari destinations due to the diversity of species and unique desert habitat. In Namibia, there are a number of studies showing the economic use value of wildlife-based tourism (Cumming, 1990; Barnes, 1995a; Barnes *et al.*, 1997), but there are as yet no studies showing the value of wildlife diversity *per se*.

Wildlife in Namibia has a range of use (direct and indirect) and non-use values. Direct use values may include both consumptive and non-consumptive activities. Consumptive use in Namibia includes mammal trophy and sport hunting, culling, live game dealing and shooting for own consumption. Non-consumptive use includes ecotourism, photographic safaris and education. Wildlife species may also have important indirect use values through keystone roles in influencing ecosystem stability and diversity. For example, elephants are known to have an important ecological role in African savannahs and forests through diversifying ecosystems, dispersing seeds, reducing bushlands, expanding grasslands and reducing tsetse fly (Western, 1989). Unfortunately, there are no economic studies of these types of indirect use values nor of non-use values of wildlife accruing both to Namibia and the global community.

Most of the empirical valuation studies in Namibia focus on the direct use values of wildlife, particularly on the economic benefits attributed to wildlife-based tourism. Regionally based studies provide a detailed picture of actual and potential returns to wildlife-based tourism relative to other land uses in commercial and communal lands, as well as in protected areas. Over 90% of the populations of some large mammal species in Namibia are located outside formally proclaimed conservation areas, largely on agricultural land. Approximately 80% of the numbers of larger game mammal species are found on privately owned commercial farms, which comprise 44% of the total surface area (Yaron *et al.*, 1994). Communal areas comprise 41% of the country and support roughly 9% of the populations of larger game. Historically, the legal rights to use wildlife for economic gain have been limited to private, commercial landowners. This legacy of the apartheid era has now been dismantled under recent legislation permitting communal landholders to

acquire common property rights over wildlife resources on their lands. This allows for the development of conservancies, in which farmers group together to manage and use wildlife (Jones, 1995).

#### *Wildlife values on commercial land*

Aggregate estimates for wildlife populations and species diversity on commercial lands indicate that the number of animals and biomass has increased by 80% over the period 1972 to 1992 (Barnes and de Jager, 1996). The number of game species has increased by some 44% over the same period. In commercial lands, the overall trend has been towards conversion of land from livestock to wildlife, which has been further enhanced by the development of conservancies enabling the growth in a greater diversity of species, as well as in overall stocks. The greatest diversity in species is found in the northern savannah private lands (Barnes and de Jager, 1996). This trend supports both economic theory and empirical evidence in other African countries that secure property rights to land and wildlife are an essential ingredient in any strategy to conserve and encourage long-term investment in wildlife habitats.

The main economic activities dependent on wildlife in commercial areas include game meat, sale of live animals, selling of recreational hunting opportunities for biltong and trophies; and non consumptive tourism. Barnes and de Jager (1996) estimate the economic contribution of all wildlife use on private lands in terms of the annual net value added to national income (Table 1).

Table 1 shows that the total net value added due to wildlife use on private lands has more than doubled over the period 1972 to 1996. In addition, it indicates that there is a move towards conversion of land from livestock to wildlife use. This trend is motivated not so much by government policy initiatives or environmental conservation concerns, but by the forces of relative financial returns. As a rough guide, it is estimated that around 30% of net income from wildlife related activities on private land accrues to non-consumptive tourism; a further 10–15% to consumptive tourism, with the remaining 55–60% attributed to other consumptive uses (J. I. Barnes, pers. comm.). Licences governing

**Table 1.** Estimation of the annual net contribution to the economy of wildlife use on private commercial lands in Namibia, 1972–1996 (N\$'000, 1994 prices)<sup>a</sup>

	1972	1992	1996
<i>Northern, predominately cattle lands</i>			
Total net value added due to wildlife use	22 100	41 200	
Net value added by wildlife (N\$ per km <sup>2</sup> )	115	214	
<i>Southern, predominately sheep lands</i>			
Total net value added due to wildlife use	8 600	14 900	
Net value added by wildlife (N\$ per km <sup>2</sup> )	52	91	
<i>Total private commercial lands</i>			
Total net value added due to wildlife use	30 600	56 100	64 200
Net value added by wildlife (N\$ per km <sup>2</sup> )	85	157	178

<sup>a</sup> From Barnes and de Jager (1996); Barnes and Ashley (1996).

consumptive use of wildlife in Namibia are issued with reference to estimates of sustainable yields of wildlife stocks. This regulation of wildlife consumption seems to be effective in commercial lands, but less so in communal areas.

#### *Wildlife values on communal land*

According to Yaron *et al.* (1994), 40% of Namibian game mammal species and 10% of combined game mammal populations occur in communal areas. Wildlife tourism can often supplement livestock farming in communal areas, but the scope for outright substitution is generally limited. Livestock, and cattle in particular, provide not only multiple economic services and products (meat, eggs, skins, milk, blood, dung used as fertilizer and fuel, wool, draught power, store of wealth), but have important social and cultural significance in Namibia. The question of whether to farm wildlife in place of livestock is meaningless in societies where 'a man without cattle is not a man' (Yaron *et al.*, 1994). For this reason, many of the regional studies evaluate wildlife tourism and other wildlife use activities in the context of the net additional benefits that can be earned from moving towards a mixed game-livestock environment. In a mixed system, there is considerable potential to develop wildlife tourism in communal areas and to distribute these benefits to local communities through the conservancy system. Until recently, the economic benefits of tourism for people in communal areas have been largely restricted to craft sales and employment in private lodges and parks.

Table 2 shows estimates of the current contribution to national income of tourism and tourism related activities in four areas of communal land in Namibia in 1994. The total estimated net contribution to national income from wildlife related tourism in the study area is some N\$7.6 million per year, ranging from N\$4 to N\$221 per km<sup>2</sup>. Net economic contribution was derived by subtracting economic costs, including costs of capital, from economic benefits, and converting financial values to economic values using the shadow pricing criteria of Barnes (1995a,b). Not surprisingly, returns are greatest in areas adjacent to protected areas and prime wildlife viewing areas such as Caprivi. By 1996, the total

**Table 2.** Current contribution to national income from tourism (and related activities) in four areas of communal land (in N\$'000, 1994 prices)<sup>a</sup>

Area	Caprivi	Bushmanland	Opuwo	Damaraland
Extent (km <sup>2</sup> )	18.8	17.9	61.6	58.1
<i>Non-consumptive tourism</i>				
Community run	32.7	17.4	20.1	41.8
Private sector run	1897.6	0	1312.9	1071.3
Government run	78.9	0	63.5	303.8
<i>Consumptive tourism</i>				
Safari hunting	1548.1	0	0	333.7
Angling	420.9	0	0	105.2
<i>Crafts</i>	171.9	59.6	70.3	49.0
Total	4150.1	77.0	1466.8	1904.7
Total per km <sup>2</sup>	221	4	24	33

<sup>a</sup> From Barnes (1995a).

contribution of wildlife use activities to national income was estimated to be in the region of N\$11.9 million, representing an average return of N\$32.2 per km<sup>2</sup>.

Table 2 shows that the bulk of economic benefits of wildlife tourism accrue to private enterprises and the government, with residents of communal areas largely excluded. As long as the economic benefits of tourism for people in communal areas remain restricted to craft sales and employment in private lodges and parks, tourism cannot be considered an economic alternative to subsistence farming or a significant option for the unemployed (Ashley *et al.*, 1994).

What is the future of tourism development in communal areas? Assuming that wildlife stocks and returns to existing activities remain constant, there is potential for the net benefits of tourism in the combined study area to more than double (Barnes, 1995a,b; Ashley and Barnes, 1996). Existing economic activities in the communal areas include livestock and crop production for cash and subsistence consumption. Barnes' and Ashley's model assumes the development of a mixed tourism and agricultural system, and that future development of the tourism sector will not reduce net returns from these traditional activities. About 2.5 times the current value could be generated with a feasible increase in the resource base. This assumes that tourism development in Namibia is fully exploited and that implementation of community based initiatives, such as communal conservancies and joint ventures with the private sector, are successfully introduced. Of this growth, non-consumptive tourism is likely to take the greater share, particularly in high potential areas. The potential for further development of consumptive tourism in these areas is constrained by existing hunting and fishing quotas which already reflect annual sustainable yields. Non-consumptive tourism, on the other hand, is not so dependent on these ecological constraints and is attracted more by scenic features and ecosystem and species diversity, rather than stock levels of particular species *per se*. The promotion of community based wildlife tourism thereby has an important role to play in diversifying both economic and ecological risks in communal areas.

#### *Wildlife values in protected areas*

At present there are 21 designated conservation areas in Namibia, representing 13.8% of total surface area (Barnard *et al.*, this issue). Statistics on wildlife numbers in protected areas suggest steady or slightly increasing numbers (Ashley *et al.*, 1994). Namibian protected areas have traditionally been known for their species richness rather than population sizes. Historically, the conservation ethic in protected areas has been very much an elitist one, in which wildlife and habitats have been protected for the benefit of a minority, with the vast majority of the population being excluded from direct benefits. This ethic is now rapidly changing, particularly with the establishment of buffer zones adjacent to conservation areas; the development of wildlife conservancy schemes; and community based wildlife utilization projects in communal areas (Jones, 1995).

There is very little information on the economic contribution and development potential of state controlled protected wildlife areas, although recent estimates suggest a net contribution to national income in the region of N\$261.9 million in 1996 (Barnes and Ashley, 1996). However, it is likely that little of this economic rent is actually captured by the government. For example, in 1991 the government derived only N\$20.3 million in revenue from the operation of public accommodation facilities in national parks, and N\$2.3 million from park entrance fees (Hoff and Overgaard Ltd, 1993). The only other major source of revenue for government is likely to be from general sales tax. The fees for

park entrance and public tourism facilities are set at a low level and bear no relationship to the real economic value of these services. A recent contingent valuation survey of tourists in Namibia (Barnes *et al.*, 1997) elicited willingness-to-pay bids for increases in park entrance fees. This clearly showed that there was considerable potential to introduce higher daily park admission fees, allowing for up to six-fold increases in some areas.

However, at current rates, the government actually incurs a loss from operating national parks and protected areas, thereby providing an implicit government subsidy to protected areas estimated to be in the region of N\$30 million per year (N. Patching, pers. comm.). This public subsidy to protected areas may undermine and undercut tourism initiatives in the communal and private sectors; although it should also be acknowledged that the protected area network effectively acts as a magnet for both wildlife and tourists. This is evidenced by the mushrooming of private game reserves on the southern border of Etosha and the eastern border of the Namib-Naukluft Park (Ashley and Barnes, 1996). By attracting tourism to Namibia, protected areas provide the foundation for the tourism industry.

### **Future directions for wildlife utilization and biodiversity conservation**

This paper shows that there are significant economic values attached to wildlife utilization strategies such as consumptive and non-consumptive tourism and other wildlife-related products. The tourism sector has also been targeted as one of the key growth sectors in the future economic development in Namibia. Can wildlife utilization offer an economically viable development strategy and at the same time provide the key to maintaining species and ecosystem diversity in Namibia? In terms of economic viability, wildlife utilization strategies have largely developed as complementary to traditional land uses such as livestock and arable farming. However, there is a trend towards devoting more and more land exclusively to wildlife utilization. Nonetheless, this investment in wildlife has costs in terms of lost production from livestock and arable farming. The potential costs to livestock from investing in wildlife may include competition for grazing land and water; disease transfer from game to domestic stock; and loss and damage to domestic stock from wild predators (Yaron *et al.*, 1994). Unfortunately, no economic estimates have been made of these potential costs to livestock. However, Barnes and de Jager (1996) have estimated the relative financial and economic returns to three types of commercial ranch in Namibia. Table 3 compares the financial and economic rates of return in the three different land use scenarios: mixed sheep and game farming in southern areas; mixed cattle and game farming in northern areas; and ranching in northern areas based on the exclusive production of game for non-consumptive wildlife viewing.

Table 3 indicates two very interesting trends. First, the greatest economic returns, but lowest financial returns, are attributed to non-consumptive wildlife tourism. Thus, with the removal of government subsidies to livestock farming in commercial areas, there will be an enhanced financial incentive for farmers to move towards wildlife-based activities. Removal of this support will give a relative boost to cash returns to wildlife and enhance biodiversity goals. Second, it indicates that the forgone economic returns from investing in wildlife tourism in northern commercial ranches amount to a rate of return on investment of 8.5% over ten years – in other words, the returns that could have been realized from mixed cattle/game farming. Mixed sheep and game farming, in the south of Namibia, appears to be the next best land use option, with an economic rate of return of about 11%.

**Table 3.** Comparison of economic and financial rates of return in different commercial land use scenarios in Namibia (in N\$, 1994 prices)<sup>a</sup>

Rate of return	Southern sheep/game	Northern cattle/game	Northern game lodge
Financial			
Financial rate of return	5.8%	3.9%	4.2%
Net present value per ha <sup>b</sup>	-16.0	-40.0	-50.0
Economic			
Economic rate of return	10.8%	8.5%	13.6%
Net present value per ha <sup>b</sup>	19.0	5.0	67.0

<sup>a</sup> Barnes and de Jager (1996).<sup>b</sup> Net present value per hectare @ 8%.

However, the land and its wildlife potential differ between north and south, and it is therefore important to compare opportunity costs of land uses only within regions.

How do the returns to wildlife utilization compare to the returns to livestock grazing in communal areas? Table 4 compares financial returns from livestock with those from wildlife tourism, hunting and cropping in Caprivi. The financial returns to wildlife are higher than to livestock. The net financial return to wildlife is N\$1.83 per hectare in the Caprivi area, and the opportunity cost in terms of forgone returns to livestock is N\$1.41 per hectare. In addition, the wildlife option enhances environmental goals by reducing pressure on pasture and water resources. The removal of government subsidies further enhances the relative returns to the wildlife utilization option.

Given this evidence, why is wildlife utilization not more popular with communal farmers? Ashley *et al.* (1994) identify two main reasons, and a third was put forward by Yaron *et al.* (1994). First, game farming requires different management skills and more infrastructure than livestock. Second, the returns to wildlife tourism do not accrue exclusively to the community. Private companies may be involved in some of the enterprises,

**Table 4.** Estimated returns to wildlife and livestock utilization enterprises on communal land in Caprivi, 1993<sup>a</sup>

Financial return (N\$ per annum)	Livestock <sup>b</sup>	Wildlife <sup>c</sup>
Net revenue	2 753 486	3 568 545
Net revenue per ha <sup>d</sup>	1.41	1.83
per kg	0.10	0.41
per household	384	498
Net revenue (excl. subsidies <sup>e</sup> )	556 369	3 111 795

<sup>a</sup> From Yaron *et al.* (1994) and Ashley *et al.* (1994).<sup>b</sup> Returns from slaughter for meat sale, and hiring of draught power.<sup>c</sup> Returns from a combination of photo-tourism, trophy hunting, cropping and live sale.<sup>d</sup> Based on 1.9 million hectares in West and East Caprivi.<sup>e</sup> Subsidies include government provision of waterpoints and veterinary services that are received by the sector though are not specific to individual farmers.

and the state in park management and issuing of hunting licences. Recent studies in the northern communal areas in Namibia show quite clearly that it is not sufficient to just demonstrate the economic value of conservation to these communities, but it is of equal importance to establish a link between those that bear the costs and those that reap the benefits of conservation. This may require changes in resource rights (such as the recent return of wildlife access rights to communal area residents); the development of innovative distribution mechanisms (such as devolving responsibility for the control and distribution of wildlife revenues to local communities); and publicizing the link between conservation and local incomes (Ashley, 1996). Finally, even if households were willing and able to switch to the economic activity with the highest return, they are likely to stick with livestock farming so long as the state continues to bear a significant proportion of the cost. Historically, these factors have combined to create a significant divergence between private and social benefits, requiring government policy intervention in the wildlife sector. Many of these incentive structures are under review by government, and recent initiatives such as the conservancy legislative amendment, will enable communities to benefit from wildlife and to develop tourism through conservancies.

There are ample data to suggest that, with appropriate rights, institutions and incentive structures, there are many benefits both for commercial and community development of wildlife related activities. This is certainly true as a complement to traditional livestock and arable farming, and in some cases as an alternative. However, is the move towards wildlife utilization also compatible with biodiversity conservation objectives? Wildlife utilization has been put forward as a way to marry biodiversity conservation and economic development objectives. Is this a long-term partnership, or are these objectives mutually incompatible? In Namibia there are both encouraging signs and some important caveats and reservations. Wildlife utilization is about making economic use of wildlife – making it pay its way to stave off the conversion of wildlife habitats to other more economically productive activities. In the past, although wildlife had a perceived value, there were limited mechanisms for individual landholders and resource users to realise this value in real economic terms. The development of wildlife utilization strategies has expanded the range of activities associated with wildlife that can help realise these economic returns. In Namibia, such strategies include photographic tourism, safari hunting and the sale of game meat and products. Some of the individual returns from these various activities have been presented in this paper. But are these uses of wildlife consistent with species and habitat diversity conservation?

There is certainly evidence that wildlife use strategies have increased the land allocated to wildlife habitat in Namibia. This is particularly the case in the commercial areas, where the stocks and diversity of wildlife have increased significantly over the last 25 years (Yaron *et al.*, 1994). Nonetheless, among these different wildlife uses, some may be more compatible than others with biodiversity objectives. The most successful strategy would include the development of non-consumptive tourism (such as ecotourism and photographic safaris). This type of activity is not only economically lucrative and a growing sector, but is founded on maintaining a diversity in wildlife species and their habitats. Consumptive uses may also be economically attractive in some areas in Namibia and will discourage further conversion of wildlife habitats to alternative uses. However, in these areas the emphasis will be on encouraging stock levels of specific species of wildlife which are popular for hunting or consumption. Specialisation in a few key species may well alter the composition and functioning of ecosystems, generating potential conflict between consumptive wildlife

utilization and biodiversity conservation (Luxmoore and Swanson, 1992). This conflict may be further exacerbated by the trend towards introducing foreign wildlife species into Namibia for consumptive and non-consumptive use (Barnes and de Jager, 1996). Further research is needed to establish the impact of this trend on indigenous species.

In communal areas, wildlife habitat has been under much greater threat, due to the intensive nature of traditional resource uses such as livestock keeping. Recent policy and legislation initiatives that focus on community based wildlife utilization and rights will probably do much to reverse this trend. Community based wildlife utilization initiatives will provide the important link between those that bear the costs of wildlife and those that receive the benefits. Historically, this link has been severed and many inhabitants of communal areas have borne the costs of wildlife (in terms of damage to crops, livestock, infrastructure and threats to personal security), but have largely been excluded from enjoying the benefits. The move towards community based wildlife utilization will encourage a long-term vested interest in maintaining wildlife and its habitat, for current and future use.

Finally, wildlife utilization, as the term suggests, is about making economic use of wildlife. However, there are limitations of this approach for biodiversity conservation. 'The most important limitation is its inapplicability to the facets of wildlands that are not appropriable: ecosystem services, genetic information, even the existence rights of other species' (Swanson and Barbier, 1992).

This paper has attempted to show how some of the more direct use values may be appropriated, but it must be borne in mind that there are also many less tangible benefits that may remain under threat even under a well-designed wildlife utilization policy. In particular, there are many indirect and non-use values relating to biodiversity that have not been taken into account in the benefit estimates presented in this paper. Neither have estimates been made of the benefits to the wider region and global economy. Recent surveys of the distribution of species wealth, in terms of stocks and diversity, reveal a number of important patterns. One of the most striking features is the extent to which species wealth is located in developing countries, whereas much of the value of biological diversity flows to the developed world. For example, the value of genetically engineered products is largely accruing to developed countries, even though most of the genetic value originates in the developing world (Swanson and Barbier, 1992).

The problem of global biodiversity conservation becomes one of developing mechanisms to compensate developing countries for conserving diversity. The Global Environmental Facility was established to support initiatives with global environmental benefits. This is an important first step in promoting the flow of resources from North to South in the global biodiversity conservation effort, but other more long term mechanisms are required. Swanson and Barbier (1992) outline a number of other approaches including the transfer of property rights through development rights transfers (such as debt-for-nature swaps), biotechnology rights transfers (such as patenting of chemical and genetic structures), and wildlife trade regulation (through demand and supply side management to increase the national benefits of wildlife conservation initiatives).

## **Conclusions**

If the international community wishes to preserve biological diversity in Namibia, it must pay for it, as development efforts will continue to put pressure on a dwindling global supply of wildlife habitats and biodiversity. In terms of domestic policy, this study shows

that there is significant potential for complementarity between economic development and biodiversity objectives, particularly in the area of ecotourism and photographic safaris. The full realization of this partnership will be accelerated by recent policy initiatives to increase incentives for investment in wildlife, such as the creation of resource use rights to wildlife in communal lands. Recent changes in the price of Namibian livestock in international markets, particularly in the European Union and South Africa, will also increase the relative returns to wildlife over livestock, as will efforts to reduce government livestock subsidies and to reform the drought relief programme. Other complementary actions currently under discussion include revisions to park entrance fees, introduction of water user fees, and removal of uncertainty about land tenure in the land reform process.

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### References

- Ashley, C. (1996) Incentives affecting biodiversity conservation and sustainable use: the case of land use options in Namibia. *DEA Research Discussion Paper 13*, 1–21. Windhoek: Directorate of Environmental Affairs.
- Ashley, C. and Barnes, J.I. (1996) Wildlife use for economic gain: the potential for wildlife to contribute to development in Namibia. *DEA Research Discussion Paper 12*, 1–23. Windhoek: Directorate of Environmental Affairs.
- Ashley, C., Barnes, J.I. and Healy, T. (1994) Profits, equity, growth and sustainability: the potential role of wildlife enterprises in Caprivi and other communal areas of Namibia. *DEA Research Discussion Paper 2*, 1–26. Windhoek: Directorate of Environmental Affairs.
- Barnard, P., Brown, C.J., Jarvis, A.M., Robertson, A. and van Rooyen, L. (1998) Extending the Namibian protected area network to safeguard hotspots of endemism and diversity. *Biodiv. Conserv.* **7**, 531.
- Barnes, J.I. (1995a) The value of non-agricultural land use in some Namibian communal areas: a data base for planning. *DEA Research Discussion Paper 6*, 1–19 + appendix. Windhoek: Directorate of Environmental Affairs.
- Barnes, J.I. (1995b) Current and potential use values for natural resources in some Namibian communal areas: a planning tool. Unpublished working document. Windhoek: Directorate of Environmental Affairs. 60 pp.
- Barnes, J.I. and de Jager, J.L.V. (1996) Economic and financial incentives for wildlife use on private land in Namibia and the implications for policy. *S. Afr. J. Wildl. Res.* **26**, 37–46.
- Barnes, J.I. and Schier, C. and van Rooy, G. (1997) Tourists' willingness to pay for wildlife viewing and wildlife conservation in Namibia. *DEA Research Discussion Paper 15*, 1–24. Windhoek: Directorate of Environmental Affairs.
- Brown, C.J. (1988) African raptors on farmlands: what is their future? *Afr. Wildl.* **42**, 103–5.
- Brown, G. and Henry, W. (1989) The economic value of elephants. *LEEC Paper 89-12*. London: International Institute for Environment and Development.

- Cumming, D.H.M. (1995) Communal land development and wildlife utilisation: potential and options in northern Namibia. Unpublished working document. Harare: WWF Multispecies Animal Production Systems Project.
- Hoff and Overgaard Ltd. (1993) Volume and value of tourism in Namibia – present and future trends. Paper presented at National Tourism Symposium, 9–10 February 1994, Windhoek.
- Jones, B.T.B. (1995) Wildlife management, utilization and tourism in communal areas: benefits to communities and improved resource management. *DEA Research Discussion Paper 5*, 1–19 + appendices. Windhoek: Directorate of Environmental Affairs.
- Lindeque, M., Brown, C.J., du Plessis, W., Griffin, M., Jones, B. and Coetzee, H. (1991) Preliminary biological survey of the Owambo region. Internal report. Windhoek: Ministry of Wildlife, Conservation and Tourism.
- Luxmoore, R. and Swanson, T.M. (1992) Wildlife and wildland utilization and conservation. In *Economics for the Wilds: Wildlife, Wildlands, Diversity and Development* (T. Swanson and E. Barbier, eds) pp. 170–194. London: Earthscan Publications Ltd.
- Nowell, K. (1996) Namibian cheetah conservation strategy. Draft report. Windhoek: Ministry of Environment and Tourism.
- Pearce, D., Brown, K., Swanson, T. and Perrings, C. (1993) Economics and the conservation of global biological diversity. Report to the Global Environmental Facility. London: Centre for Social and Economic Research on the Global Environment, University College London.
- Richardson, J. (1997) The economics of biodiversity conservation in Namibia. In *Biological Diversity in Namibia: a Country Study* (P. Barnard, ed.). Windhoek: Ministry of Environment and Tourism/National Biodiversity Task Force (in press).
- Swanson, T. and Barbier, E. (1992) *Economics for the Wilds: Wildlife, Wildlands, Diversity and Development*. London: Earthscan Publications Ltd.
- UNEP (1994) *Global Biodiversity Assessment, 8. Economic Values of Biodiversity*. Nairobi: United Nations Environment Programme.
- Western, D. (1989) The ecological value of elephants: a keystone role in African ecosystems. In *The Ivory Trade and the Future of the African Elephant* (ITRG). Report prepared for Second Meeting of the CITES African Elephant Working Group, July 1989, Gaborone, Botswana.
- Yaron, G., Healy, T. and Tapscott, C. (1994) The economics of wildlife in Namibia. In *The Economics of Wildlife* (J. Bojö, ed.) pp. 49–86. Washington: Environmentally Sustainable Development Division, Technical Department, Africa Region, The World Bank.