

Notes on the economic use of the Kruger National Park

W.G. ENGELBRECHT and P.T. VAN DER WALT

Engelbrecht, W.G. and P.T. van der Walt. 1993. Notes on the economic use of the Kruger National Park. *Koedoe* 36(2): 113-119. Pretoria. ISSN 0075-6458.

In an economic analysis the present use of the most important national park in South Africa, (Kruger National Park) is compared with the use of the same land for agricultural purposes. The present use of the Kruger National Park creates substantially more net social benefits to society than agricultural use. The question remains whether these benefits are equitably distributed at various levels of the South African society.

Key words: economics, land use, Kruger National Park.

W.G. Engelbrecht, Development Bank of Southern Africa (DBSA), P O Box 1234, Halfway House, 1685 Republic of South Africa; P.T. van der Walt, National Parks Board, P O Box 787, Pretoria, 0001 Republic of South Africa.

Introduction

In this paper estimates are provided to show that the present use of the land represented by the Kruger National Park (KNP) is more efficient than allocation to agriculture. The aim with economic efficiency is to maximise the net value or benefits from the use of a resource for the economy or society as a whole.

This investigation was sparked by a recent debate on alternative uses of the KNP (Hanekom & Liebenberg 1993; *Beeld* 15 July 1993, 16 July 1993). The KNP is economically the most important national park in South Africa (Hanekom & Liebenberg 1993). This and other protected areas should be subjected to economic and other social analyses so as to provide the necessary information base for well-considered public decisions on the use of these resources.

Methods

The net social benefits from the present use of the KNP for conservation and tourism is compared with the net social benefits from using the land for agriculture. It is conceivable that the land could be used for

other purposes e.g. urbanisation, mining or industry. These alternative uses are, however, not investigated here.

In this paper we look at the KNP as an entity. The efficiency impacts of utilising only certain landscapes of the KNP (Gertenbach 1983) for alternative uses are not considered.

Costs and benefits are quantified as far as data are available. In other cases the costs and benefits are listed with a brief discussion as to its nature and possible magnitude. We deliberately tried to steer away from using analytical cost benefit techniques. These are fraught with difficulties as to the appropriate discount rate and shadow prices.

Use for agricultural purposes

Three types of agricultural use will be considered: dryland cropping, livestock farming, and irrigation.

Dryland cropping

The minimum rainfall required to ensure successful small scale dryland cropping in the area of the KNP, is an average of 600 mm per annum (Development Bank of Southern Africa [DBSA] norms, J.W. Saueremann *pers. comm*). From the rainfall map compiled by

Gertenbach (1980), it is clear that only the portion south of Tshokwane could be considered for rainfed crop production. This amounts to about 25% of the total KNP area of about two million hectares. According to Bornman (1993) the rainfed crop production potential will still be marginally low to low, due mainly to rainfall variability, high evaporation rates, less suitable soils, and topography. The description of soil characteristics in the KNP by Venter & Gertenbach (1986) supports this point of view. It is therefore estimated that only about five percent of the available area will be suitable for cropping. This amounts to 2 million ha x 0,25 x 0,05 = 25 000 hectares. Two types of dryland cropping will be considered — unimproved dryland farming and an improved farming situation with farming support being provided to the farmer. The calculations are based on actual figures from DBSA-supported projects, such as the Phokwane maize farmer support project in Lebowa. It should be noted that rainfall and temperature conditions on that project are somewhat better than what it is for the Kruger National Park.

(a) Unimproved dryland farming

Under unimproved conditions, yields for maize are below 500 kg per hectare, providing a gross margin of about R80 per hectare per annum. The gross margin is the income from sales minus all direct production costs. Capital and interest payments are not deducted. If it is assumed that the land will be donated to the farmers, the gross margins could be taken as income available to the farmers' households.

Applying these figures to the available 25 000 hectares area of the KNP, gives the following gross margin:

$$\begin{aligned} &25\,000 \text{ hectares} \times \text{R}80 \text{ per hectare} \\ &= \text{R}2 \text{ million per annum.} \end{aligned}$$

(b) Improved dryland farming

In this venture access to support such as proper ploughing, hybrid seeds, fertiliser,

herbicides and insecticides are provided to the farmer. This high input situation is very risky for the farmer in such a marginal cropping area.

Yields could now increase to about 2 000 kg per hectare per annum, yielding a gross margin of about R250 per hectare per annum. The total gross margin will be R6,25 million per annum.

Preparation of the lands for cropping will require debushing. Costs will amount to R600 – R800 per hectare. If the figure of R600 per hectare is taken, total costs will be R15 million.

Livestock farming

Figures in this section are derived from DBSA-supported projects such as the Majeje livestock farmer support project in Lebowa.

(a) Without additional infrastructure

Carrying capacity under communal grazing conditions is estimated to be about 12 hectares per largestock unit (LSU). The gross margin is estimated at R8 per hectare. Applied to the ca. 2 million hectare area of the KNP, the gross margin for the whole area is R16 million per annum.

(b) With additional infrastructure

Investment in infrastructure such as border and camp fencing, reservoirs, troughs, boreholes, quarantine camps and spray dips, could increase carrying capacity to between 8-10 ha per LSU. This also assumes that sufficient ground water will be found — which can be a problem. If the better figure of 8 ha per LSU is accepted, the gross margin is estimated at R27 per hectare. Applied to the total KNP, it gives a gross margin of R54 million per annum. Infrastructure cost will, however, amount to R190 per hectare or R380 million for the whole area.

Irrigation farming

During recent years the river systems of the KNP were placed under excessive ecological stress (Bredenkamp & Van Rooyen 1993). Of concern at present, is the issue of allocating water in a rational manner to the numerous economic user sectors within the catchment areas of the respective rivers (FRD 1990). International agreements with neighbouring Mozambique also limit reductions in the throughflow of the river. Even if the water was available, irrigation along the rivers of the KNP will require additional damming capacity and other infrastructure, thus substantially reducing the profitability of such a venture.

For these reasons the possibility of utilising areas along the KNP for irrigation purposes, are not considered further.

Summation

Gross margins for different types of farming operations in the KNP:

(a) Unimproved farming

Livestock farming	R16,0 million per annum
Dryland cropping	R 2,0 million per annum
Total	R18,0 million per annum

Additional costs:

Debushing	R15,0 million (once only)
---------------------	---------------------------

The supplemented minimum living level for a black family of six persons in the Nelspruit area, for February 1993, is given as about R15 000 per annum by UNISA's Bureau of Market Research. Given a gross margin of R18,0 million per annum, 1 200 families, at an average of six members each, could thus earn a living at the supplemented minimum living level from unimproved farming in the KNP.

(b) Improved farming

To attain improved farming conditions a whole system of extension and development

will be required to support the farmer. These are usually provided by government and parastatals such as agricultural development corporations. The cost of such a structure was, however, not quantified.

Livestock farming	R54,0 million per annum
Dryland cropping	R 6,0 million per annum
Total	R60,0 million per annum
Additional costs	
Infrastructure	R380 million (once only)
Debushing	R 15 million (once only)
Extension and development	Not quantified (per annum)

The investment and extension effort expended on this type of project, is generally done so as to enhance income levels. At a gross margin of R60,0 million, 1 000 families could each earn R60 000 per annum or R5 000 per month. Two thousand families will each earn half that or R30 000 per annum or R2 500 per month. Investment in the order of about R400 million would be required to attain this. An increase in recurrent cost to supply support structures and extension officer salaries will also be necessary.

Use of KNP for conservation purposes

For most goods and services, prices are established in the open market through the process of buying and selling. However, many of the benefits (and costs) of protected areas are not traded through markets and therefore do not have a market price as an indication of its value. For some of these, approximate values can be calculated. In some instances estimation of value is exceptionally difficult. It is, however, important that all benefits and costs, whether measurable or not, should be considered in an economic analysis (See Swanson & Barbier 1992, for a discussion).

For the purposes of this paper sufficient data is available to estimate the impact of direct income and tourism. For other benefits, which are generated by nature conservation, such as research and training, education,

biodiversity, consumer surplus and option, and existence values, sufficient information is not available to allow accurate monetary estimates of value. These are, however, listed and briefly discussed, and are also considered.

Income generated in the park

The KNP is budgeted to yield a gross income from trade of R90 million in the 1993/94 financial year. (Figures for the first four months of 1993 are within two percent of budget — the budgeted figures thus seem accurate enough to use). Of this amount R50 million will be spent on salaries, wages, and other payments to staff. The KNP currently employs about 3 000 staff members.

Impact of tourism on the national economy

(a) Foreign tourism

About 700 000 people visited the KNP in 1990/91 of which about 10% or 70 000 were foreigners. One of the main reasons for foreigners to visit the country is to view the wildlife and scenery. The country's wildlife, scenery and climate is indeed the base of South Africa's tourist industry (SATOUR & DBSA 1991).

In 1989 about 930 000 foreigners visited South Africa spending R2 763 million or about R3 000 per visitor (Hugo 1992b). For the 70 000 foreigners visiting the KNP total spending in SA amounted to R210 million. Adjusted for inflation it will amount to about R350 million per annum in 1993 figures. It should also be noted that these figures are average figures for all foreigners, about half of which came from African countries. The European and North American visitors to the KNP are likely to spend in excess of this average. Benefits to the national economy from such spending will be in the form of employment creation, foreign exchange, increase in gross domestic product (GDP), and household income.

These aspects have been quantified by Hugo (1992a, 1992b). Applying Hugo's multipliers to the 70 000 foreigners visiting the KNP and which spend R350 million in the national economy, the following results are obtained:

Jobs created in the formal sector: 9 000
 Increase in gross domestic product: . . . R310 million
 Increase in household income: R240 million
 Impact on balance of payments: R310 million

(These results are different expressions of the same economic effect and should thus not be aggregated).

These impacts could, of course, not wholly be described as benefits created by the KNP. A visit to the KNP is only one of the reasons why a foreigner will visit the country. But, as was mentioned, a visit to a natural area such as the KNP is an important reason for many foreign tourists to visit the country. The least that could be said is that the KNP definitely makes some contribution to the national benefits created from foreign tourism. Even if a visit to the KNP was only 10% of the reasons why the person visited the country, it could be seen that the impacts are still substantial if compared to direct income generated in the park.

(b) Local tourism

The type of economic impact of the 630 000 South African visitors to the KNP will, with the exception of foreign exchange, be the same as for foreign tourists, namely employment creation, increase in GDP and household income. To quantify these impacts will require total expenditure figures (both inside and outside the KNP) per tourist to the KNP. These figures are unfortunately not available. A rough estimate could, however, be attempted. Total expenditure per visitor in the KNP amounts to about R130 per visit. If about R120 is added for other costs — travel, accommodation — a figure of R250 per visitor and a total of R157 million is calculated. The impact on the economy will thus be:

Jobs created in the formal sector: 4 000
 Increase in gross domestic product: . . . R139 million

Increase in household income: R107 million

Impact of tourism on the regional economy

The impact of tourism on the regional economy is a sub-effect of the impact on the national economy. One will, however, gain a better appreciation of the regional distribution of the economic impact by looking at the effect on the regional economy.

The Eastern Transvaal Escarpment and Lowveld area is one of the prime tourist areas of South Africa. The contribution of the Commerce and Tourism sector to the Gross Geographic Product of the Eastern Transvaal Lowveld (Planning region 26) amounted to the substantial figure of about 11% in 1990 and has been growing at a rate of 3,7 percent per annum between 1970 and 1990 (Ligthelm & Wilsenach 1993).

The KNP forms a major component of the tourism industry in this region. Much infrastructure outside the park has sprung up to serve the needs of visitors to the KNP. Of the 700 000 visitors in 1990/91 about 300 000 were day visitors that had to be accommodated elsewhere. A small component of this will be inhabitants of surrounding towns, but a substantial portion would have to be accommodated in neighbouring hotels and lodges. Presently 33 hotels, 12 private game parks and a substantial number of guest houses do business in the vicinity of the KNP. A visit to the KNP is usually combined with a visit to other attractions in the area, thus further contributing to the regional economy.

During 1993 the KNP placed about 60% of its total orders to 194 suppliers in the Nelspruit area. This amounted to about R41 million.

Research and training

The KNP is internationally acknowledged as a major generator of knowledge on the type of ecosystems found in the park.

In 1991, 146 research projects were registered in the KNP. Of these 118 (81%) were initiated by researchers from outside institutions. A total of 122 scientific papers, theses and books were published on this research during 1991 (National Parks Board 1992).

Education

Environmental education to enlighten a visit to the KNP and on a broader level to enhance environmental awareness amongst visitors of today and decision makers of tomorrow, is expanding rapidly. During 1992/93, 15 bushcamps and 19 ecology courses were directed towards opinion-makers, while 65 school groups (4 000 pupils) were handled. This activity is set to grow in future, with the focus on neighbouring communities.

Consumer surplus

Visitors to parks value their visits on average much higher than the gate fees paid. This difference constitutes so-called "consumer surplus" and should be added to the net social benefits generated. Calculation of this value will, however, require surveys and much analysis. See Dixon & Sherman (1990) for an estimate for the Khao Yai National Park in Thailand. For present purposes the existence of consumer surplus will only be noted and mentioned in the list of social benefits generated.

Existence and option values

Further net social benefits include so-called existence and option values. Option value is the value society places on products of conservation for possible future use by its current members or progeny. Existence value is the value placed on something such as a park merely for the knowledge that it will continue to exist, irrespective of any intention to use the resource in the future Pearce (1993).

It should be borne in mind that most conservation areas are not commercially viable. In this regard the KNP which generates large

Table 1
Benefits and costs from alternative uses of the KNP

A. Use of KNP for agriculture	
Gross margin from unimproved farming	R18,0 million p/a
Additional costs:	
Deforestation	R15,0 million (once only)
or	
Gross margin from improved farming	R60,0 million p/a
Additional costs:	
Infrastructure	R380,0 million (once only)
Deforestation	R15,0 million (once only)
Extension and development administration	Not quantified
B. Use of KNP for conservation and tourism	
Salaries and wages to 3 000 employees	R50,0 million p/a
Impacts on the national economy from 70 000 foreign tourists	A portion of total impacts as calculated in text
Impacts on the national economy from 630 000 local tourists	Rough estimates as calculated in the text
Research and training	122 papers, theses and books per annum
Education	4 000 pupils, 15 bushcamps and 19 ecology courses for opinionmakers.
Consumer surplus	Not quantified
Existence values	Not quantified
Option values	Not quantified
Biodiversity values	Not quantified
International prestige value	Not quantified
Additional costs:	The infrastructure and administrative systems are already in place to generate these benefits. No additional investments are thus required.

direct income for itself and indirect benefits for the economy is a rare exception. In their work, *Economics of Protected Areas* by Dixon & Sherman (1990) one of their major

conclusions are "... few protected areas are 'privately beneficial' and thereby protected and managed by individuals". Society, nevertheless, is willing to expend public monies for

conservation even on areas which do not generate substantial income from e.g. tourism. Existence and option values will substantially explain this. Dixon & Sherman (1990) gives an estimate of these values for a national park in Thailand.

Value of biodiversity

Biological diversity is widely recognised to be important to society but is very difficult to value in monetary terms. For the purposes of these notes this benefit is recognised and added to the list of benefits that should be considered. See Pearce (1993) for an overview of recent approaches and techniques to value this benefit. See Ruitenbeek (1989) for an estimate he made of the possible values that could be captured from scientific discoveries in a park in Central Africa.

International prestige value

Internationally the prestige value of a well-functioning KNP is well regarded. It fulfils in three of the four criteria to become a World Heritage Site — only one criterion is needed for such a prestige status.

Discussion

For the purpose of the discussion, Table 1 contains a summary of the analysis done.

If the purpose of the land is to create income to support families, it could be seen that the current R50 million annual income to families employed in the KNP is about three times as high as the R18 million annual income (gross margins) that could be generated from unimproved dryland cropping and livestock farming. Debushing costs of at least R15 million would be required to make the latter possible. Utilising the KNP for this type of farming operation is therefore clearly not as efficient as its present use.

Should infrastructure and other development costs to the tune of about R400 million be expended, an improved farming situation

could be created. Salaries and other administrative costs (not quantified) for an extension and development service will also be required. In this case a gross margin of R60 million could be earned per annum. It should be noted that this is a ballpark figure. In its calculation the more favourable assumptions were always used. The figure of R60 million is thus comparable to the R50 million currently earned from salaries and wages in the KNP.

However, if the R10 million difference is taken seriously, it should be realised that it will require at least R400 million to increase income by that much. If that amount is expended over four years and income is taken over 30 years, a negative internal rate of return (about -2%) is attained. Such an investment will thus not be a viable proposition.

On these grounds alone it could be argued that the use of the KNP for conservation and tourism purposes is about at least as economically efficient as using the whole area for agricultural purposes. The large fluctuations in agricultural income due to variable weather conditions (especially in that area), and the consequent demands on the fiscus for assistance, further weakens the arguments for agriculture.

The current use of the KNP creates a number of additional benefits. Expenditure by foreign and local tourists have a substantial impact on the economy. Even if only a small portion of these impacts could be ascribed to the KNP, the benefits will still be considerable if compared to the direct income generated. A number of other (unquantified) benefits were also listed.

Considering the above arguments based on quantified and some unquantified information, it could be concluded that the present use of the KNP for conservation and tourism creates substantially more net social benefits for society if compared to agricultural use.

A question, however, remains whether these net social benefits are equitably distributed amongst South African society at the following levels:

- the national economy
- the regional economy
- local communities, and
- the KNP itself and the National Parks Board.

A balance should be sought between the distribution of benefits among these different levels, as well as amongst the different groups and constituencies within the levels. The lessons learnt elsewhere in the world, and especially in the Third World, in this regard (Whelan 1991; Boo 1990; Ramphele 1991), indicates that an imbalance in distribution could lead to a serious threat to, and even the complete demise of, conservation areas. This subject is a very important and involved one and should rightfully be addressed in a separate paper.

Acknowledgements

The assistance of Messrs J.W. Saueremann, D.J. Bornman and L.C. Honeyborne of DBSA is hereby acknowledged.

References

BEELD, 15 July 1993 and 16 July 1993.
 BOO, ELIZABETH. 1990. *Ecotourism: The potentials and pitfalls*. (Volumes I and II). Washington: World Wildlife Fund.
 BORNMAN, D.J. 1993. *A macro perspective on the agricultural potential of the soils and climate of the Kruger National Park*. Internal Report: Development Bank of S.A.
 BREDEKAMP, G.J. AND N. VAN ROOYEN. 1993. A survey of the vegetation of the Letaba River in the Kruger National Park. Report to Ekotrust cc.
 BUREAU OF MARKET RESEARCH, March 1993. *The minimum and supplemented living levels of non-whites residing in the main and other selected urban areas of the RSA*. Pretoria: Unisa Bureau of Market Research.
 DEVELOPMENT BANK OF SOUTHERN AFRICA, no date. Phokwane maize farmer support project site. Midrand: Development Bank of Southern Africa.

DEVELOPMENT BANK OF SOUTHERN AFRICA, no date. Majeje Livestock farmer support project site. Midrand: Development Bank of Southern Africa.
 DIXON, J.A. AND P.B. SHERMAN. 1990. *Economics of protected areas*. Washington: Island Press.
 FOUNDATION FOR RESEARCH DEVELOPMENT. 1990. *Characteristics and dynamics of the riparian zones of Kruger National Park rivers; a research approach*. Pretoria: FRD
 GERTENBACH, W.P.D. 1980. Rainfall patterns in the Kruger National Park. *Koedoe* 32: 35-43.
 GERTENBACH, W.P.D. 1983. Landscapes of the Kruger National Park. *Koedoe* 26: 9-121.
 HANEKOM, D. AND L. LIEBENBERG. 1993. *Utilisation of national parks with special reference to the costs and benefits to communities*. Report of the Agricultural desk of African National Congress.
 HUGO, M. 1992a. *Die rol van buitelandse toerisme in die Suid-Afrikaanse ekonomie*. Unpubl. M. Comm. thesis, University of Stellenbosch, Stellenbosch.
 HUGO, M. 1992b. A quantification of the role of foreign tourism in the South African economy. *Journal of Studies in Economics and Econometrics* 16(2): 41-51.
 LIGTHELM, A.A. AND A. WILSENACH. 1993. Development, poverty and the environment with particular reference to the Eastern Transvaal region. *Development Southern Africa* 10(1): 45-64.
 NATIONAL PARKS BOARD, 1992. Progress report of the research projects undertaken in the Kruger National Park during 1991. Skukuza: National Parks Board.
 PEARCE, D. 1993. *Economic values and the natural world*. London : Earthscan publications.
 RAMPHELE, M. (ed). 1991. *Restoring the land: environment and change in post-apartheid South Africa*. London: Panos.
 RUITENBEEK, H.J. 1989. *Social cost-benefit analysis of the Korup project, Cameroon*. Report for the World Wide Fund for Nature and the Republic of Cameroon. London: World Wide Fund for Nature.
 SATOUR AND DEVELOPMENT BANK OF SOUTHERN AFRICA. 1991. A strategic framework for tourism development in South and Southern Africa. Johannesburg: SATOUR and Development Bank of Southern Africa.
 SWANSON, T.M. AND E.B. BARBIER. (ed). 1992. *Economics for the wilds*. London : Earthscan publications.
 VENTER, F.J. AND W.P.D. GERTENBACH. 1986. A cursory review of the climate and vegetation of the Kruger National Park. *Koedoe* 29: 139-148.
 WHELAN, T. (ed). 1991. *Nature tourism: managing for the environment*. Washington: Island Press.