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THE ECONOMIC DIMENSION TO HUMAN/WILDLIFE CONFLICTS

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SUMMARY

Human/wildlife conflicts in Kenya are much wider in scale and scope than trampled crops, predated cows and gored children. Acute conflicts result in the direct loss of human life and in tangible losses and damage to property, crops and livestock. In contrast, Chronic conflicts arise from non-tangible losses to livestock production and result in the pernicious loss of wildlife and biodiversity throughout the rangeland areas of Kenya.

Within the developed agricultural areas of Kenya we see the total eradication of large wildlife; the gradual erection of physical barriers between the fixed agricultural boundary and neighbouring wildlife areas; the targeted destruction of "problem" animals; and the displacement of wildlife along the expanding agricultural frontier. Similarly, in pastoral areas we see the near total eradication of large wildlife; the near total avoidance of wildlife by livestock in both time and space; the displacement of wildlife by expanding human settlement; the non-targeted destruction of problem animals – especially predators; and the erection of protective barriers (especially for livestock).

These characteristically "defensive activities" have the same objectives: to eliminate (in agricultural areas) and reduce (in pastoral areas) the interactions and conflicts between wildlife and people, their crops and their livestock.

Such ubiquitous defensive activities against wildlife suggest underlying economic origins. The analysis of the production functions for crops and livestock clearly demonstrate that while wildlife contribute substantially to production costs they yield few benefits. Even in the "tourist areas" of Kenya the returns to wildlife do not offset their contribution to production costs; neither are the net returns from wildlife competitive against those from either livestock or crops.

The underlying economic origin of these human/wildlife conflicts is to be found with the lack of clearly defined, defensible and transferable property rights to wildlife and, accordingly, to the absence of any economic value of wildlife to the great majority of agricultural and livestock producers. Wildlife are being eliminated on economic grounds: it is not in the economic interests of agricultural or livestock producers to look after them – let alone invest in them as a viable resource.

1: THE SCOPE OF HUMAN/WILDLIFE CONFLICTS

1. Human/wildlife Conflicts (HWC) in Kenya are much wider in scale and scope than trampled crops, predated cows and gored children.
2. HWC fall into two distinct categories, ACUTE and CHRONIC.
 - a. ACUTE conflicts arise from direct and tangible injury to persons or loss of life, and loss and damage to property; while
 - b. CHRONIC conflicts result in the pernicious loss of wildlife throughout the rangelands of Kenya.
3. In Agricultural Areas we see:-
 - a. The total elimination of all wildlife from agricultural areas;
 - b. The erection of physical barriers between the fixed agricultural boundary and wildlife reserves (e.g. Mount Kenya);
 - c. The targeted destruction of "problem animals" (e.g. elephant, crocodiles); and
 - d. The displacement of wildlife, but not livestock, from the expanding agricultural frontier (Figure 1).
4. But in Pastoral Areas we also see:-
 - a. The near total eradication of all wildlife (>50% loss in 30 years);
 - b. The near total avoidance of wildlife by livestock in both time and space (Table 1);
 - c. The displacement of wildlife by the expanding agricultural frontier (Figure 1) and by the expanding settlement frontier (Figure 2);
 - d. The non-targeted destruction of "problem animals" (e.g. predators); and
 - e. The erection of protective barriers between wildlife and livestock (bomas, fences).
5. Both are accompanied by a wide range of "defensive activities" which have the objective to eliminate (in Agricultural areas) and reduce (in Pastoral areas) the interactions and conflicts between wildlife and people, their crops and livestock. These suggest a common economic basis to these conflicts.

2: THE ECONOMIC BASIS OF HWC IN KENYA

ACUTE Conflicts – primarily in agricultural areas

6. The mean net returns from agricultural activities increase along the rainfall gradient (Figure 3) from around \$10 ha⁻¹y⁻¹ at 200mm rainfall to around \$225 ha⁻¹y⁻¹ at 1200 mm above which net returns level off in the face of lower temperatures.
7. The total elimination of large wildlife from the agricultural areas of Kenya can therefore be interpreted as a defensive activity by landowners to protect the value of their agricultural production. For example, the effect of a single visit by elephants to an irrigated banana operation can be devastating (Table 2), with net revenues per hectare slashed from \$5,200 to \$1,200 – a loss of almost 80%.

CHRONIC Conflicts – primarily in the rangeland areas

8. In rangeland areas, there is a marked difference between the net returns to landowners from agricultural, livestock and wildlife production (Figure 4). Net returns to agriculture are vastly greater than are those to livestock, while the returns to wildlife are so meagre as to be economically uncompetitive with either.
9. Table 2 indicates the potential scale of crops losses from wildlife. Wildlife also impact livestock production (Table 3), reducing net returns by up to 48%.
10. In response to these differential returns to agricultural, livestock and wildlife production, and the negative impacts from wildlife on both agricultural and livestock production, major changes are apparent throughout the pastoral areas since the mid-1970s (Figure 5).
11. With the human population growing at 3.1% per annum the area under cultivation is expanding rapidly at some 8.8% per annum, with over 50% of the most productive land in the rangelands already converted to cultivation (Table 4).
12. The strong growth in livestock sales of 4.4% per annum from a stable livestock herd (the 0.8% per annum growth is not statistically significant) indicates a significant shift from a more extensive to a more intensive approach to livestock management, with greater participation in the cash economy.
13. Meanwhile, wildlife are in a steep decline of -3.2% per annum.

3: THE IMPACT OF WILDLIFE ON PRODUCTION FUNCTIONS

14. Wildlife enter into the production functions for both agriculture and livestock by their impact on the net returns to landowners.

Farm/Ranch Production Function

15. At the individual farm or ranch level (Box 1), the simplest production function takes the form of:-

<p>Box 1</p> <p style="text-align: center;">Farm/Ranch Production Function</p> <p style="text-align: center;">$NB_{FR} = NB_{AGLV} + NB_W + \dots\dots\dots$</p> <p>Where:-</p> <ul style="list-style-type: none">• NB_{FR} = net benefits at farm/ranch level;• NB_{AGLV} = net benefits from agricultural and/or livestock production; and• NB_W = net benefits from wildlife production
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16. This states simply that the Net benefits (NB) at the farm or ranch level are a function of the net benefits from agricultural and/or livestock production and from wildlife production, and from any other economic activities on the ranch.
17. The implication of this function is that if wildlife yield positive net benefits then it will add to the farm/ranch income stream and in turn help lessen HWC and enhance conservation.

Wildlife Production Function

18. A simple wildlife production function (Box 2) relates the net benefits from wildlife to their direct benefits, to their management and compliance costs, and to their social benefits.
19. While management costs are simply those associated with capturing the stream of direct benefits, the compliance costs are those associated with the rules and regulations imposed by the Kenya Wildlife Service (KWS) and National Environmental Management Agency (NEMA). These include annual monitoring of wildlife populations, overcoming regulatory hurdles, and environmental impact assessment of the wildlife operation.

Box 2**Wildlife Production Function**

$$NB_W = DB_W - MC_W - CC_W + SB_W$$

Where:-

- NB = net benefits of wildlife production to the landowner;
- DB = direct benefits – i.e. income from tourism, lodge, cropping or whatever;
- MC = management costs associated with capturing that stream of benefits;
- CC = compliance costs (imposed by KWS and other regulators, e.g. NEMA); and
- SB = social benefits of wildlife (+ve or -ve depending upon the individual landowner)

20. The social benefits of wildlife are also important for they explain why some landowners will tolerate wildlife whatever the cost – they simply like to have wildlife around – while others will never countenance any wildlife on their property whatever the potential benefits.
21. So long as the direct benefits are larger than the management costs ($DB_W > MC_W$) then wildlife production will yield positive net benefits (Example 1 in Table 5). However, if the compliance costs (CC_W) become too high they can seriously erode any positive net benefits from wildlife and make wildlife production uneconomic for the landowner (Example 2 in Table 5).
22. Even where there are no direct benefits of any kind from wildlife, as is the case on 95% of Kenya's rangelands, interference from KWS may make it in the landowners interests to discourage and get rid of wildlife (Example 3 in Table 5).

Agricultural / Livestock Production Function

23. The agricultural/livestock production function (Box 3) shows how wildlife can impact net benefits through their indirect costs (IDC_W) on production.

Box 3**Agricultural / Livestock Production Function**

$$NB_{AGLV} = DB_{AGLV} - MC_{AGLV} - CC_{AGLV} + SB_{AGLV} - IDC_W$$

Where:-

- DB = direct benefits from agricultural and/or livestock production;
- MC = management costs associated with obtaining those benefits;
- CC = compliance costs (veterinary regulations, cess etc);
- SB = social benefits; and
- **IDC_W** = Indirect Costs of Wildlife on farm or ranch production (loss of life and property)

24. It is clear that it is the **IDC_w** which can so reduce the net benefits from agricultural or livestock production that they become uneconomic. In Table 6, these IDC_w are represented by the cost of the single visit by elephants (Example 1) and by the costs of wildlife on livestock production (Example 2).
25. So the key relationship that represents the economic basis of human/wildlife conflicts is between the net benefits of wildlife (NB_w) and the indirect costs of wildlife on ranch production (IDC_w). If:-

$$(NB_w - IDC_w) > 1$$

then conflicts might be resolved, for the net benefits of wildlife are greater than the overall losses to ranch production. If, however :-

$$(NB_w - IDC_w) < 1$$

then conflicts may never be resolved.

26. Taking the analysis of the costs of wildlife (Table 3) and the cropping example (Table 5), and reducing both to the same numeraire of \$ ha⁻¹y⁻¹, it is clear that the net benefits of wildlife from cropping are not sufficient to offset the indirect costs of wildlife on livestock production:-

$$NB_w = \$3.2 \text{ ha}^{-1}\text{y}^{-1} < IDC_w = \$8 \text{ ha}^{-1}\text{y}^{-1}$$

27. It is clear from these simple production functions that HWC will not necessarily be resolved simply by creating positive net benefits from wildlife. Two other important relationships must be considered.
- Compliance costs: which must be kept to as minimum to maximize net benefits from wildlife; and
 - The indirect costs of wildlife on production which may obviate any positive net benefits.

Opportunity Costs To Land

28. However, there is yet another relationship underlying HWC – the opportunity costs to land – which in this context can be defined as the difference between the anticipated benefit stream once the land is developed to its "full potential" and the contemporary benefit stream at current levels of development (Box 4).

Box 4	
Opportunity Cost to Land	
	$OC_{LAND} = NB_{FULL\ DEVELOPMENT} - NB_{AGLV} - NB_w \dots\dots$
Where:-	
OC_{LAND}	= net opportunity costs to land;
$NB_{FULL\ DEVELOPMENT}$	= anticipated net benefits to land once it is developed to its "full potential"; and
NB_{AGLV} and NB_w	= are the contemporary benefit streams at current levels of development

29. The implication of this relationship is that even if things are arranged so that the net benefits of wildlife are greater than their indirect costs on production, HWC will still continue if the net opportunity costs to land are positive ($OC_{LAND} > 1$) especially if land is being held at a low level of development in order to promote conservation.
30. A contemporary example from the group ranches surrounding the Maasai Mara National Reserve shows that:-

$$\begin{aligned}
 NB_{FULL\ DEVELOPMENT} &= \$215m\ y^{-1} \\
 NB_{AGLV} &= \$53m\ y^{-1} \\
 NB_W &= \$12m\ y^{-1}
 \end{aligned}$$

so the net opportunity costs to land are:-

$$OC_{LAND} = \$215m - \$53m - \$12m = \$150m\ y^{-1}$$

31. These opportunity costs of \$150 million each and every year represent the difference between the net income that might be generated were the land to be developed to its full potential and the contemporary net returns from the land. They generate HWC through economic pressure to further develop the land – irrespective of how high the net benefits from wildlife production might be¹.

4: POLICY IMPLICATIONS

32. The policy implication to these analyses is that the root cause of human/wildlife conflicts lie with the indirect costs of wildlife in the production functions at the farm, ranch and household levels.
33. Policy responses (Table 7) must therefore aim either to decrease the indirect costs of wildlife or to increase the direct benefits of wildlife, so that wildlife production (and conservation) can compete economically with agricultural and livestock production – perhaps even to the extent that it can equal or surpass the opportunity costs to land.

Acute Conflicts

34. Acute Conflicts are perhaps the most straightforward to address because by their very nature they are highly specific and constrained in both time and space – the gored child, the predated livestock, the devoured bananas, the destroyed water system.

¹ Some conservationist NGOs are calling for a "freeze" on land development around the Maasai Mara National Reserve to "preserve conservation interests". It is clear that such an action would remove potential income to the landowners of \$150 million each year, thus perpetuating rural poverty (in the name of conservation, of course). Such activities are known as "conservation poverty traps".

35. Compensation schemes function to meet the indirect costs of wildlife that produce tangible losses. Schemes that have been tried include:-
 - a. State funded compensation schemes, specifically for loss of life;
 - b. State funded (or subsidized) and/or privately funded insurance schemes for loss or damage to property, crops and livestock;
 - c. Privately (or communally) funded schemes for loss of livestock to predators (e.g. as on Mbirikani Group Ranch, and on the Kitengela); and
 - d. Privately (or communally) funded grazing compensation schemes (e.g. as on the Kitengela).
36. In contrast, policy instruments to make defensive activities more effective aim to reduce the incidence of acute conflicts. These can include:-
 - a. Erection and maintenance of physical barriers (funded by the state and/or jointly with affected landowners); and
 - b. Crop selection to avoid raiding by wildlife.

Chronic Conflicts

37. Policy instruments to reduce chronic human/wildlife conflicts must aim to raise the economic value of wildlife to landowners so that wildlife production becomes an economic alternative to agricultural and livestock production.
38. Key policy instruments will include:-
 - a. Codify and strengthen the property rights of landowners to wildlife on their land;
 - b. Broaden the economic potentials of wildlife to landowners, specifically by releasing the constraints to consumptive utilisation;
 - c. Reform the tourism cartels so that landowners, the producers and husbanders of wildlife, receive a fairer proportion of wildlife generated revenues; and
 - d. Institutional reforms among those purporting to manage and conserve wildlife within Kenya, namely the KWS, County Councils, Donors and NGOs.

5: ECONOMIC ANALYSIS OF POLICY OPTIONS

39. The policy options outlined in Table 7 must all be subject to detailed economic analysis with the objective of creating and selecting policy instruments that are both economically and socially efficient. A number of key issues must be addressed including property rights, transaction costs and whether regulatory, tax or bargaining principles apply.

Property Rights and User Rights to Wildlife

40. While there are currently no property rights of any kind to wildlife in Kenya there are legally enforceable property rights to the land on which the wildlife are to be found. Through the proper enforcement of these property rights all landowners, which includes the Government and its agents (the KWS and the County Councils), can control access to wildlife and control the nature of development on that land.
41. The Government does, however, regulate the use to which wildlife can be put, both inside and outside the protected areas. Currently the Government allows only non-consumptive use of wildlife through "game viewing", although it does license some game ranching (ostrich, crocodiles, butterflies, chameleons); bird shooting -- both pest control of wildfowl, and game bird shooting on private and communal land; and culling of excess populations (although no use of any kind may be made of the carcasses).
42. It is the weak and conflicting nature of the property rights and user rights to wildlife that lie at the heart of all these human/wildlife conflicts, and to the general loss of wildlife from rangelands For example:-
 - a. Consider why human/livestock conflicts are rarely an issue. Livestock are owned and have value, so their owners accordingly invest in and profit from their upkeep, maintenance and use. As a result, the agricultural areas and rangelands of Kenya are stuffed full of livestock. To avoid conflicts with neighbours livestock are fenced in as much as they are fenced out, and when conflicts do occur there is a strong social fabric within which disputes can be settled and compensation decided upon.
 - b. In contrast, human/wildlife conflicts arise because wildlife are not owned by anyone and accordingly have little or no value to those on whose land they are found. Any damage caused by wildlife is thus seen as a loss – unlike with livestock where benefits in general outweigh costs. And since wildlife have no value they are being eradicated wholesale throughout the country, especially from the rangelands. Indeed, the devastating scale of the bush meat trade in Kenya is a stark reminder of what happens to resources that are neither owned nor have value to the owners of the land where they are found.
 - c. Even where benefits are generated from wildlife, for example from tourism, the benefit streams are too meager to attract investment. In the Protected Areas investment is in tourism (roads, lodges etc.) not in wildlife or habitat management. Outside protected areas, tourism cartels divert revenues away from the producers of wildlife – and profits are taken away, not invested. Extraordinary as it may seem, not a single tourism company in Kenya invests in wildlife or habitat management even though their very economic future depends upon the resource; and neither do landowners. Both decisions stem from the lack of clear cut property rights

to wildlife: not only are the returns from wildlife meager, but why invest in something that is not yours.

- d. Indeed, the only areas where wildlife rents (the profits from wildlife) are reinvested in wildlife and habitat management are on the few, large, private conservancies where fencing effectively gives ownership of wildlife to landowners. Furthermore, the landowners are actively involved in most aspects of the tourism industry and accordingly capture a larger slice of the wildlife rents, making investment even more profitable. These are the only areas in Kenya where wildlife numbers and diversity are stable, or even increasing.
43. Issues of property rights have interesting implications for compensation schemes. Outside protected areas, on land under private or communal ownership, the rights to life and to physical property such as infrastructure, crops and livestock are clear cut and enforceable. But why should the State pay compensation for damage to such property by wildlife if it does not in fact own the wildlife? And does paying compensation imply ownership on the part of the State?
 44. Property rights issues will also effect efforts to raise the economic value of wildlife to landowners, for as we have seen it is not just increased revenues that are important. Landowners must be willing to invest in wildlife, and user rights alone may not be in itself enough to guarantee the required investment in wildlife and habitat management to ensure their long term survival. A degree of ownership is also necessary.
 45. It is often claimed that ownership to wildlife is impossible in Kenya because they move around between properties, but experience suggests this need not be the case:-
 - a. In Europe, for example, landowners invest in raising game birds for the shoot even though they move freely between properties. Conflicts are minimized by neighbouring landowners pooling their access and hunting rights, and by habitat management to keep the birds within defined boundaries.
 - b. This is exactly what is taking place around the Maasai Mara National Reserve where 33 land parcels previously under communal ownership have rapidly evolved into 38,000 land parcels under private ownership. There are now a number of examples where neighbouring landowners have pooled their access and user rights to wildlife by forming Wildlife Conservancies or Wildlife Associations to negotiate directly with tourism operators.
 - c. In Kenya, most wildlife are in fact not obligatory migrants and can be kept within defined boundaries by proper wildlife and habitat management. Even large wildlife such as elephant can be accommodated if neighbouring landowners pool their ownership and user rights. Clearly this whole process becomes easier the larger the property and the lower the human population density, but it is feasible none the less.

Transaction Costs

46. Transaction costs arise from the implementation, enforcement and regulation of a policy instrument: if they are too high then the instrument becomes neither socially nor economically efficient.
47. Compensation schemes typically suffer from high transaction costs – for example the costs of insurance loss adjustments following traffic accidents, burglaries or domestic fires. Wildlife compensation schemes are no different in this respect, and even though loss of life from wildlife is difficult to fabricate, all claims for loss of life and property are difficult and expensive to verify if the event occurs far from the competent authorities. High transaction costs can lead quickly to corruption as corners are cut, which has been the fate of most State compensation schemes to date.
48. Transaction costs have other interesting influences. Livestock keepers, for example, may find it cheaper and more effective to poison predators than invest in "predator-proof" compounds or avoid predator infested areas. Similarly, wildlife authorities may find it cheaper and more effective to invest in wildlife proof fences than pay compensation for loss of life and property in the surrounding communities; or invest in veterinary services and predator-proof compounds among local communities rather than share revenues.
49. Transaction costs even come into play during Coasian bargaining where, for example, the State and landowners might negotiate over compensation rates or user rights. Negotiations will break down if the costs of bargaining (e.g. the cost of attending meetings, hiring lawyers etc) become too high for one or both of the parties.

The Nature of the Policy Instruments

50. Policy instruments of the kind set out in Table 7 can be based on the principles of regulation, (Pigouvian) taxes or (Coasian) bargains. In general, only the latter is really appropriate.

Regulation

51. Regulation will be appropriate here only for matters concerning the broadening or transfer of property, user and ownership rights to wildlife from the State to landowners. In contrast, it would not be appropriate to regulate the "numbers of animals leaving protected areas" for the transaction costs (fencing all the Protected Areas) would be prohibitive.

Taxes

52. In the same way, it would not be appropriate to apply the "polluter pays" principle by treating the State as a polluter, all wildlife leaving the protected areas as a pollutant, and levying a tax on the State depending on the numbers of wildlife leaving the protected areas.

53. It is clear that revenue sharing schemes do not act in any sense as a Pigouvian tax and do not create incentives for the KWS or County Councils to be more "efficient" in keeping wildlife off private land.

Coasian Bargains

54. Coasian bargains between parties are the most appropriate here, and while they will in principle lead to socially and economically efficient outcomes, these can be effectively nullified by inequalities between the bargaining parties. Inequalities that will effect the outcome of a bargaining process include both the ability to meet the transaction costs (see 49) and the general level of experience in, and knowledge of, bargaining procedures.

55. Coasian bargaining will form important components of:-

- a. Compensation Schemes: landowners must bargain with the State and/or Insurance Companies over the scale of compensation and the conditions under which compensation may be claimed.
- b. Defensive Activities: landowners must bargain with the State over the erection of physical barriers between wildlife and agricultural areas. The State may decide to invest in barriers rather than pay compensation, while landowners may also decide to invest in barriers to reduce losses; efficient bargaining should result in both meeting some of the investment costs.
- c. Revenue Sharing: landowners must bargain with the State over the scale of revenue sharing and over which communities should benefit. The State may instead prefer to invest at the community level in veterinary services, employment schemes, education schemes or defensive activities. Bargaining will sort this all out.

56. Landowners must also bargain with the tourism cartels over more favourable leases for their land; for a fairer distribution of business risks between the producers of the wildlife and the service side of the industry; and to lower the barriers to landowners becoming more directly involved in the tourism industry.

FIGURES

Figure 1: Displacement of Wildlife (but not of livestock) by the expanding agricultural frontier

Displacement of Wildlife by Cultivation

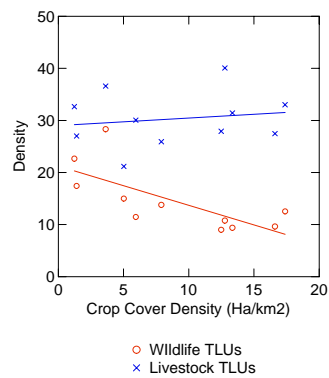


Figure 2: Displacement of wildlife by the expanding settlement frontier

Displacement of Wildlife by the Expanding Settlement Frontier

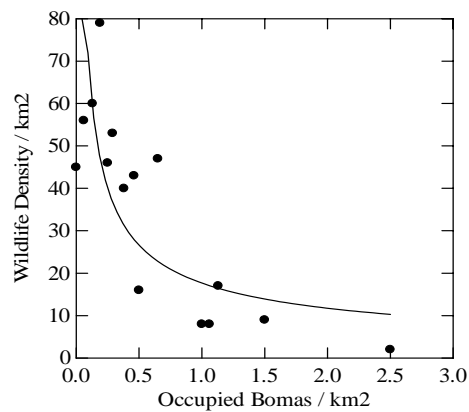


Figure 3: Returns to agriculture

Returns to Agriculture along the Rainfall Gradient

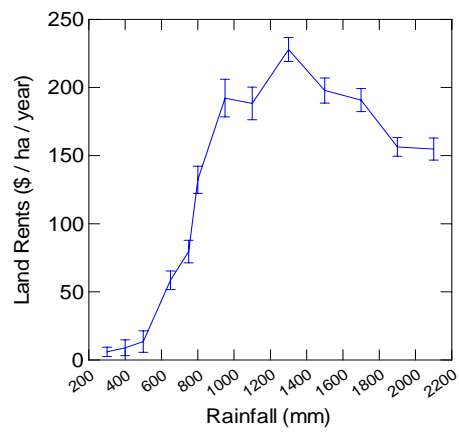


Figure 4: Differential returns to agricultural, livestock and wildlife production

Differential Returns to Agriculture, Livestock and Wildlife

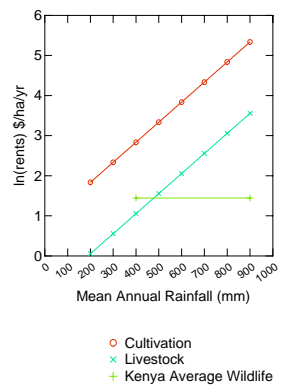
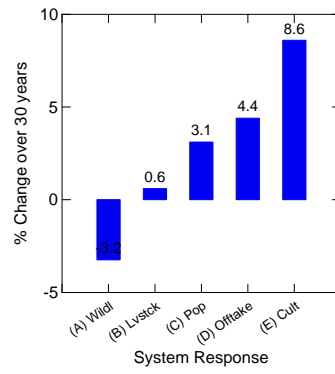


Figure 5: Changes in the pastoral areas of Kenya since 1977

Rangeland Responses Since mid-1970s



TABLES

Table 1: Mutual avoidance of wildlife by livestock in 400,000 km² of rangeland surveys in Kenya, Tanzania and southern Sudan (1980s)

	Occupied	Unoccupied
% area occupied by pastoral settlements at time of survey	25%	75%
% of all livestock seen	66%	34%
% of all wildlife seen	3%	97%

Table 2: Example of crop losses from a single visit by elephants (\$ per hectare)

Value of Production:	\$8,000
Costs of Production:	\$2,800
Potential revenues/ha	\$5,200
Loss from single visit by elephants	\$4,000
Actual revenues/ha	\$1,200

Table 3: Cost of wildlife on livestock production ($\$ \text{ha}^{-1} \text{y}^{-1}$) on a single ranch in Machakos District, Kenya, over eight years

Gross output	\$143.45	
Cost of production	\$119.28	
Additional costs from wildlife		\$7.87
Security		37%
Disease (prevention and cure)		33%
Losses to predators		18%
Losses to infrastructure		9%
Compliance costs (KWS)		3%
Net revenues WITH wildlife	\$16.3 $\text{ha}^{-1} \text{y}^{-1}$	
Net revenues WITHOUT wildlife	\$24.18 $\text{ha}^{-1} \text{y}^{-1}$	
% costs of wildlife	48%	

Table 4: Uptake of cultivation on Kenya's rangelands

Rainfall	% ASAL Districts	% Cultivated
Low: < 400mm	60%	< 1%
Medium: 400mm – 700mm	30%	20%
High: > 700mm	10%	52%

Table 5: Examples of wildlife production functions

Example 1: concession area of 3000 ha rented at \$300 ha ⁻¹ y ⁻¹				
DB	MC	CC	[SB]	NB
\$0.9m	\$0.2m	\$0.2m		\$1.1m
Example 2: cropping – 200 zebra @ 5,000/- per carcass				
DB	MC	CC	[SB]	NB
Shs 1m	Shs 0.2m			Shs 0.8m
		Shs 0.5m		Shs 0.3m
Example 3: No DB of wildlife (as in 95% of rangelands) yet large compliance costs imposed by KWS				
DB	MC	CC	[SB]	NB
Shs 0	Shs 0			Shs 0
		Shs 0.2m		- Shs 0.2m
Note: DB = direct benefits, MC = management costs, CC = compliance costs, [SB] = social benefits, NB = net benefits of wildlife to landowner				

Table 6: Examples of the effect of the indirect costs of wildlife (**IDC_w**) on ranch production

Example 1: irrigated bananas (\$ ha ⁻¹ y ⁻¹)					
DB	MC	[CC	SB]	IDC_w	NB
\$8,000	\$2,800				\$5,200
one visit from elephants				\$4,000	\$1,200
Example 2: livestock production (\$ ha ⁻¹ y ⁻¹)					
DB	MC	[CC	SB]	IDC_w	NB
\$144	\$119				\$25
costs of wildlife				\$8	\$17
Note: B = direct benefits, MC = management costs, [CC SB] = compliance costs and social benefits, IDC_w = indirect costs of wildlife on production, NB = net benefits to the landowner					

Table 7: Policy Responses

Policy Responses to Human / Wildlife Conflicts in Kenya		
Conflict	ACUTE	CHRONIC
Impact	Direct and tangible losses of life, crops, livestock and property	Pernicious loss of wildlife and biodiversity throughout the rangelands of Kenya
Response	<ul style="list-style-type: none"> • Compensate injured parties • Promote defensive activities 	<ul style="list-style-type: none"> • Raise the economic value of wildlife to landowners
Possible Policy Instruments	<ul style="list-style-type: none"> • Compensation schemes <ul style="list-style-type: none"> ○ State compensation schemes for loss of life ○ Private (or State subsidised) insurance schemes for loss of property, crops and livestock ○ Private (or communally) funded predator compensation schemes (e.g. Mbirikani and Kitengela) ○ Grazing compensation schemes (e.g. Kitengela) • Defensive Activities <ul style="list-style-type: none"> ○ Physical barriers (funded by the State, or jointly with communities) ○ Veterinary services ○ Crops avoided by wildlife ○ etc. etc .etc. 	<ul style="list-style-type: none"> • Codify and strengthen property rights <ul style="list-style-type: none"> ○ Devolution of wildlife user & ownership rights to landowners • Broaden economic potentials <ul style="list-style-type: none"> ○ Release restrictions on consumptive utilisation e.g. ranching, cropping, and culling; live capture and sales (national and international); sport hunting; bird shooting; and all associated value added activities • Reform Tourism Cartels <ul style="list-style-type: none"> ○ Fairer deals with operators ○ Greater engagement in the tourism industry • Institutional Reforms <ul style="list-style-type: none"> ○ KWS becomes an enabling rather than an enforcement agency ○ Revenue sharing from KWS and County Councils ○ Donors: focus on raising economic value of wildlife, e.g. payment for ecosystem services ○ NGOs: refocus programme activities on raising economic value of wildlife ○ etc. etc. etc.

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