INTERNATIONAL JOURNAL OF ORGANIZATION THEORY AND BEHAVIOR
Vol. 5, Nos. 3 & 4, pp. 259–297, 2002

ANALYZING THE EFFICIENCY OF COLLABORATIVE WILDLIFE MANAGEMENT: THE CASE OF TWO COMMUNITY WILDLIFE SANCTUARIES IN KENYA

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ABSTRACT

In nature conservation, interorganizational governance structures, which are typically referred to as collaborative management, have gained increasing importance in recent years. This paper deals with the assessment of the efficiency of such governance structures, taking wildlife conservation in Kenya as an example. The paper starts with theoretical considerations on allocative and organizational efficiency in nature conservation, and goes on to discuss the problems of calculating production and transaction costs and benefits in this field. Using empirical data from two wildlife community

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DOI: 10.1081/OTB-120014892
1093-4537 (Print); 1532-4273 (Online)

sanctuaries in Kenya, the paper then estimates the production and transaction costs of conservation and assesses the factors influencing their magnitude and distribution. To calculate interorganizational efficiency, a benefit–costs analysis of different collaborative governance structures is carried out, both from the landowners' perspective (financial analysis) and from the society's perspective (economic analysis). The paper shows that valuation problems and the variety of factors influencing the costs and benefits of nature conservation constitute a major challenge for calculating interorganizational efficiency in this field.

Key Words: Interorganizational efficiency; Transaction costs; Cost-benefit analysis; Nature conservation; Wildlife management; Kenya

1 INTRODUCTION

The rapid loss of biological diversity represents one of the major global problems of our time.[1] Therefore, the creation of efficient governance structures for the conservation of biodiversity is an important challenge. Traditionally, nature and wildlife conservation has been a task of public sector organizations such as wildlife departments and protected area administrations. However, in developing countries, the capacity of the state to manage and protect biological diversity has proved to be rather limited.[2] In these countries, which are typically rich in biodiversity, the pressure on the biological resources caused by increasing population, poverty and commercial interests is comparatively high. In view of the limited capacity of the state agencies in these countries, decentralization, devolution, user participation, and community-based approaches in natural resource management have received increasing attention among policy-makers and scientists.[3]

What has emerged as a particularly promising approach is collaborative management (in short, co-management), which involves both state agencies and organizations of the local residents, and, possibly, other stakeholders such as non-governmental organizations (NGOs) and private businesses. Therefore, collaborative management can be considered as an interorganizational governance structure involving both public and private sector organizations. Transaction costs economics has been suggested as a useful tool to judge the efficiency of such collaborative governance structures that involve the participation of resource users.[4]

Hanna[5] argued that user participation can lead to more efficient governance structures as it provides legitimacy, which helps to save the transaction costs caused by monitoring and enforcement. Other authors focused more generally on the conditions of success of decentralization and devolution in natural resource management.[6] However, empirical studies that use quantitative measures to test hypotheses concerning the efficiency of different governance structures in nature and wildlife conservation have remained remarkably scarce. An exception is Kuperan et al.,[7] who measured the transaction costs of introducing collaborative management systems for fisheries. In their Philippine case, co-management regimes involved lower transaction costs than pure state management regimes. However, in view of the scarcity of other empirical attempts to measure transaction costs, the assertion that collaborative management as an interorganizational government structure–is more efficient than pure state management has remained a hypothesis.

As North & Wallis[8] and others have pointed out, it is essential to consider production and transaction costs simultaneously, when assessing organizational efficiency. However, the differentiation between production costs and transaction costs has been rather neglected in the literature on efficiency in nature conservation. Studies focusing on transaction costs, such as Kuperan et al.,[9] do not address production costs, while studies focusing on allocative efficiency in nature conservation, such as Norton-Griffiths,[10] do not distinguish between production and transaction costs and tend to neglect the latter.

Against this background, this paper endeavors to contribute to the assessment of the efficiency of collaborative wildlife management, as an interorganizational governance structure. In view of the scarcity of empirical literature on this subject, the paper has an explorative focus. Based on theoretical considerations on allocative and organizational efficiency in nature conservation, the paper aims to estimate the production costs and transaction costs of collaborative wildlife management, to assess the nature, magnitude and distribution of these costs, and to compare them with the benefits derived from wildlife conservation, taking two wildlife sanctuaries in Kenya as an example. The paper uses cost-benefits analysis to assess the efficiency of different collaborative management arrangements. The empirical case studies serve to identify the challenges of empirically measuring production and transaction costs of wildlife conservation and to explore the factors influencing these costs.

The paper proceeds as follows: The next section presents theoretical considerations concerning the efficiency of different organizations in nature conservation. Section 3 gives an overview of the two empirical cases and Sec. 4 outlines the methodology applied for the empirical study. The results are presented and analyzed in Sec. 5. Sec. 6 discusses the results and Sec. 7 draws some conclusions.

2 CONCEPTUAL FRAMEWORK

2.1 Theoretical Considerations on Efficiency in Nature Conservation

Efficiency in nature conservation can be considered as involving two decision-problems: (1) to identify the level of nature conservation that is efficient (allocative efficiency), and (2) to identify the organizational structure that makes it possible to reach conservation goals with minimal costs (organizational efficiency). Even though the focus of this paper is placed on organizational efficiency, both decision-problems are considered together here as they are assumed to be interdependent. Figure 1 shows how the first decision-problem can be solved in a neo-classical framework. The x-axis in Figure 1 represents the amount of land placed under conservation, which can be considered as the major variable input in the "production" of nature conservation benefits. The y-axis displays the benefits derived from conservation, including both use and non-use benefits. The curve Y can be labeled "conservation benefit function." It corresponds to the monetary production function in production economics and displays the law of diminishing marginal returns. The line TC indicates the total costs of conservation, which consist of the fixed costs, indicated by the intercept FC, and the variable costs of the input land. For reasons of simplicity, it is assumed here that the price per unit of input remains constant. According to neo-classical theory, the optimum level of conservation is represented by the point of tangency between the benefit function and a parallel line of the cost function, where the marginal costs of producing conservation benefits equal the marginal returns. Point A in Figure 1 represents this optimum level, which corresponds to a level of the conservation input indicated by I^A and a conservation benefit of Y^A. The net benefit of conservation is represented by the distance NB between the benefits and the total costs. Similar approaches to assess the allocative efficiency of nature conservation have been developed by Hampicke,[11] who uses an output-output diagram, and by Norton-Griffiths,[12] who considers marginal costs and benefits.

In order to illustrate the interrelation between allocative and organizational efficiency, the second decision-problem concerning organizational efficiency is treated here in the same figure. The cost curve TC then has to be interpreted as including both production and transaction costs, following the assertion that transaction costs have to be studied simultaneously with production costs in order to optimize governance.[13] Figure 1 displays a

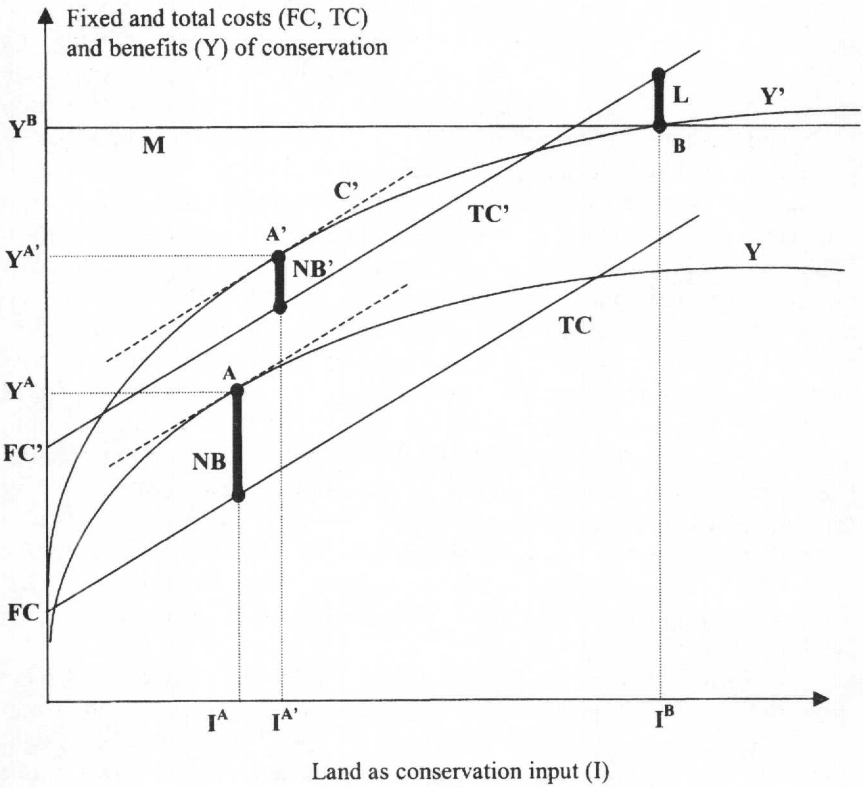


Figure 1. Efficiency in nature conservation.

situation in which the introduction of a more appropriate governance structure, for example, collaborative management as an interorganizational arrangement, increases the level of conservation benefits that can be achieved on a certain area of land. This is represented by an upward shift of the conservation benefit function (Y to Y′), corresponding to technical progress in production economics. If the costs of the variable production factor land do not change, a higher level conservation benefits will be efficient, as represented by point A′ in Figure 1. It may, however, well be that under the new organizational arrangement, the fixed costs increase considerably, because setting up a participatory management agreement may involve high transaction costs. This is represented by the upward shift of the intercept representing the fixed costs from FC to FC′. The net benefit in the new situation is lower than before (NB′ < NB), but a higher level of conservation is reached (shift from Y^A to $Y^{A'}$).

Ecological economists have pointed out that biological or ecological relations are often not adequately described by the assumptions underlying neo-classical cost and benefit curves.[14] It may be necessary to conserve a critical minimum level of biological diversity. One example is the protection of an endangered wildlife population, where at least the "minimum viable population" has to be conserved, which is determined by biological, not by economic factors. This consideration can be included in a neo-classical framework as shown by line M in Figure 1: Line M represents the critical minimum level of conservation benefits. In the situation characterized by Figure 1, the minimum level can only be reached under the new organizational structure (curve Y′). However, a loss represented by L would be incurred in this situation. Whether L really represents a loss for the society depends on the valuation of the benefits. Curve Y′ in Figure 1 may represent the benefits at the local or national level. Taking global benefits into account would then shift up the curve Y to a level under which net benefits instead of losses are incurred. In such a situation, collaborative management may be efficient from the global, but not from the local perspective. One could also say that in such a situation, conservation would be efficient according to the Kaldor-Hicks compensation criterion, because those who benefit from conservation (the global society) could compensate those who loose (the local landowners).

According to these considerations, one has to empirically measure the costs and benefits of nature conservation for different levels of input and under different organizational structures. To get a sufficiently large consistent data set for such empirical analysis can be considered as a major challenge. As already indicated above, studies that empirically measure both transaction and production costs in nature conservation are still scarce, and the methods of measuring these costs are not well developed. Therefore, as explained in the introduction, this paper is exploratory. It aims at contributing to the goal of operationalizing the framework developed above by studying two empirical cases of collaborative wildlife conservation in Kenya, which represent interorganizational governance structures. The measurement of the benefits, especially the non-use benefits of conservation, also involves methodological challenges. However, suitable techniques for this purpose, especially contingent valuation, have already been improved considerably in recent years. For reasons of scope, this paper does, therefore, not endeavor to contribute to this literature and draws on secondary sources to determine non-use benefits. As the two cases considered here do not allow us to construct cost and benefit functions, this paper has to be seen as a starting point for an empirical application of the above theoretical framework. The next sub-sections discuss the challenges of operationalizing this framework. In the empirical part of this paper, cost-benefit analysis will be used to assess the comparative efficiency of different organizational structures. Applying a cost benefit analysis has the advantage that it allows the analyst to take the time dimension of the cost and benefit streams into account, which is not captured in the above comparative-static framework. A financial analysis will be used to assess the efficiency from the landowners' point of view and an economic analysis will be conducted to take the society's view into account. This approach will make it possible to assess the problem mentioned above that interorganizational governance structures for nature conservation may be efficient from the society's perspective, but not from the local landowners' perspective. A sensitivity analysis will be used to assess how changes in the relevant parameters influence the efficiency of different organizational arrangements.

2.2 Distinguishing and Calculating Production Costs and Transaction Costs in Wildlife Conservation

The distinction between production and transaction costs in wildlife conservation involves conceptual problems, since it is not immediately clear what is produced and what is transacted when wildlife species and their habitats are placed under protection. To adopt the theoretical approach developed above, wildlife conservation is considered here as a "production" of wildlife and related benefits, such as the maintenance of biological diversity. This "production process" requires certain institutional arrangements such as changing the property rights for the areas to be protected, and various technical measures such as relocating wildlife and constructing fences. The costs arising for the technical measures are considered as production costs, while the costs arising for creating and implementing the institutional arrangements are regarded as transaction costs. Drawing on different literature sources,[15] transaction costs are considered here to comprise the following three categories:

1) search and information costs,
2) bargaining and decision or contracting costs, and
3) monitoring, enforcement and compliance costs.

The costs of the first two categories arise before an institutional arrangement is established (ex-ante), while the costs of the third category arise afterwards (ex-post).

Fencing may be used as an example to illustrate the practical problems of distinguishing production and transaction costs in wildlife conservation. If a fence is constructed to prevent people and crops from damages caused by wildlife, it is a measure arising due to technical or ecological circumstances and the costs involved are considered as production costs. If a fence is constructed to prevent illegal hunting (poaching), it has to be considered as a method of enforcing an institutional arrangement that forbids the extraction of wildlife. In this case, the costs have to be considered as enforcement costs, which is a category of transaction costs. In practice, fences may fulfill both functions, so that the costs are difficult to assign. Similar problems of distinguishing between production and transaction costs arise, if wildlife wardens are necessary to prevent poaching on the one hand, and to prevent damages caused by wildlife on the other hand. One way to solve this problem, which will be applied here, is to categorize such costs according to the problem that has the greater practical relevance in the case under consideration.

The calculation of the production and transaction costs in wildlife conservation is further complicated by the fact that conservation is often coupled with tourism enterprises. It is, therefore, difficult to clearly attribute investments such as fencing, and operating costs such as the manager's salary, to either wildlife management or the tourism business. Moreover, wildlife conservation is typically competing with agriculture. This leads to opportunity costs of land, which have to be considered as one category of the production costs of conservation. These costs typically show a considerable regional and annual variation, which implies considerable data requirements. Finally, when operationalizing the above theoretical framework, one has to consider that both production and transaction costs can occur (1) as fixed or variable costs, (2) as investment or operating costs, and (3) as opportunity costs or cash expenses.

2.3 Calculating the Benefits of Wildlife Conservation

Different classifications concerning the benefits of conservation can be found in the literature. Economists concerned with the economic valuation of natural resources distinguish use values from non-use values. Use values may be further classified into consumptive and non-consumptive values, while non-use values are considered to consist of existence and bequest values.[16] As indicated above, special techniques such as contingent valuation are needed for measuring non-use benefits. In agricultural project investment analysis, it is customary to distinguish between tangible benefits that can be easily measured, and intangible benefits that do not lend themselves to valuation.[17] Depending on the level at which benefits occur, one can also distinguish between local, domestic and global benefits. In practice, it may, however, be difficult to identify which share of a certain conservation benefit should be attributed to each level.

3 OVERVIEW OF THE COMMUNITY WILDLIFE SANCTUARIES

Two community wildlife sanctuaries that are characterized by a collaborative (interorganizational) management structure have been selected for this study: the Kimana Community Wildlife Sanctuary, hereafter referred to as Kimana Sanctuary, and the Golini-Mwaluganje Community Wildlife Sanctuary, hereafter named GM Sanctuary. The two community wildlife sanctuaries were selected because Kenyan conservationists regard them as particularly successful cases of community involvement in wildlife management. The Kimana Sanctuary (60 km^2) is situated in the dispersal area of the Amboseli National Park (390 km^2), which is one of the leading revenue earners among the Parks and Reserves managed by Kenyan Wildlife Service (KWS). The GM Sanctuary (36 km^2) is located in the wildlife dispersal area of the Shimba Hills National Reserve (217 km^2), which is also managed by KWS.

Both sanctuaries have been established under the KWS community wildlife policy, according to which the landowners have the right to derive the direct benefits from the presence of wildlife in their land, e.g., income from tourism. The communities can establish business relations, such as lease arrangements, with private enterprises, e.g., in the tourism sector. The KWS remains the owner of the wildlife and has the task to train the landowners, to help them to derive benefits from conservation, to monitor their conservation projects and to continue providing security to both humans and wildlife. Due to these shared rights and responsibilities, the community wildlife sanctuaries can be classified as collaborative (interorganizational) management structures involving private and public sector organizations.

Kimana sanctuary is an important wet grazing area for the giraffes, impalas, Thompson gazelles, zebras and wildebeests that often follow a migratory corridor connecting Amboseli and Tsavo West National Parks. Resident wildlife found in this sanctuary includes elephants, lions, buffaloes, cheetahs and leopards. The area is also known for its over 75 bird species from 36 different families (Amboseli National Park's office records, reviewed during field research). Up to February 2000, a committee managed the Kimana sanctuary, which was appointed by the executive committee of the group ranch, in which the sanctuary is located. The management committee also co-opted the KWS and two tour operators which manage visitors' camps in the sanctuary. Due to the failure to attract tourists, declining revenues, problems of corruption and lack of distributing benefits to the landowners, the sanctuary was eventually leased to the African Safari Club (ASC) in March 2000. Although the former management committee was disbanded, the involvement of KWS was maintained, though at a lower scale. Under these current management arrangements, only few members of the Group ranch committee are directly involved in collecting lease fees and solving grazing disputes between ASC and the landowners. The management structure that emerged after the lease can still be considered as a collaborative management, but it is characterized by a lower involvement of the local landowners and increased integration of the private sector. Table 1 summarizes the major characteristics of the two sanctuaries.

Since the late 1980s up to the establishment of an electrical fence in 1994, no farming could be practiced in the area of the GM sanctuary due to the high intensity of human-wildlife conflicts, mainly caused by wild elephants. These attacks also spread to other areas that are now outside the electrical fence, thus making farming and other economic activities in an area of more than 100 km^2 difficult. Crops could not be grown without guarding them day and night. Human injuries and deaths from elephant attacks were also common. After the adoption of a community-oriented conservation policy in 1992, the KWS initiated negotiations concerning the possibility of creating a sanctuary. There were two major incentives for the landowners to accept the establishment of a community sanctuary: First, fencing implied that the losses in crop and livestock production due wildlife attacks in the area outside the sanctuary would be diminished. Second, the creation of the community sanctuary rendered an enlargement of the National Reserve unnecessary, which would have implied an expropriation of their land.

In Kimana, the area of the sanctuary used to be the dry season watering and grazing area for the Maasai pastoralists, but it was also used by wildlife for this purpose. The pastoralists have co-existed with wildlife for decades and know how to avoid losses of livestock through wildlife predation, but the area also provided hideouts for wildlife attacking crops in private farms and irrigated fields located in the region. Therefore, human-wildlife conflicts were common in the inhabited areas of the Group ranch. KWS persuaded the Group ranch members to form the sanctuary because they feared that the wildlife would be driven away (even from the Amboseli Park) after the cultivation of the Kimana swamp. The major motivation for the members to accept this proposal was the desire to receive benefits from wildlife conservation.

4 RESEARCH METHODS

Data collection[18] included a survey among the landowners and interviews with other stakeholders, including the co-opted and ex-officio members of the community sanctuaries. To structure the collection of data,

Table 1. Overview of the Two Community Wildlife Sanctuaries

	Kimana Sanctuary	GM Sanctuary
Location	Dispersal area of Amboseli National Park, isolated-swampy area	Corridor (10 km long) between Shimba Hills National Reserve and Mwaluganje Forest Reserve
Agro-ecological Zones and conditions	Lower midland livestock-millet zone with 150–200 mm of rainfall per year. No potential for rainfed arable production	Lowland cashew nut-cassava zone with 900–1000 mm of rainfall peryear. Medium potential for arable production
Year of foundation	1996	1995
Area	6,000 ha	3,600 ha
Legal status	Group ranch property	Shareholder company
Number of landowners	843	127
Ownership status of land	Land communally owned by group ranch members	Land owned individually
Membership besides landowners	KWS, Africa Safari Club and Amboseli/ Tsavo Group Ranches Association (*all are co-opted members*)	KWS, Forest Department, Local County Council, Local Town Council, Travelers Group of Hotels (Private agency) and Eden Wildlife Trust (NGO) (*all are permanent ex-officio members*)
Type of management	Before March 2000: local management committee appointed by the Group ranch committee). After March 2000: African Safari Club (ASC), which has leased the Sanctuary	Board consisting of five elected shareholders representatives (ancestral landowners), 6 permanent ex-officio members and 2 nominated Cliff area owners
Income sources and distribution	Fixed amount for lease plus fees per visitor per night, not distributed to members	Entrance fees from visitors, since 1995 distributed twice to members

(*continued*)

Table 1. Continued

	Kimana Sanctuary	GM Sanctuary
Important characteristics of landowners	Large, well established and stable group, guided by traditional norms, landowners from one ethnic group, homogeneous interests, high illiteracy level, unskilled leaders	Small, newly established and unstable group, no established power structure, landowners from many ethnic groups, characterized by heterogeneity of interests, low illiteracy level, skilled leaders
Landowners' forms of land use and relationship to wildlife	Semi-nomadic pastoralists, have co-existed with wildlife for hundreds of years, recently, some became actively involved in irrigated horticulture	Subsistence farmers, in 1990s forced by elephants to abandon their farms
Tourist attraction	Diversity of wildlife: elephants, giraffes, lions, leopards, zebras, wildebeests, etc., proximity to Mt. Kilimanjaro	Elephants only, high density (7 elephants per km^2), proximity to Kenyan coastal beaches

Source: authors.

the process of establishing the sanctuaries was divided into two stages (ex ante/ex post) as shown in Table 2.

For the ex ante stage, data on the total transaction and production costs arising in the time period shown in Table 2 was collected. The

Table 2. Stages in the Establishment of the Sanctuaries

Stage		Time frame	
		Kimana	GM
1a)	Information acquisition	1995	1992–93
1b)	Negotiations and setting up of sanctuaries	1995–96	1994–95
2)	Operation of the sanctuaries	1996–2000	1995–2000

Source: own research.

operational stage, however, is a too long period for the respondents to recall all the information on the sanctuaries. Therefore, only data for a single year was collected at this stage. For the GM sanctuary, the data collected for this latter stage was confined to the activities of the current year. However for Kimana, data for two operational periods was collected: the year preceding the lease to African Safari Club (denoted as Kimana BL) and the current year (denoted as Kimana AL).[19] Assuming that operational costs do not change considerably between the years, these costs of a single year are regarded as the average annual costs of the ex post stage.

Data on landowners' participation and contribution in terms of cash expenses and time was collected for the two stages through in-depth interviews, based on a detailed semi-structured questionnaire, of a stratified random sample of members and non-members of the two sanctuaries. A total of 136 landowners (70 and 66 from Kimana and GM sanctuaries, respectively) were interviewed. Key informants from the sanctuaries' areas were interviewed to collect additional data on cash expenditure, effort and time of participation in the first stage.

To convert the landowners' time of participation in meetings into monetary expenses, the opportunity costs of participating in wildlife activities were calculated, i.e. the amount of money that the landowner could have earned from other activities during the time of the meeting. These earnings foregone were multiplied with the recorded time of participation in meetings. Since the total population and the percentage of members in both study areas is known, the total costs of participation were extrapolated using the data obtained from the interviewed participants. A similar methodology was applied to estimate the costs of fence construction and maintenance, and the costs of guarding the farms located adjacent to the Sanctuaries. To estimate the guarding costs, it was assumed that the landowners guard the farms during the night only (on average eight hours per night) and spend the day resting. The opportunity costs of the income forgone during daytime were calculated for six months (two rainy seasons) per year. Even though the cost share for this activity is considerable (see Fig. 3), it is still a conservative estimation, because the fruit trees and the irrigated horticultural crops have to be guarded throughout the year during both day and night time. However, other household members than the household head, who have lower opportunity costs of labor, often do this work. In order to measure the benefits of the sanctuaries arising due to electrical fencing, the landowners were asked to compare the time spent for guarding and the losses due to crop damages before and after fencing.

Data was also collected on the contributions in time and cash that the co-opted and ex-officio members of the sanctuaries made in the two stages of

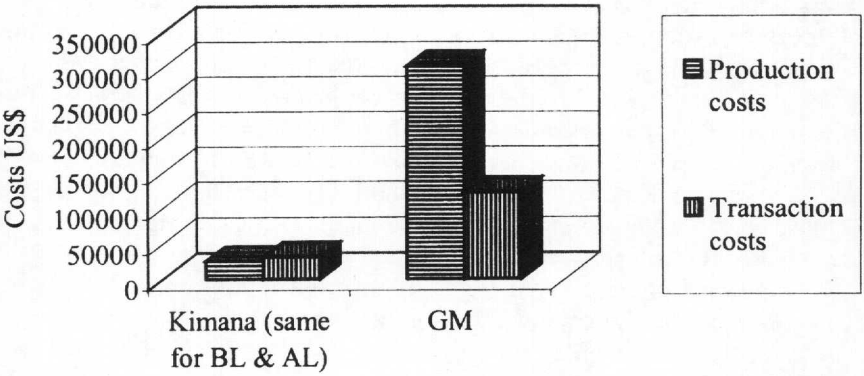


Figure 2. Production and transaction costs of establishing the community sanctuaries.

the co-management process. These members supported various activities, such as collection of information for planning, educational campaigns, infrastructural development, sanctuary administration, resource maintenance and improvement, conflict resolution, etc. Data collection methods at this level included the review of secondary data and interviews with key persons that were directly responsible for setting up and implementing the projects. Other methods included informal interviews guided by a checklist, joint field visits by the researcher and the members, and participant observation.

5 RESULTS AND ANALYSIS

5.1 Investment for the Establishment of the Sanctuaries

5.1.1 Production Costs

Figure 2 shows the production and transaction costs that were incurred for the establishment of the Kimana and the GM Sanctuary. Table 3 shows the corresponding figures. This table also includes the production and transaction costs that were incurred per household and per km^2, respectively.

The production costs were incurred for the establishment of fences, access and game-drive roads, sanctuary offices and gates, and staff houses. The level of production costs was influenced by the outcome of the bargaining process between the stakeholders. The ancestral landowners wanted

Table 3. Investment and Operational Production and Transaction Costs (in US $) of Different Stake Holders

	Investment Stage		Operational Stage			
	PC[a]	TC[b]	PC[a]	TC[b]	PC[a]	TC[b]
Kimana Stakeholders			Kimana BL		Kimana AL	
State agencies	25,300	16,900	12,900	0	200	0
Private agencies	0	0	0	1,200	22,200	0
NGOs	0	0	0	0	0	200
Ancestral landowners	0	14,300	177,500	45,400	177,500	26,100
Kimana totals	25,300	31,200	190,400	46,600	199,900	26,300
Kimana total/km^2	422	520	3,173	777	3,332	438
Kimana total/household	19	24	146	36	154	20
GM stakeholders	PC[a]	TC[b]	PC[a]	TC[b]		
State agencies	48,900	5,000	3,600	250		
NGOs	25,800	42,600	61,700	0		
Private agencies	195,400	0	0	1,700		
Cliff area owners	11,200	62,500	27,600	5,200		
Ancestral landowners	20,900	11,800	241,500	5,900		
GM totals	302,100	121,900	334,400	13,100		
GM total/km^2	8,392	3,386	9,289	364		
GM total/household	455	186	504	20		

[a]PC = production costs.
[b]TC = transaction costs.
Source: own research.

the wildlife to be fenced off their land to reduce time needed for guarding the crops. As indicated in Sec. 3, this was a major motivation to agree to the establishment of the sanctuaries. The state agencies and conservation non-governmental organizations (NGOs), however, wanted to avoid the total enclosure (with electric fence) of Shimba Hills National Reserve. The production costs incurred during the investment phase are lower in Kimana Sanctuary than in GM sanctuary because the area is located near a main road and it is topographically flat, so that–as compared to GM Sanctuary–no high investment for infra-structural development was necessary. Table 3 shows how the production and transaction costs in the investment phase and the operational phase were distributed among the different stakeholders.

5.1.2 Transaction Costs

Figure 2 shows that in the investment phase, the transaction costs in Kimana were higher than the production costs, while in GM they were lower than the production costs. In the GM Sanctuary, the costs of information acquisition were low because the capacity of the area to attract tourists was already clear to KWS and the participating stakeholders. The availability of wildlife is guaranteed by its location directly adjacent to the Shimba Hills National Reserve. The potential of the Kimana sanctuary, in contrast, was not clear in advance because it is an isolated swampy area located about 15 km away from the Amboseli National Park. In both sanctuaries, transaction costs were also incurred for the identification of genuine landowners and their exposition to successful examples of community sanctuaries, for the assessment of their needs and interaction with wildlife, and for carrying out feasibility and environment impact assessment studies.

Differences concerning the organization of the landowners also help to explain why the transaction costs incurred for the establishment of the sanctuaries were lower in Kimana than in GM. Having been registered in 1972 as a group ranch, the Kimana Sanctuary landowners are a better organized group with an established decision-making mechanism. During the bargaining phase, therefore, KWS found it easier to deal with the group ranch committee and a few other members. In contrast, the GM Sanctuary landowners had not yet formed an organization. They consisted of different groups, including ancestral landowners and Cliff area landowners who are mainly rich Kenyans and foreigners. As they were not organized yet, they had to be dealt with as individuals and not as a group. The transaction costs in the establishment phase were further increased by the need to mobilize the communities, which led to the spending of time and resources by a non-governmental organization (Eden Wildlife Trust) and the Cliff area landowners, whose opportunity costs of participation are higher than those of the ancestral landowners.

5.2 Costs of Operating the Sanctuaries

5.2.1 Production Costs

Opportunity Costs of Land

The opportunity costs of land depend on the agricultural potential of the studied areas. This paper uses the figures calculated by Mwau,[20] indicated in Table 4, which are averages for the different agro-ecological zones in Kenya.

As explained in Sec. 3, the farmers in the GM Sanctuary had to leave their land in the early 1990s due to elephant problems. Therefore, one does not need to consider opportunity costs of land in a financial cost-benefit analysis of this case. The Kimana landowners still graze their animals in the sanctuary during the dry season. During the time of the local management board, they used to do so freely. Under the lease arrangement, however, they have to get permission, which is granted in only around 30% of the requests. Therefore, a financial analysis has to take into account opportunity costs of land, which correspond to approximately 70% of the potential land returns from pastoralism stated in Table 4. In an economic analysis, the full opportunity costs of land can be considered for both sanctuaries, because from the society's point of view, a reference situation can be considered in which wildlife numbers are so low that crop damages do not occur. Table 5 shows how these figures were used to estimate the total opportunity costs of land in the two community sanctuaries and the adjacent protected areas.

Other Production Costs

Figure 3 displays three categories of production costs that are incurred in the operational phase besides the opportunity costs of land: (1) the costs of guarding, (2) the costs of fence maintenance, and (3) the costs of wildlife control and improvement. Table 3 shows how these costs are distributed among the stakeholders and indicates the production and transaction costs arising per ha and per household. One can derive from Fig. 3 that the costs of guarding, which consist of the opportunity costs of the farmers' time spent

Table 4. Potential Returns from Different Types of Agricultural Land Use

Alternative Land Use	Financial Returns/km^2 (US$)
Irrigation (horticulture)	33,405
Small scale mixed farming (medium potential)	24,417
Pastoralism	406
Small scale mixed farming (low potential)	227

Source: Mwau[20].

Table 5. Calculation of Opportunity Costs of Land

Area	Land Types	Calculation	Total US$/ year/km²
Kimana	20% irrigation	(33,405 * 0.2)	7,006
	80% pastoralism	+ (406 * 0.8)	
GM	50% small scale mixed farming, medium potential	(24,417 * 0.5) + (227 * 0.5)	
	50% small scale mixed farming, low potential		12,323
Amboseli	30% irrigation	(33,405 * 0.3)	
National Park	70% pastoralism	+ (406 * 0.7)	10,306
Shimba Hills National Reserve	100% Small scale mixed farming-medium potential	24,418	24,418

Source: own calculation using figures of Mwau.[20]

for guarding, represent the largest category of production costs after the opportunity costs of land. However, whether this cost category has to be considered in a cost benefit analysis depends on the reference situation. Before the establishment of the sanctuary, the landowners had to spend even more time for guarding, because they could not take advantage of the fences. If the reference situation is the actual situation prior to the establishment of

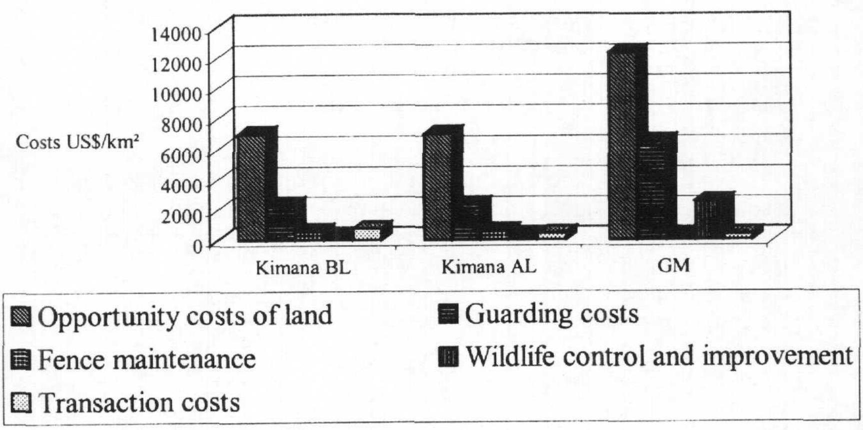


Figure 3. Annual production and transaction costs in the operational phase.

the sanctuaries, the landowners have the benefit of reduced guarding costs. These reductions in time spent for guarding will, therefore, be considered as a benefit in the financial cost-benefit analysis, which captures the landowners' perspective. In the economic analysis, the guarding costs arising after the establishment of the sanctuaries will be considered as costs, because—as explained above with regard to the opportunity costs of land—the reference situation for the economic analysis is considered here as one where the wildlife numbers are so low that no problems for crop farming exist.

Figure 3 also shows that the production costs of GM sanctuary are higher than those of Kimana before and after the lease.[21] A major reason is that the GM landowners failed to function well as an organization. Conflicts emerged due to inadequate representation of the ancestral landowners and from heterogeneity within the landowners and across the stakeholder groups. There were often disputes on the implementation of some initial agreements, which led to increased production costs. An example is the delayed fencing of the Golini side of the sanctuary. As a consequence of the delay, the ancestral landowners had to continue to guard their farms against wildlife passing through areas that had already been designated (but then disputed) for fencing. This is an example that illustrates how management problems can influence production costs. Other stakeholders incurred costs when they assisted the landowners in reducing their costs. For instance, the Cliff area landowners provided vehicles for supervision activities and the Eden Wildlife Trust paid the salary of the sanctuary manager, while KWS together with Eden Wildlife Trust and another NGO invested in the translocation of trouble animals to other protected areas.

5.2.2 Transaction Costs

Transaction costs in the operational phase arise from landowners' participation in management meetings, conflict resolution and supervision of some activities to ensure compliance with the agreements. In the Kimana case, the number of management meetings was higher when the local landowners were directly involved in the management activities. Therefore, the transaction costs tended to be higher under the local management committee than under the lease arrangement. As shown in Fig. 3, the transaction costs were in all cases comparatively low as compared to the different categories of production costs.

5.3 Comparison of Investment and Operational Costs

Comparing the costs incurred for the establishment of the sanctuary with the operational costs (see Table 3), one has to note that the costs of the

Kimana sanctuary during the investment phase were lower than the production costs arising every year during the operational phase. This is due to the comparatively high opportunity costs of land and the guarding costs. As the investment costs can be depreciated over a period of at least ten years, it is obvious that the transaction and production costs arising for the establishment of the Kimana sanctuary are not an important category of costs to be considered in assessing the efficiency of this organization. In the GM sanctuary, the production and transaction costs arising during the investment phase are comparatively higher. However, if they are depreciated over time, they do not play a major role either.

5.4 Comparison of Cost and Benefits of the Different Governance Structures

5.4.1 Cash Expenditure and Revenues of Community Sanctuaries and State-Managed Protected Areas

As a first step of the cost-benefit analysis, Table 6 compares the cash expenditure and cash revenues of the two state-managed protected areas and the two community sanctuaries in the study areas. In this first step, no valuation problems concerning opportunity costs and intangible benefits occur. Table 6 lists the cash expenditure and revenues of all stakeholders involved that can be attributed directly to wildlife management. In this sense, the figures can be considered as "direct" expenditure and revenues of wildlife management. For the Kimana Sanctuary, two groups of figures representing management arrangements before and after leasing the Sanctuary to African

Table 6. Cash Expenses and Revenues of the Two Community Sanctuaries and the Adjacent State Managed Parks

Park (or Reserve) and Sanctuaries	Area (km^2)	Direct Management costs/km^2/year (US$)	Revenue/ km^2/year (US$)	Ratio: Revenue/ Direct Management Costs
Amboseli N.P.	390	550	5848	10.63
Kimana Sanctuary (BL)[a]	60	394	295	0.75
Kimana Sanctuary (AL)[a]	60	698	884	1.27
Shimba Hills N.R.	217	718	1340	1.87
GM Sanctuary	36	787	508	0.65

[a]BL = before lease to African Safari Club, AL = after lease to African Safari Club.
Source: own research.

Safari Club (Kimana BL and Kimana AL, respectively), are presented. The revenues shown in Table 6 consist of the gate receipts from tourists. Other tourism-related income, for example, from tours and hotel operators, travel agencies, etc., is not included. Donations from individuals and non-governmental organizations that are not specific to wildlife management, such as investment in health facilities, have been excluded, too.

The results in Table 6 show that, due to economies of scale, the direct costs per km^2 per year of managing the protected areas are lower than those of the adjacent community sanctuaries. However the revenues per km^2 per year of the protected areas are also higher since they have higher wildlife numbers and more tourist attracting facilities. The computed ratio of revenues and direct management costs indicates that Kimana after lease (Kimana AL) and the two state-managed protected areas earn substantial revenues, which offset their direct management costs. This is not the case in the Kimana sanctuary before the lease (Kimana BL) and in the GM sanctuary.[22] This indicates that the revenues of the sanctuaries depend on the type of management arrangements. In the Kimana case, leasing the sanctuary to private tourism business operators led to an increase in benefits that outweighed the increased costs of the new management.

The results also show that Amboseli National Park and Kimana Sanctuary, which are located in the semi-arid areas, have higher revenues and lower costs than Shimba Hill National Reserve and GM Sanctuary, which are located in the humid tropical areas. This is due to the higher abundance and larger variety of wildlife in the semi-arid area, which can be more easily observed by the tourists than the wildlife in humid regions.

5.4.2 Financial Analysis

The financial analysis is carried out here for the landowners, as the most important stakeholder. Therefore, only the costs incurred by them and the benefits received by them are considered. The cash outflows for this analysis are the direct management costs and landowners' opportunity costs of land as well as their labor input in fence maintenance and their participation in the management of the sanctuaries. The inflows include the revenues from the entrance fees paid by the tourists and landowners' savings in guarding costs and crop losses (see Table 7). As described in Sec. 5.2.1, the installation of electrical fences in both sanctuaries led to a reduction of the time needed for guarding the farms and reduced the crop losses.[23] These reductions are considered as benefits in the cost-benefit analysis. The fence in Kimana encloses only the private farms and one agriculturally important swamp area, thus leaving all other areas exposed to crop damage. Likewise,

Table 7. Financial Cost-Benefit Analysis of the Community Sanctuaries (in US $)

Size		Kimana BL 60 km²	Kimana AL 60 km²	GM 36 km²
Production costs	Land opportunity costs[a]	17,100	17,100	0
	Direct management costs	23,700	41,900	27,800
	Fence maintenance	35,500	35,500	8,200
Transaction costs:	Costs of participation	45,800	26,400	6,200
Total outflows		122,000	121,000	42,200
Revenue (entrance fees from tourists)		17,700	53,100	18,300
Savings on guarding costs		56,300	56,300	24,100
Savings due to reduced crop losses		25,400	25,400	8,100
Total inflows		99,400	134,800	50,500
Net benefit		−22,600	13,800	8,400
Initial capital investment		56,400	56,400	424,000
Benefit: cost ratio[b]		0.77	1.05	0.52
Financial net present value[c]		−207,700	45,600	−320,300

[a]It is estimated that the returns of the Kimana pastoralists in the presence of wildlife are about 30% of the potential returns from pastoralism in arid and semi-arid areas. The GM landowners do not have such returns since they could not carry out farming in the presence of elephants at all.
[b]The benefit-cost ratio is calculated by dividing the present worth of the benefit stream by the present worth of the cost stream.
[c]The net present value is the present worth of the incremental net benefit.
Source: own research.

the GM sanctuary is not fully enclosed by the fence. The Kimana fence is better maintained than that of GM, but both do not prevent crop damages by small wildlife species. Based on the information collected from the landowners, the proportion of time saved in crop guarding is estimated to be approximately 30 percent in Kimana and 10 percent in GM. Due to fencing, most of the vulnerable farms in both Sanctuaries are completely isolated from the sanctuary. Therefore, it is estimated that the crop losses are reduced by about 50 and 60 percent in Kimana and GM, respectively. The annual net cash flows are discounted at a real rate of 12%, which corresponds to the 1999–2000 opportunity cost of capital in Kenya. The operating time for the sanctuaries is assumed to be 25 years. Even though the sanctuaries are intended to exist for a longer time span, a different technical and institutional set-up requiring new investment may be necessary after such a time span. The initial capital investment is derived from Table 3.

The results in Table 7 show that the net present value for the local management committee arrangement (Kimana BL) is negative while that of the lease arrangement (Kimana AL) is positive. This is due to increased benefits from tourism, which were created by the new management, as discussed in the preceding section. In the GM sanctuary, the discounted benefits cover only half of the discounted costs. Therefore, subsidies are necessary to make the sanctuary financially attractive from the landowners' point if view. Indeed, other stakeholders like the Cliff area landowners forgo cash benefits in order to increase the share that goes to ancestral landowners. They also supply technical expertise to enhance the generation of tourism revenues. Interpreting the figures in Table 7, one also has to keep in mind that the reference situation is the farmers' situation before the establishment of the sanctuary, where they already suffered losses due to the presence of wildlife. If the reference situation was one without wildlife damages, their opportunity costs of land would be much higher.

In the sensitivity analysis (see Tables 8 and 9), the impact of a variation of the different cost and benefit positions is evaluated. As the benefit-cost ratio of the base case of Kimana AL is only slightly above one, the profitability of this organization is affected most by changes in the inflow and outflow parameters. With the exception of a 25% increase of the opportunity costs of land or a 25% increase in the landowners' participation costs, an increase in costs or a reduction in revenues leads to a benefit-cost ratio below one, indicating that the sanctuary would not be profitable in these cases.

Kimana BL remains financially unprofitable, even with higher variations (50%) of inflows and outflows. Only if the savings on crop losses would reach 70%, the sanctuary would become profitable from the landowner's point of view. As Table 9 shows, the GM Sanctuary would only become profitable, if a comparatively high reduction on guarding costs could be achieved.

The results of the financial analysis expectedly show that transaction costs (landowners' participation costs) are not a major factor influencing the efficiency of wildlife management organization in situations where production costs play a major role. The impact of the transaction costs on overall efficiency is larger in Kimana BL, where community members are more involved in the management, and where the direct assistance from other stakeholders is comparatively low.

The sensitivity analysis shows that the two cases of collaborative management, where the local users play the major role in the management (Kimana BL and GM) are not financially viable. Therefore, the question arises which incentives the landowners had to convert their land nevertheless into sanctuaries. They may have overestimated the benefits of the

Table 8. The Effect of Change of Outflow Base Parameters on the Benefit: Cost Ratio of the Different Management Arrangements

	Benefit: Cost Ratios		
	Kimana BL	Kimana AL	GM
Land opportunity costs			
150% of base value	0.72	0.99	0.52
125% of base value	0.74	1.02	0.52
Base value	0.77	1.05	0.49
75% of base value	0.80	1.09	0.52
50% of base value	0.82	1.13	0.52
Direct costs			
150% of base value	0.70	0.90	0.46
125% of base value	0.74	0.97	0.49
Base value	0.77	1.05	0.49
75% of base value	0.81	1.14	0.56
50% of base value	0.85	1.26	0.61
Fence maintenance			
150% of base value	0.68	0.92	0.50
125% of base value	0.72	0.98	0.48
Base value	0.77	1.05	0.49
75% of base value	0.83	1.13	0.50
50% of base value	0.89	1.22	0.55
Landowners participation			
150% of base value	0.65	0.95	0.51
125% of base value	0.71	1.00	0.48
Base value	0.77	1.05	0.49
75% of base value	0.84	1.11	0.50
50% of base value	0.93	1.17	0.54

Source: own research, based on figures of Table 7.

conversion. One also has to consider the fundamental issue of property rights. The property rights to the wildlife on the land owned by the local communities belong to the state, in this case the KWS. The landowners also feared that the state could expropriate their land for the expansion of the protected areas. A situation in which they could retain their property rights to the land appeared preferable to them, especially because they could also expect revenues from tourism and subsidies from NGOs, donors and the government. They also anticipated benefits from reduced human-wildlife conflicts, including the intangible benefit of reduced human casualties

Table 9. The Effect of Change of Inflow Base Parameters on the Benefit: Cost Ratio of the Different Management Arrangements

	Benefit: Cost Ratios		
	Kimana BL	Kimana AL	GM
Revenue from tourism			
150% of base value	0.84	1.26	0.62
125% of base value	0.80	1.15	0.53
Base value	0.77	1.05	0.49
75% of base value	0.73	0.95	0.44
50% of base value	0.70	0.84	0.43
Savings on guarding costs			
40% savings	0.91	1.20	1.27
30% savings (base value for Kimana BL&AL)	0.77	1.05	1.02
10% savings (also base value for GM)	0.48	0.76	0.52
0% savings	0.33	0.61	0.27
Savings on crop losses			
70% savings	1.03	1.32	0.57
60% savings (also base value for GM)	0.87	1.15	0.52
50% savings (also base value for Kimana BL & AL)	0.77	1.05	0.50
40% savings	0.70	1.00[a]	0.48

[a] This value rounds up to 1.00 from 0.998. Its net present value is –900. Thus Kimana AL is not financially viable with 40% savings on crop losses.
Source: own research, based on figures of Table 7.

caused by wildlife. The establishment of the sanctuaries also induced local and international donors to reward them with benefits that are not directly related to wildlife and therefore not included in the above analysis. Examples are infrastructure development like provision of schools, clinics, cattle dips, etc., and school bursaries for the poor households.

5.4.3 Economic Analysis

This section assesses the efficiency of the sanctuaries from the society's point of view, using an economic cost-benefit analysis. As indicated above, we assume in this analysis that the base line situation is one where wildlife density is so low that no damages to other activities occur. Therefore, the full opportunity costs of land calculated in Sec. 5.2.1 (see Table 5) have to be taken into account. The economic analysis also requires the use of shadow prices. In order to calculate the shadow prices for land, one has to consider that tax exemptions to agricultural inputs and other protective measures in Kenya target the large-scale farmers. As indicated by Mwau,[24] small farmers like the ones being dealt with in this paper benefit only from tax exemptions for fertilizer but have to pay taxes for seeds and small-farms implements. The opportunity costs calculated in Sec. 5.2.1 are therefore adjusted upwards by ten percent in order to reflect the real values to the society.

The production costs incurred by other stakeholders than the landowners are also taken into account here, for example, the costs for wildlife translocation, the salaries of technical advisors, etc. As wildlife conservation is coupled with tourism, the full costs and benefits of these enterprises arising for the society are taken into account here. The costs for establishing tourist facilities have been adapted from Emerton,[25] who shows that US$ 754,940 are spent to facilitate wildlife viewing in Kenya in an area of 100 km^2. Since this estimate is based on one game camp or lodge for 100 km^2, it is also applied to the two protected areas.[26] The transaction costs used in this economic analysis include the opportunity costs of landowners' participation in meetings, costs of other stakeholders during monitoring, enforcement of agreements, conflict resolution and organizing the landowners. One also has to consider the depreciation of the transaction costs incurred during the investment phase, and the transaction costs from tours and game viewing services. Following Gittinger's[27] recommendation of applying constant rather than current prices in economic analysis, all the above costs exclude adjustments for inflation[28] and interest rates. To reflect general unemployment and social pressure, the shadow price for unskilled and semi-skilled labor was estimated by reducing the actual wages by 30%.[29] A foreign exchange premium of nine per cent was added to the prices of tradable items in order to make adjustments for price distortions in traded and non-traded goods and services. All capital is assumed to have an opportunity cost of 12 percent, which reflects the real value of discount rate.

The local benefits shown in Table 10 are derived mainly from the direct gates' receipts from visitors. As Goessling[30] calculates, the gate receipts in developing countries are typically only 0.01–1% of the gross revenue from such tourism, while the net revenue remaining in the developing country is in the range of 20–40% of the gross revenue. The latter figure is supported by the Norton-Griffiths'[31] studies in Kenya. He estimates that the net economic returns from eco-tourism range from 24–40% of the gross revenues. Thus, after assuming the gate receipts to be 1% of the gross revenue, the net local economic returns accruing to Kenya are

Table 10. Costs and Benefits (at Shadow Prices) of the Two Community Sanctuaries and the Adjacent State-Managed Parks

	Kimana (BL)	Kimana (AL)	GM	SHNR	ANP
Area (km^2)	60	60	36	217	390
Production costs					
Land use opportunity costs	462,400	462,400	488,000	5,839,300	4,424,200
Direct costs including depreciation of initial capital	26,000	46,100	30,500	172,000	236,100
Guarding and fence maintenance	124,200	124,200	172,500		
Income losses to other activities	56,500	56,500	13,100	79,000	367,600
Direct contributions from other stakeholders	14,300	24,700	102,200		
Tours, hotels and other services[a]	830,400	830,400	830,400	1,985,900	3,564,900
Transaction costs					
Opportunity costs of landowners participation	31,800	18,300	4,100		
Transaction costs of organizing landowners	1,200	200	8,900		
Depreciation on investment transaction costs[b]	500	500	900		
Transaction costs from tours and hotels operations[c]	41,500	41,500	41,500	99,300	178,200
Total costs (TC)	1,588,900	1,604,900	1,692,300	8,175,500	8,771,000

(continued)

Table 10. Continued

	Kimana (BL)	Kimana (AL)	GM	SHNR	ANP
Local benefits (LB)	566,800	1,698,200	585,500	9,322,900	73,032,700
Benefit: cost ratio (LB)	0.36	1.05	0.34	(1.12)[e]	(8.30)[e]
Other domestic benefits[d]	108,000	108,000	64,800	391,320	702,500
Total domestic benefits (DB)	674,800	1,806,200	650,300	9,714,200	73,735,200
Benefit: cost ratio (DB)	0.42	1.12	0.37	(1.16)[e]	(8.38)[e]
Global benefits[d] (GB)	648,000	648,000	388,800	2,347,920	4,214,800
Total Benefits (TB)	1,322,800	2,454,200	1,039,100	12,062,100	77,950,000
Benefit: cost ratio (TB)	0.83	1.52	0.59	(1.45)[d]	(8.86)[d]
Social profit (TB-TC)	−266,100	849,300	−653,100	(3,886,600)	(69,179,000)

[a]Emerton's 1997 figure of US$ 754,940 (the cost of game viewing per 100km^2) has been adjusted by 10% due to inflation.
[b]Just like the production costs, it is estimated that the investment transaction costs will depreciate at a rate of 2.5% p.a.
[c]The transaction costs for the tours and hotels operators are assumed to be 5% of the total costs of game viewing.
[d]Figures from Norton-Griffiths,[32] reduced by 10% to take decline of biological diversity in the last decade into account.
[e]Benefit: cost ratios of protected areas are in parentheses since they are just estimates after assuming that their investments costs per unit area could be as less as 50% of those of the adjacent community sanctuaries. This assumption takes into consideration the fact that these costs were lower than those of the sanctuaries due to economies of scale and non-involvement of the local landowners and conservation NGOs.
Source: own research, including data from Emerton[25] and Norton-Griffiths.[33]

estimated using the figure of 32%, which is the average of the range calculated by Norton-Griffiths.

The domestic benefits include other direct and indirect use values from forestry, watershed services (erosion and floods control), etc., and non-use values. The figures for these benefits are taken from Norton-Griffiths,[34] who calculated a mean value of US$ 20 per hectare for these benefits. The global benefits were estimated by Norton-Griffiths[33] to be US$ 120 per hectare. This value is also used in the economic analysis here. Due to worsening economic conditions and, hence, increased illegal harvesting of natural resources and poaching of wildlife,[34] the 1989 values for domestic and global benefits have been adjusted downwards by ten percent in order to reflect the estimated current level of benefits.

After including the initial investment costs from Table 3 (only for the community sanctuaries), the benefits for each organization/arrangement are calculated for the three different levels of the benefits (i.e. local, domestic and global). The economic benefit: cost ratios are then calculated on the basis of the benefits and costs that are discounted at a real rate of 12% for an investment period of 25 years.

The results of this economic analysis show a pattern that is similar to that of the financial analysis. Even if global benefits are taken into account, Kimana BL and the GM Sanctuary do not become profitable. However, one has to take into consideration that the values calculated by Norton-Griffiths are country values and not values from a specific region. Therefore, it is not possible to take into account the regional variation of the cases presented here. The GM sanctuary and the Shimba Hills National Reserve, which are characterized by tropical forests, are most likely to have higher benefit values than the semi-arid regions.

What is interesting with regard to interorganizational efficiency is the fact that even without considering the national and global benefits, the introduction of a lease arrangement with a private company rendered the Kimana Sanctuary economically viable. A sensivity analysis (see Tables 11 and 12) showed that only reductions in the local benefits from tourism would render this arrangement unprofitable, while other parameter changes hardly affect its profitability. The sensivity analysis also showed that Kimana BL and the GM Sanctuary remained unprofitable, if inflow and outflow parameters were to change in ranges between 25 and 50%. However, interpreting the results one has to keep in mind that the analysis did not take into account intangible benefits such saving human life that was made possible by fencing. Likewise, the calculation does not take into account other incentives of the landowners to agree to the establishment of the sanctuaries, as discussed in connection with the financial analysis in Sec. 5.4.2.

Table 11. Effect of Changing the Benefit Parameters on the Benefit: Cost Ratios of the Different Management Arrangements (Domestic Level)

	Benefit: Cost Ratios		
Parameters	Kimana BL	Kimana AL	GM
Tourism or local benefits			
150% of base value	0.60	1.65	0.54
125% of base value	0.51	1.38	0.46
Base value	0.42	1.12	0.37
75% of base value	0.33	0.86	0.29
50% of base value	0.25	0.59	0.20
Other domestic benefits			
150% of base value	0.46	1.15	0.39
125% of base value	0.44	1.14	0.38
Base value	0.42	1.12	0.37
75% of base value	0.41	1.10	0.36
50% of base value	0.39	1.09	0.35

Source: own calculations on the basis of the Figures in Table 10.

6 DISCUSSION

6.1 Challenges of Calculating Costs and Benefits of Wildlife Conservation

The empirical case study shows that the calculation of the costs and benefits of wildlife conservation, as theoretically discussed in Sec. 2, is confronted with valuation problems and with problems caused by a wide variety of influencing factors. Figure 4 summarizes these factors. As shown in the cases under consideration, bio-physical and ecological factors can cause production costs of wildlife conservation that are orders of magnitude higher than the transaction costs (see Fig. 2). In the cases under consideration, comparatively high costs were incurred for protection of crops from damages caused by wildlife. The costs incurred for preventing wildlife damages were influenced by wildlife densities and the available fencing technology rather than by the organizational structure. These costs mainly consisted in the opportunity costs of the farmers' time spent for guarding, which are subject to valuation problems because they vary between farm households and fluctuate during the year.

Table 12. Effect of Changing the Cost Parameters on the Benefit: Cost Ratios of the Different Management Arrangements (Domestic Level)

	Benefit: cost ratios		
Parameters	Kimana BL	Kimana AL	GM
Land opportunity costs			
150% of base value	0.37	0.98	0.33
125% of base value	0.39	1.05	0.35
Base value	0.42	1.12	0.37
75% of base value	0.46	1.21	0.40
50% of base value	0.49	1.31	0.43
Direct management costs			
150% of base value	0.42	1.10	0.37
125% of base value	0.42	1.11	0.37
Base value	0.42	1.12	0.37
75% of base value	0.42	1.13	0.37
50% of base value	0.43	1.14	0.37
Guarding costs			
150% of base value	0.41	1.08	0.35
125% of base value	0.41	1.10	0.36
Base value	0.42	1.12	0.37
75% of base value	0.43	1.14	0.38
50% of base value	0.44	1.17	0.39
Losses to other economic activities			
150% of base value	0.42	1.10	0.37
125% of base value	0.42	1.11	0.37
Base value	0.42	1.12	0.37
75% of base value	0.43	1.13	0.37
50% of base value	0.43	1.14	0.37
Contributions from other stakeholders			
150% of base value	0.42	1.11	0.36
125% of base value	0.42	1.12	0.37
Base value	0.42	1.12	0.37
75% of base value	0.42	1.12	0.38
50% of base value	0.42	1.13	0.38
Tourism services' costs			
150% of base value	0.33	0.88	0.30
125% of base value	0.37	0.99	0.33
Base value	0.42	1.12	0.37
75% of base value	0.49	1.30	0.43
50% of base value	0.58	1.54	0.50

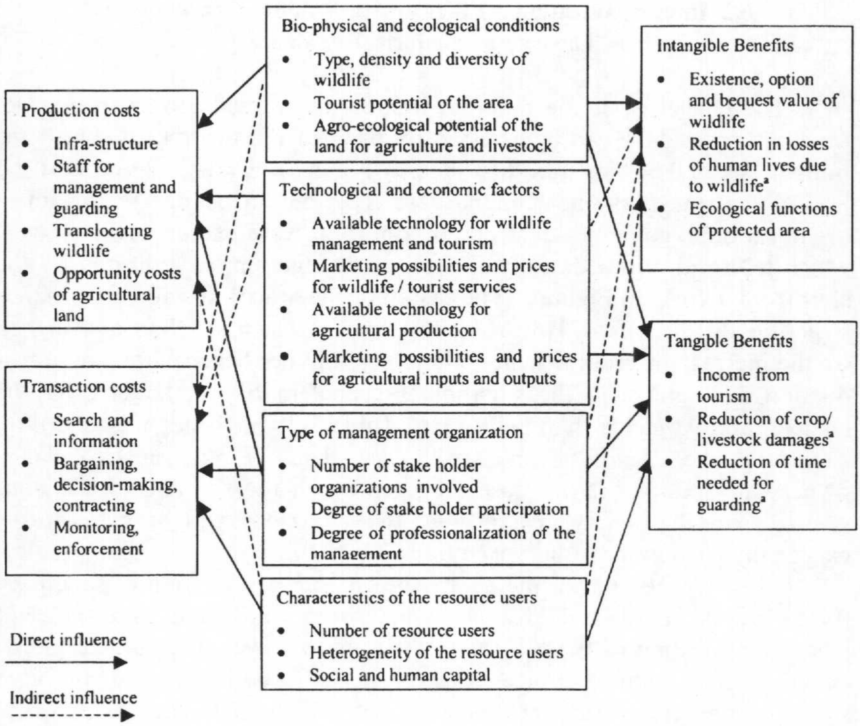
(*continued*)

Table 12. Continued

Parameters	Benefit: Cost Ratios		
	Kimana BL	Kimana AL	GM
Landowners participation			
150% of base value	0.42	1.11	0.37
125% of base value	0.42	1.12	0.37
Base value	0.42	1.12	0.37
75% of base value	0.42	1.12	0.37
50% of base value	0.43	1.13	0.37
Transaction costs from tourism services			
20% of the tourism production costs	0.39	1.04	0.35
10% of the tourism production costs	0.41	1.09	0.36
Base value (5%)	0.42	1.12	0.37
2.5% of the tourism production costs	0.43	1.13	0.38
1.25% of the tourism production costs	0.43	1.14	0.38

Source: own calculations on the basis of the figures in Table 10.

Costs related to the type of management organization, such as participation in management meetings, were relatively unimportant as compared to these production costs. This result indicates that the argument in literature concerning ex ante and ex post transaction costs in determining efficient governance structures[35] has to be placed in perspective. In situations where production costs play such an overwhelming role, the transaction costs arising for collective action, participation, negotiation and other activities required for the establishment of a collaborative management are not a major factor influencing the efficiency of such an interorganizational governance structure. Together with economic factors, the bio-physical and ecological conditions also influence the opportunity costs of land, which represented the largest single cost category in the cases considered here. At the same time, the bio-physical and ecological conditions influence the tourism potential, which determines together with economic factors such as the demand for such tourism, the level of benefits. In the cases under consideration, the humid area had a higher agro-ecological potential and at the same time a lower tourism potential, which negatively affected the efficiency



[a]In the case studied here, the establishment of a sanctuary included fencing and, thus, reduced the damages caused to people, crops and livestock. It also reduced the time that farmers spent for guarding. In other cases, the establishment of a sanctuary may have the opposite effect because of increased wildlife density. In that case, increased damages should appear as additional costs on the left-hand side of the graph.

Figure 4. Factors influencing production and transaction costs in wildlife management.

of wildlife conservation in this area. This important role of bio-physical and ecological factors in determining the costs and benefits of wildlife conservation also demonstrates the challenge arising for quantitative statistical studies on interorganizational efficiency in wildlife conservation: It appears close to impossible to get a sufficiently large set of wildlife conservation areas with different types of management organization within the same ecological region. Therefore, the case study approach will continue to play a major role in this field.

6.2 Interorganizational Efficiency in Wildlife Conservation: Theory and Empirical Evidence

The efficiency of the different interorganizational governance structures presented here can be assessed on basis of the theoretical considerations in Sec. 2.1, which are illustrated in Figure 1. Table 7 shows that the lease arrangement in the Kimana case represents a change in the interorganizational governance structure (more private sector involvement), which led to an upwards shift of the benefit function, as indicated by the shift from Y to Y′ in Figure 1. The costs associated with the new governance structure also increased. However, this increase was more than outweighed by the increase in gross benefits. Therefore, the net benefit after the introduction was, unlike in the situation indicated in Fig. 1, larger after the change in governance than before (see Table 7). This result was relatively robust, as the sensitivity analysis showed. Table 7 represents the landowners' perspective. If the lease arrangement in the Kimana case is considered from the society's perspective, the increase in benefit: cost ratio is expectedly even more pronounced (see Table 10).

As Table 10 shows, the establishment of the community sanctuary (GM) located in the humid area could not be considered as an efficient measure according to the Kaldor-Hicks criterion, even after taking global benefits into account. However, this result has to be interpreted with care since the figures for the benefits were not site-specific. The value to the society of conserving wildlife in such areas may be particularly high. This demonstrates the importance of valuation problems in calculating efficiency in nature conservation. With regard to the theoretical considerations of Sec. 2.1, the GM sanctuary may be interpreted as a case, where the establishment was motivated by the ecological considerations (see Sec. 3) to achieve a critical minimum level of wildlife conservation, which is indicated by line M in Fig. 1. It was, however, beyond the scope of this paper to assess to which extent biological and ecological data support the assumption that the area placed under protection in the GM case indeed represents such a critical minimum level. In the GM case, a loss, as indicated by the distance L in Fig. 1 occurred. However, as discussed in Sec. 2.1, it depends on the perspective and the valuation of the benefits whether or not such a situation is to be judged as inefficient.

The empirical case study did not intend to compare the efficiency of community-managed and state-managed conservation areas, because it concentrated on the community-based area, and it was not possible in the scope of this study to collect sufficient data on the state-managed areas. If only the costs considered in Table 10 for the state-managed areas are taken into account, these areas would have to be considered to be more efficient than the community-based sanctuaries (see Figures in parentheses in Table 10). However, it is not clear to which extent this is due to economies of scale, which could favor the larger state-managed protected areas.

6.3 Policy Implications

The assessment of the efficiency of different interorganizational governance structures in wildlife conservation makes it possible to derive some policy implications. One implication is to pay attention to the problem that collaborative wildlife management may be efficient from the society's perspective, but inefficient from the landowners' perspective, especially if the opportunity costs of land and time are taken into account. In this case, considerations of distributional justice may require a compensation of the landowners. It was beyond the scope of this paper to evaluate how such compensation could be organized. It is, however, important with regard to interorganizational governance structures that the establishment of community sanctuaries provides at least one opportunity for compensating local users, because it allows the community members to receive benefits from tourism and subsidies for measures, such as fences, to reduce wildlife damages. Whether the establishment of collaboratively managed community arrangements is more efficient for providing such benefits than other arrangements is a question of interorganizational efficiency that needs further consideration.

Even though transaction costs did not constitute a major cost category in the cases under consideration, it is from a policy perspective nevertheless useful to study differences in the transaction costs incurred under different governance structures. In the GM case, the lack of an already existing organization, the lack of self-organizational capacity and the heterogeneity of the landowners were among the key factors that contributed to the relatively high costs of the local communities' participation in wildlife management in this case. This result has policy implications because it allows us to draw conclusions concerning economies of scale. While larger community-based sanctuaries can make it possible to save production costs due to economies of scale (e.g., in fencing), the transaction costs of organizing collective action may increase. The larger the sanctuary, the larger and the more heterogeneous the membership of the resource users will become, and the higher will be the transaction costs incurred.

The case study also illustrates the advantages of combining organizations from different sectors in an interorganizational governance structure, if there are different types of business enterprises that are closely coupled, such as wildlife conservation on the one hand and tourism enterprises on the other hand. The lease arrangement in the Kimana case allowed the stakeholders to integrate the high management capacity of a private sector organization in the field of tourism. The increase in benefits from tourism created by this interorganizational arrangement outweighed the increased management costs to a considerable extent.

7 CONCLUDING REMARKS

In conclusion, this paper shows that the calculation of interorganizational efficiency in wildlife conservation is confronted with a number of challenges. Major challenges are caused by valuation problems and by the prominent role that bio-physical and ecological factors play in influencing the costs and benefits of conservation. In empirical studies, it is, moreover, difficult to distinguish scale effects from effects that can clearly be attributed to the management organization. The issues discussed here for the case of wildlife are likely to be relevant for biodiversity conservation in general. More empirical work is, therefore, required to overcome these challenges and to identify governance structures that are able to conserve biological resources of global relevance without compromising the development aspirations of the local communities.

8 ACKNOWLEDGMENTS

The authors gratefully acknowledge the financial support of Ökumenisches Studienwerk e.V (Bochum) for this research. We are also grateful to the Kenya Wildlife Service (KWS) and the stakeholders of the two community wildlife sanctuaries for making this research possible and providing us with both primary and secondary data. We would like to thank Heidi Wittmer for useful comments on an earlier draft of the paper. Any errors or omissions are solely the responsibility of the authors.

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19. AL and BL stands for "before lease" and "after lease" to African Safari Club respectively.
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21. The production operational costs for Kimana BL and Kimana AL do not differ a lot because over 90% of them emanate from guarding farms and fence maintenance. However as shown in Sec. 5.3, the direct management costs of the latter organisation are almost double of those of the former.
22. The failure for GM sanctuary to meet its costs is evidently supported by its trading and profit/loss accounts. For example, from 1997 to 1999, it had an annual loss of US$1,300 even after taking account of an infusion of US$21,490 per year as cash donations from non-governmental organisations and friends of the Cliff area landowners (source: audited reports).
23. Since the fence cannot prevent the wildlife from attacking human beings and livestock, it is assumed that landowners savings arise only from reduced time of guarding and crop losses.
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26. Even if the sanctuaries are less than 100 km^2, each has only one Game camp. Amboseli has four Game lodges while Shimba Hills is served by many hotels since it is located nearer to the coastal beaches.
27. Gittinger, quoted above,[17] 126.
28. Adjustments for inflation have however been done for those values estimated earlier than the year 2000.
29. In the OECD project evaluation guidelines, 25% is recommended by Little/Mirrlees (quoted by Gaspary and Schmidt, 1984) as the upper limit of the value that should be applied to convert actual wages to shadow ones. However, with an ever rising unemployment level in Kenya, 30% is applied instead.
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