TOTAL ECONOMIC VALUATION OF KENYAN PASTORALISM

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Total Economic Valuation of Kenyan Pastoralism

This economic valuation report has been compiled by the World Initiative for Sustainable Pastoralism (WISP), a GEF programme, implemented by UNDP and executed by IUCN, the World Conservation Union. The report uses data collected through another IUCN project, "Kenya's Drylands: wastelands or an undervalued economic resource". The rationale behind this report is that pastoralism appears to be routinely undervalued, and this undervaluation allows the promulgation of inappropriate policies. Undervaluation of the livestock production system allows the promotion of alternative production systems that may be economically inferior, and that place greater costs on the environment. As a result, poverty and environmental degradation are unnecessarily common-place in the drylands of Kenya.

This study attempts to draw attention to the multiple values of pastoralism, including those which are measurable in monetary terms and those which are not. It aims to illustrate that pastoralism provides numerous services that are not normally quantified and are thus ignored in development planning. It also aims to draw together those values which are sometimes measured, such as meat and milk production, but yet still fail to influence planning and policy, perhaps because the values are misrepresented or the data is not disaggregated.

This report presents a wide range of values that can be attributed to pastoralism, although these are not necessarily additive: some represent asset values, others represent the value of productive inputs or outputs or non-productive outputs.

Ultimately, there may be many reasons why policy makers or development planners are uncomfortable with the concept of mobile pastoralism, and the arguments of economic non-viability or irrationality may not rest on empirical foundations, but rather on received wisdom or even prejudice. This report highlights the strong economic rationale of pastoralism, the significant contribution it makes to Kenya's economy and the many goods and services of pastoralism that are routinely over-looked. It recommends that these values be given much greater consideration, or planners risk substituting mobile livestock production in the drylands with something inferior, incurring a tremendous opportunity cost.

WISP

WISP is a three year GEF-funded project, implemented by UNDP and executed by IUCN (The World Conservation Union). It is an advocacy and capacity building project that seeks a greater recognition of the importance of sustainable pastoral development for both poverty reduction and environmental management. WISP enables pastoralists to sustainably manage drylands resources and to demonstrate that their land use and production system is an effective and efficient way of harnessing the natural resources of the world's drylands.

WISP works in a consultative manner through global, regional and national partnerships to ensure that appropriate policies, legal mechanisms and support systems are established to enhance the economic, social and ecological sustainability of the pastoral livelihood system. We aim to provide the social, economic and environmental arguments for pastoralism to improve perceptions of pastoralism as a viable and sustainable resource management system.

Total Economic Valuation

Pastoral systems are more than simply a mode of livestock production; they are also consumption systems that support a large global population, and they are natural resource management systems that support a wide range of services and products that are globally valued, such as bio-diversity protection, tourism and raw materials. Policy decisions that affect pastoralists and the drylands cannot be safely made in the absence of information over these existing values. The multiple values of pastoralism must be understood and accounted for, whether or not they have a market value and whether they are produced or foregone.

This report presents a holistic representation of the total value of pastoralism in Kenya, using the framework for Total economic Valuation elaborated by MacGregor and Hesse (IIED, 2006). This TEV framework looks beyond the immediate benefits of livestock and livestock products to consider the whole range of direct and indirect values, whether or not they are measurable. The value of pastoralism is often considered to equate to the value of livestock sales, perhaps sometimes also including the sale of certain by-products, such as dairy and hides. Whilst these values can be difficult to quantify in themselves, and government data rarely disaggregates pastoral contribution to the economy from the rest of the agricultural sector, they do not capture the full value of pastoralism.

There is a multiple and extensive set of values associated with pastoralism. Some are tangible but many are not; some can be measured but many cannot; and those that can be measured are often underestimated. Assessing an economic activity's total contribution to the national economy is one tool to identify, quantify and aggregate all values associated with that activity, however, it is "misleading to assume that this is simply a process of

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monetising all aspects of economic life. Rather it proves as useful tool to explore the full range of costs and benefits emanating from an activity, which can also be used for lobbying in support of pastoralism" (MacGregor and Hesse, 2006).

Figure 1: The TEV framework (adapted from Hesse and MacGregor, 2006)
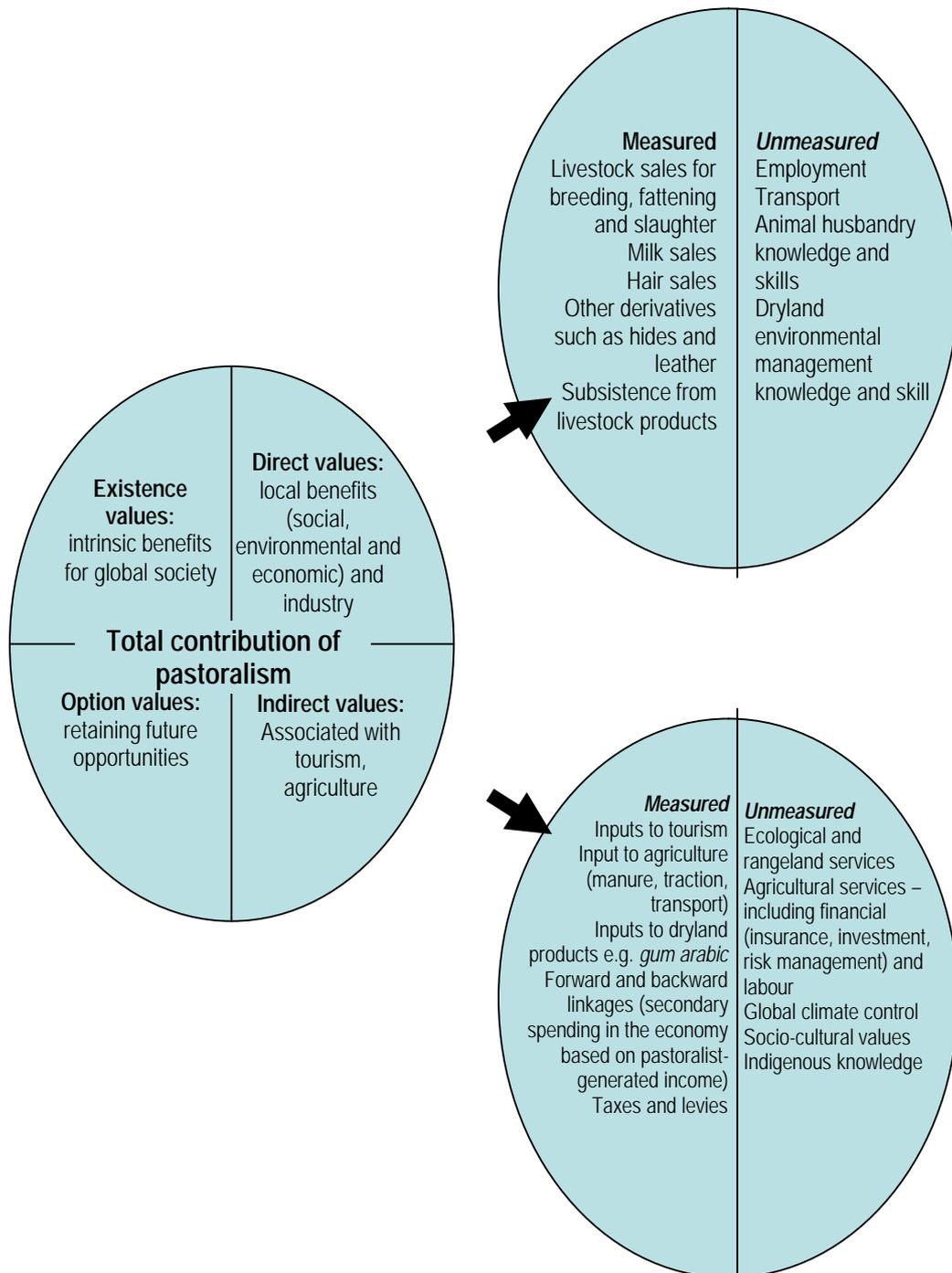
Conceptualising the value of Kenyan pastoralism

At this stage in the report, the TEV framework is expanded to provide a holistic overview of economic value in the Kenyan pastoral context. However, it is immediately clear that many values do not lend themselves to such simplistic compartmentalisation. At this stage, the categorisation of values, as direct or indirect, is less important than making sure that all key values are captured.

Direct values

Value	Data Source, type and quality
Livestock sales	Up until 1995, good statistically viable data from regular surveys by KREMU Local case studies (e.g. at district level) can corroborate national data sets Great variation between data sources Which price should be used – price to the producer, or at the end market?
Milk sales	Triangulate data sources with case study and separate subsistence milk use from that which is marketed May need to use data from one region to estimate level of sales in another region where no data is available
Hides and skins	Government statistics? Tends to be imputed from number of animals slaughtered
Subsistence	Case studies to estimate subsistence meat/milk/blood use, informal transfers of animals for slaughter (including ceremonies), value of hides and skins in subsistence Methodological question over valuing the subsistence economy – whether to use market value of a good or a replacement or proxy value
Transport income	Estimate incomes from transport and other livestock services

Direct Values – Unmeasured

Value	Data Source, type and quality
Employment	Labour costs for pastoralism not yet calculated (could be done in the same way as for cultivation based agriculture – labour inputs for herding and livestock management, labour inputs for other household activities)
Social capital	Case studies of livestock and product transfers, estimates of insurance or social security conferred, predominantly qualitative
Transport service	Use a substitution value (kilometres travelled per year multiplied by a vehicle rental costs from the same sort of services) Could be subsumed within the system as a production cost, but much of the transportation is for household consumption – other systems would not subsume such costs under production

Comments

- A number of values are presented in the IIED framework that could be considered as inputs to the production system: so production costs rather than economic values per se (for example, transportation or indigenous knowledge). They have mostly been omitted from the above list.

- "Risk and Resilience" is placed as a value in the IUCN Kenya study (from which this table was taken), but there are concerns about how to define the value of risk and resilience. Elements of resilience, such as social security systems, or provender harvesting practices, can be listed separately as values, but the concept of resilience may not be a value in its own right but rather a property conferred by other valued components.

Indirect Values – Measured

Value	Data Source, type and quality
Inputs to tourism	Direct revenue accrued from tourism to people, groups and local governments (including benefit sharing) Opportunity costs of pastoral land lost for reserves (parks, forests etc.) Supplementary incomes generated from tourism through the use of pastoral culture and heritage
Input to agriculture (manure, traction, transport)	Manure Traction (cultivation, water, fodder, other goods) Need to segregate traction (an input to agriculture) from transport (an input to the household)
Forward and backward linkages to the economy	Using the experience from Namibia, multiply GDP by 1.8 to show the effects of secondary spending in the economy based on pastoralist-generated income from livestock (e.g. shops selling radios, products so that the monies are recycled out of pastoralism) This includes expenditure on goods and services by pastoralists, value added in the production chain and subsequent expenditures by those in related industries.
Taxes and levies	Tax revenues can be assessed from local and national records, although records may be weak due to corruption.
Inputs to dryland products e.g. gum arabic	Provision of labour, manure, improving water and mineral cycling. Such environmental services lead to locally captured benefits that may be hard to quantify unless comparison is made between areas under different grazing arrangements. Dryland products include aloes, sisal, honey, incense, gum, henna, dyes, medicinal plants, plus a range of provender (wild foods) and forest products.

Indirect Values – Unmeasured

Value	Data Source, type and quality
Ecological and rangeland services	Protecting and enhancing water sheds Carbon sequestration (perhaps an option value) potential – can be calculated based on IPCC (Inter governmental Panel on Climate Change) findings for different land use systems and vegetation types Cost of desertification and value of pastoralism in averting it
Agricultural services	'Financial' role of livestock towards agriculture In group ranches there may be data on loans issued against livestock
Global goods	Value of dryland natural resources, biodiversity, and scenery Value of system resilience and risk managing and coping strategies.
Socio-cultural values	As perceived by pastoralists
Animal genetic resources	Data on how much people/institutions are willing to pay to preserve rare breeds

Comments

- A number of indirect values have been removed from the IUCN Kenya report, including inputs to services and crop cultivation.

- Indigenous knowledge and institutions for management are considered as productive inputs rather than a value per se, and the value is the output in the form of livestock or environmental products.

- The same applies to animal husbandry knowledge and skills and dryland environmental management knowledge and skill – these are also productive inputs which if anything should be valued under employment and labour input.

- The value of timber resources has been removed since it is hard to ascertain the role of pastoralism in protecting such resources. The existence value of such resources is captured elsewhere.

Quantifying the values

Part of the challenge in interpreting data is the poor quality of livestock population data in Kenya and the fact that livestock population censuses are not equipped to cope with the dynamic nature of pastoral systems, and the rapid rates of herd growth and shrinkage according to climatic conditions. Though there is not a great deal of data on pastoralism in Kenya, and some of the data that exists is of questionable veracity, a few attempts have been

made to quantify the gross contribution of pastoralism to Kenya's economy. However, there is a tendency for national data to be focused on readily available information such as marketed off take rather than gross output. In a subsistence pastoral economy the difference can be striking.

Nationally Kenya's livestock sector if of great importance with milk the second largest contributor to agricultural GDP, after beef production (Tegemeo, 1999). Indeed, some sources indicate that milk production constitutes about 50% (over 40 billion Kenya shillings) of the total value of livestock products (Omore *et al.*, 1999). The Government of Kenya (2000) indicate that 60% of Kenya's livestock are found in the pastoralist lands, and are worth approximately $6 billion, with an annual milk value of between $67-$107 million (though it is not certain as to whether this includes subsistence milk). While milk yield is of a comparable order of magnitude to Nyariki's (2004) figures, the Government's livestock asset values are very different at 7 times the estimate of Nyariki.

Kenya's pastoral herd is reared primarily for dairy, rather than meat production and the value of milk greatly exceed the value of meat or livestock sales. Using Nyariki (2004) the value of milk is around double the value of meat. Most of this is used in the subsistence economy, as milk is either drunk directly or processed into yogurt and other (more storable) products. In fact it has long been known that, other things equal, meat production systems in the rangelands of Africa are significantly less productive per hectare than systems focusing on milk (Scoones, 1995). Given the high availability of labour and the low availability of other inputs, there is little surprise that pastoralists remain focussed on dairy production and the subsistence economy.

Who are the pastoralists?

The drylands (Arid and Semi Arid Lands or ASAL) of Kenya make up 84% of Kenya's total land surface (Figure 2), support about 8 million Kenyans (about 25% of the country's population), account for more than 80% of the country's eco-tourism interests and possibly up to 60% of the country's livestock (GoK, 2002).

Table 1: Districts Classified by Percentage of Kenya's ASALs (GoK, 1994)

% Drylands per District	Districts	% Kenya's ASAL
100%	Isiolo, Marsabit, Garissa, Mandera, Wajir, Turkana	62%
85-100%	Kitui, Tana River, Taita-Taveta, Kajiado, Samburu	25%
50-85%	Embu, Meru, Machakos, Laikipia, West Pokot, Kilifi, Kwale, Baringo	10%
30-50%	Lamu, Narok, Elgeyo, Marakwet	3%

Figure 2: Kenya's production systems (FEWS NET, 2006)
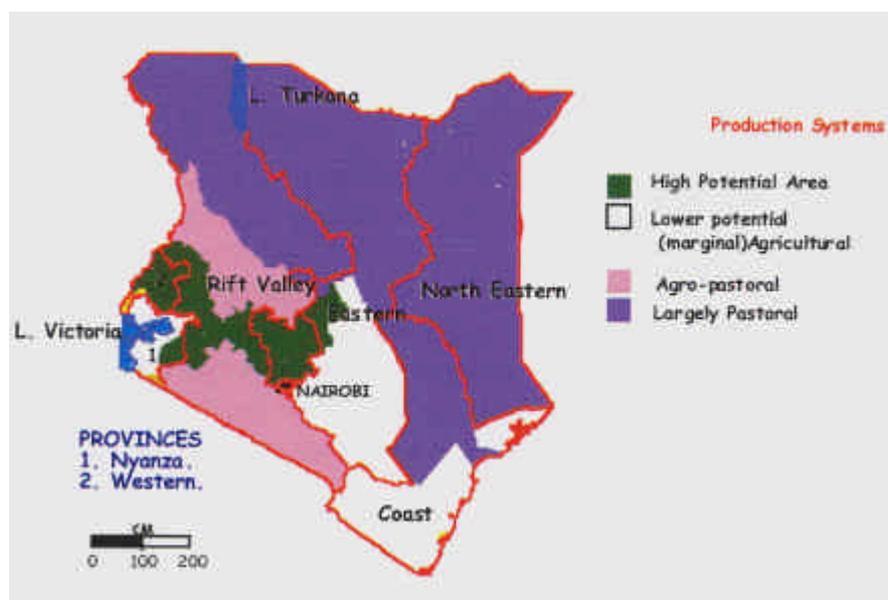
Figures for human and livestock populations in Kenya are very varied with disagreement over which districts are pastoral and which are not. The following table, when contrasted with Table 1 above illustrates this.

Table 2: Human and livestock populations ('000) in Kenya's 13 pastoral districts (RoK, 2000; 2003, cited in Nyariki, 2004)

District	People	Cattle	Camels	Sheep	Goats
Tana River	180.9	342.6	70	180	400
Garissa	392.5	390	56	40	271
Mandera	250.4	203.6	300	216	162
Wajir	319.3	200	260	250	300
Isiolo	100.9	140	30	180	205
Marsabit	121.5	50	78	300	425
Moyale	53.5	50	7	3	12
Baringo	265	296	4.3	233	876.2
Kajiado	406.1	170	0	500	449
Narok	365.8	801	0	436	423
Samburu	143.5	217.6	3.7	696	53.1
Turkana	450.9	200	115	687	2,062
West Pokot	308.1	608	1	190	120
Total	**3,358.40**	**3,668.80**	**925**	**3,749.00**	**5758.3**

Working population figure

Using the Government of Kenya's figures (GoK, 2002), 90% of the drylands population of 8 million people relies on livestock production, which gives a rough estimate of 7.2 million pastoralists. Using the average household size of 8 people taken from Turkana (Republic of Kenya, 2002), the total number of pastoralist households in Kenya is approximately 90,000. This calculation does not assume a specific degree to which the household is supported by livestock keeping, although the same government report indicated that 95% of household income was generated by livestock – a figure that seems high. The population figure is 2.14 times higher than that proposed by Nyariki (2004), largely due to the inclusion of many more drylands districts than in the Nyariki report.

The figures used by Nyariki are cited elsewhere in this report, since they are one of the few examples of data collection on pastoralism in Kenya. However, this 2.14 multiplier will be used in cases where the data is based on the lower, incomplete estimate. Using the same multiplier on the livestock population data of Nyariki, the total livestock pastoral livestock population of Kenya may be as high as 32 million head, making the total national livestock population estimate of 33.4 million a huge underestimate. Indeed, such figures are supported by other data, such as that gathered from Turkana, representing one of 23 drylands districts, yet apparently bearing half of the official total goat population, according to the Nyariki data.

Livestock population

Livestock numbers are difficult to measure in pastoral areas, and in fact the logic of the pastoral system, as a means of managing uncertain environments, dictates that livestock numbers must fluctuate greatly over time. Increases and decreases of around 50% and more over the space of a year or so are not uncommon, as pastoral livestock are highly prolific in the immediate aftermath of climatic shocks. Pastoralism in Kenya relies on livestock diversity to harness diverse rangeland resources, and typical pastoral herds and flocks include grazing cattle, donkeys and sheep and browsing camels and goats. Pastoralism also relies on a diverse array of livestock products, including milk, hides, meat and power.

The livestock sector in the drylands accounts for 90% of employment and more than 95% of family incomes and livelihood security. Many of the livestock slaughtered in Kenya's urban centres originate in the drylands, even if they are fattened elsewhere before they come to the market: for example, newspaper reports state that 50% of Nairobi's meat comes from the drylands. Kenya's national livestock herd produces 10% of GDP, and 50% of agricultural GDP (GoK, 2000). Kenya's drylands have over 50% of the country's livestock population and produce over 67% of the red meat consumed. All the camels are found in the ASAL, and contribute about 11.5% of the milk produced in Kenya, although only about 1% of the meat (Muthee, 2006??? – check Ed).

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Table 3: Livestock Distribution in Kenya (Muthee, 2006)

Species	Pastoral areas (millions)	Kenya total (millions)	Percentage in pastoral areas
Dairy Cattle[1]	Negligible	3	0
Other Cattle	4	9	44
Goats	6	12	50
Local Sheep	4	7	57
Wool Sheep	Negligible	1	0
Camels	1	1	100
Donkeys	0.2	0.4	50
Total	**15.2**	**33.4**	**46**

It is notoriously difficult to gather reliable data on pastoral livestock populations, partly because of reluctance of producers to divulge such information and partly owing to the high degree of fluctuation in such herd and flock sizes. This fluctuation is not a weakness in the production system, but an adaptation to the highly uncertain climate and the resulting fluctuation in fodder availability. However, certain data in the above table could be questioned: for example the goat population for the district of Turkana alone is around half of the figure given for the total national pastoral goat population (see Table 4).

Data from Turkana, presented in Table 4, illustrate the year-on-year change in livestock numbers in a pastoral area of Kenya between 1997 and 2004. This data is presented to provide an indication of change over time, although the period covered is short. These data question the frequent assertions that pastoral livestock populations are either exploding or imploding.

Table 4: Livestock census data from Turkana, Kenya (1997 – 2004) (ref?)

	1997	1998	1999	2000	2001	2002	2003	2004
Cattle	200,000	200,000	234,420	175,815	175,815	193,600	193,600	197,700
Goats	2,600,000	2,750,000	3,252,150	1,626,000	1,626,000	1,951,200	1,951,200	2,021,000
Sheep	916,667	916,667	1,084,050	813,027	813,027	975,600	975,600	1,054,400
Camels	115,000	115,000	144,960	138,000	138,000	140,760	140,760	172,400
Donkeys	33,000	33,400	42,830	32,000	32,000	32,640	32,640	35,160
Poultry	9,760	9,851	9,856	10,030	9,920	12,056	11,651	10,368
Hives	727	727	8,964	9,407	9,472	10,114	10,132	10,134
TLU[2]	619,867	635,027	759,806	517,773	517,773	582,016	582,016	632,394
% of 1997 population	1.00	1.02	1.23	0.84	0.84	0.94	0.94	1.02

Contribution to the national economy (Markakis, 2004)

Contribution of agriculture sector to GDP	16%
Contribution of livestock to agricultural GDP	50%
Significance of pastoralists as livestock owners	60% (GoK, 2000/2002?)
Significance of indigenous cattle in national herd	75%
Proportion of national milk output from pastoralism	24%

Direct values of pastoralism in Kenya

Although the direct values of pastoralism should be the easiest to measure, making such valuation is made difficult by the low quality of the data that is available and the extreme divergence of the few data sets that exist. Much of the following data is taken from a report commissioned by IIED (Nyariki, 2004) which draws on various Government of Kenya statistics. The figure presented by Nyariki for livestock off take (US$69.3 million) works out at US$21 per capita (based on Nyariki's population estimate), or US$165 per household per annum. This is a little more than the value of a cow or camel, or about the value of eight small ruminants using end market values.

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[1] It is assumed that 'dairy cattle' refers to exotic breeds, since indigenous cattle in pastoral systems are primarily reared for dairy purposes, as this report illustrates.

[2] TLU (Tropical Livestock Unit) – 1 TLU = 1 camel, 1.43 cattle, 2.5 donkeys, 10 sheep or goats. The figures presented here exclude poultry and hives.

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Table 5: Value of Pastoral Herds and Off-take (adapted from Nyariki 2004)[3]

	National Herd ('000?)	Asset value (Million Ksh)	Asset value (million $)	% Off take	Value of off take (billion Ksh)	Value of off take (million $)
Cattle	3,669	36,688	524	10	3,668	52.4
Camels	925	9,250	132	2	185	2.6
Goats	5,758	8,637	123	7	604	8.6
Sheep	3,749	5,624	80,	7	393	5.6
Total	14,101	60,199	860		4,852	69.3

These data do not allow for the subsistence economy and the consumption and exchange of livestock within the pastoral community. Furthermore, they are derived using the restricted pastoral population figure that was based on a narrow inclusion of drylands districts. Using the 2.14 multiplier from the previous section, we can estimate that the total livestock offtake from pastoral herds in Kenya may be around US$148 million.

Marketed offtake is only part of the total herd offtake in most pastoral societies and survey data, such as Nyariki's, often overlooks the importance of livestock consumed in the subsistence economy, whether slaughtered for home consumption or religious ceremonies, or exchanged within the community. Such data is particularly difficult to ascertain, owing both to reluctance to divulge such information and the great variation between households and over time in such consumption patterns. Furthermore, people's perception of such 'transactions' vary widely to the extent that the exchange of livestock through customary institutional mechanisms may be omitted from such calculations by pastoral households. Nevertheless, such exchanges bring tangible benefits and are very much a part of the local pastoral economy.

The following table shows the subsistence economy amongst a relatively livestock wealthy group of Turkana pastoralists. The data represents total consumption per household, with an average household size of eight people. The data represents a total daily per capita consumption of 1.8 litres milk, around 200 grams of meat and 0.65 litres of blood[4]. This data may not be representative of all pastoral households in Kenya, and meat consumption seems particularly high. Furthermore, the value attributed to hides is high, and the number of hides 'consumed' is not supported by the total quantity of meat consumed – the number used for roofing seems particularly high and might represent a one-off consumption rather than an annual figure. Conversely, the value of livestock exchanged within the community is not provided, which skews the total subsistence value in the opposite direction.

Table 6: Household subsistence livestock use in Turkana

	Estimated consumption	Value per unit	Estimated value (Ksh)	Estimated value (US$)
Milk (for food, litres)	5,475	15	82,125	1,141
Meat (kgs)	648	160	103,680	1,440
Animal blood (litres)	1,920	20	38,400	533
Animal skin (shoes)	3	50	133	2
Animal skin (Sleeping mats)	2	2,000	4,000	56
Animal skin (roofing)	15	2,000	30,000	417
Total			258,338	3,589

The figure of 5,475 litres milk produced per household is supportable using the figures of Dahl and Hjort (1976), who propose 240 litres per bovine per year (averaged out across all ages and sexes): 5,475 litres would require a total herd of 23 bovine equivalents per household, which is not an unrealistic pastoral herd size, and is certainly within the herd sizes quoted in the Turkana study. Using these figures, but omitting the value of animal skins for roofing (since this is not an annual practice), the total pastoral subsistence economy of Turkana is valued at US$3,172 per household or US$397 per capita.

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[3] Based on livestock prices of Kshs 10,000/= for indigenous cattle ($143), Kshs 10,000/= for camels ($143), Kshs 1,500/= for indigenous goats ($21), and Kshs 1,500/= for indigenous sheep ($21).

[4] Blood is routinely consumed by the Turkana and is taken in relatively small quantities from lives animals. However, not all Kenya's pastoralists consume blood: for example it is prohibited to Muslim pastoralists.

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There is also a challenge in estimating the real value of different products (i.e. the difference between the value received by the producer and the price received at the end market). The difference between producer prices and end market prices may reflect both transaction and production costs, raising a question over whether it is valid to use the end market price to estimate total value. However, the difference between the two prices is striking and local market prices do not give a fair indication of the real value of pastoral livestock, as Table 7 illustrates.

Table 7: National livestock prices vs. Turkana producer prices in Ksh

	Prices to producer	Prices marketed	% to producer
Cattle (indigenous)	5,000/= ($72)	10,000/= ($143)	50
Camels	7,000/= ($100)	10,000/= ($143)	70
Goats (indigenous)	800/= ($11)	1,500/= ($21)	53
Sheep (Indigenous)	700/= ($11)	1,500/= ($21)	47
Source	Mogaka (2006)	(Nyariki 2004)	

The level of milk sale from pastoral herds is generally significantly lower than consumption and a proxy market value can be assigned to calculate the subsistence value. Table 8 shows possible milk production values in Kenya.

Table 8: Value of Dryland Milk Production (adapted from Nyariki 2004)[5]

	National Herd ('000)	Drylands population	Contribution to Milk supply	% attributable to drylands	Value of Dryland milk production
Improved cattle	3,120	0.00%	59.80%	0%	-
Zebu cattle	9,067	40.00%	24.60%	9.95%	$55,435,714
Camels	800	100.00%	12.50%	12.50%	$69,642,857
Indigenous goats	9,975	58.00%	3.00%	1.70%	$9,471,429
Improved goats	34	0.00%	0.10%	0%	-
Total values					**$134,550,000**

The calculations in the previous table are also based on the lower pastoral population estimates and therefore can be multiplied up to provide a total of US$288 million. However, it is unclear whether this figure represents milk sales or total milk production, which is of importance considering that much of the milk produced in the pastoral economy is consumed rather than sold.

Using the higher figure of US$288 million for annual pastoral milk production, the per capita production is just 0.55 litres per day. At 750 kcal per litre, this works out at around 20% of daily energy needs met by milk. Some pastoral communities may be much more dependent on milk than this, such as the Turkana as Table 6 showed, who may consume up to 1.8 litres of milk per day, satisfying over half of daily energy requirements. If the Turkana case is typical, the total national milk output for Kenya, based on the subsistence economy, is around US$946 million per year. If the real level of milk production in the pastoral herd is somewhere between these two figures, it might be closer to the mean value of 1.2 litres per day, around 36% of daily energy requirement, or US$618 million per annum. For the following table, the lowest of the figures is used, although this discrepancy will be revisited later.

Table 9: Asset and offtake values of the drylands livestock herd based on Nyariki (2004), using a 2.14 multiplier

	Dryland Herd (millions)	Asset Value ($'millions)	Annual Off-take value ($millions)[6]	Annual Milk Value ($'millions)	Total Annual Value ($'millions)
Cattle	8	1121	112	119	231
Camels	2	282	6	150	155
Goats	12	263	18	20	39
Sheep	8	171	12	-	12
Donkeys	-	-	-	-	-
Total	**30**	**1,838**	**148**	**289**	**437**

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[5] Based on a per litre milk value of Kshs 15.00 per litre to the producer (approx US $0.20), and national milk production of 2.6 billion litres worth $557 million per annum.

[6] Includes meat and hides.

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This figure of US$437 million could be a substantial underestimate, considering that conservative values have been used for milk production, and meat consumption is omitted entirely. The following table compares the above data with two other estimates of direct value: that taken directly from the Turkana study, which may be an over-estimate; and a 'proposed estimate' based on reworking the two available data sets.

Table 10: Estimates of direct values from pastoralism per capita per annum[7]

	Nyariki (2004)[8]	Turkana (2006)	Proposed estimate
Milk consumed	40$	143$	86$
Milk sold	-	-	-
Livestock consumed	-	180$	180$
Livestock sold	21$	60$	21$
Blood consumed	-	67$	-
Hides consumed	-	59$	7$
Hides sold	-	-	-
Total	61$	509$	294$

Table 11: Estimates of total direct values from pastoralism

	Nyariki (2004)[9]	Turkana (2006)	Proposed estimate
Per capita per annum	61$	509$	294$
National total per annum	439,200,000$	3,664,800,000$	2,116,800,000$
Percentage of GDP[10]	3%	24%	14%
Direct value per hectare[11]	9$	79$	45$

Indirect values of pastoralism

In the subsequent section, a range of indirect values of pastoralism are presented. However, some of these values may overlap and other values may not be entirely attributable to pastoralism. The reason for presenting the data is to illustrate the range of values associated with pastoralism and to try and show the order of magnitude of those values. However, assigning a clear figure to such values remains an elusive goal.

The importance of the 'system' that constitutes pastoralism is increasingly recognised, but often not given much weight in policy debates that affect individual pastoral resources. Management of the drylands is fraught with risk and the management strategies are complex and well developed. Of central importance is mobility, which serves many purposes: to access key resource pockets such as salt licks or water points; to evade seasonal diseases such as those associated with more humid areas; to access high-quality vegetation in the drier areas that are only seasonally available; to access buffer zones during periods of particular climatic adversity.

Measuring the value of different elements within a system is complicated by the fact that some of those elements are often integral to the entire system and are not divisible. Remove a small portion of land from the pastoral system and the loss in productivity may be commensurate with the size of that land area, or, if the land represents the only means of surviving the dry season, it may mean collapse of the entire system. The following data illustrate some of the values associated with key resources on which pastoralists depend and could be considered as natural asset values associated with pastoralism. However, more work is needed to fully comprehend the opportunity cost associated with competing uses of these key resource patches.

Inputs to tourism

Tourism is an important source of foreign exchange to the Kenyan government (see Table 12), and pastoralism plays a number of roles in supporting this industry: particularly through cultural and environmental services.

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[7] Notes: milk sales are assumed to be captured in milk consumed; meat consumption includes all exchanges and uses of livestock outside of the marketplace; consumption of blood is omitted form the proposed estimate due to lack of data on national consumption patterns; hides sold are assumed to be captured in animal sales; in the proposed estimate, hides for roofing are omitted.

[8] Uses the 2.14 multiplier to include missing districts.

[9] Uses the 2.14 multiplier to include missing districts.

[10] Based on a GDP of 15 billion dollar, although clearly if these figures were added to GDP (and the rest of the subsistence economy were valued) Kenya's GDP would be significantly higher than 15$bn.

[11] If the drylands make up 80% of Kenya's 582,650 km2 land area, then the total drylands area is approximately 466,120 km2 or 46,612,000 hectares.

Total Economic Valuation of Kenyan Pastoralism. Davies, January 2007

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Disaggregating the contribution of pastoralism to tourism is difficult and no examples have been found. However, it is worth noting that a significant, and possibly growing, proportion of tourism is carried out on pastoral lands and that the lion's share of large game is found on grazing land rather than in game reserves. This game represents a huge economic cost to the pastoralists (perhaps upwards of 50%: Norton Griffiths 2006) and to ensure its continued provision, there may come a time when the provider decides to only provide the service on the basis of appropriate compensation.

Table 12: selected industries supported by inputs from pastoralism (Kenya CBS – electronic source)

Tourists	Tourism as a % GDP	Agriculture as a % GDP
1,132,000	12.2%	16%

Input to agriculture (manure, traction, transport)

This is another indirect value or service of pastoralism that is not well captured in the literature.

Manuring contracts … formerly there? under stress?

Pastoral livestock provide traction and transport, within the pastoral production system and as a service to other producers (e.g. cultivators). The value of transportation, particularly of goods to and from the market, but also of sick to hospital, is difficult to quantify or monetize realistically, but it would be prudent to get a better understanding of the extent of transportation and its contribution to pastoral economies.

Forward and backward linkages to the economy

No reports have been found of efforts to measure linkages between pastoralism and other sectors of the economy, but clearly there are extensive related sectors that benefit from pastoralism to one degree or another. Kenya's sizeable Nyama Choma industry gets the vast majority of its meat from the pastoral sector. The growing extent of trading centres in pastoral areas also sheds light on the importance of these market linkages, both in the value chain of pastoral goods and also in the supply of goods and services.

A study of dryland economies in Namibia suggested that the value of the forward and backward linkages to national economy amounted to 1.8 times the direct local value of pastoral production. Applying this figure to the data gathered earlier gives extraordinary contributions to GDP, ranging from a conservative estimate of 5.3%, to a high end estimate of 44%.

Table 13: contribution to GDP including forward and backward linkages

	Nyariki (2004)[12]	Turkana (2006)	Proposed estimate
National total per annum	439,200,000$	3,664,800,000$	2,116,800,000$
	790,560,000$	6,596,640,000$	3,810,240,000$
Percentage of GDP	5.3%	44%	25.4%

Inputs to dryland products

Gums and resins command a sizeable global market, much of which is supplied from dryland resources in Sudan. However, the value to Kenyan drylands, and by extension Kenya's pastoralists is significant. There are different ways of considering this as a value of pastoralism: the resource represents a natural resource value of the pastoral system, assuming that pastoralists are afforded ownership or use rights over their natural resource base; it represents an enabling resource that offers livelihood diversity for pastoralists and can help in buffering risk; the crop of gums and resins may be enhanced through effective mobile herd management that improves water and mineral cycling in the drylands.

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[12] Uses the 2.14 multiplier to include missing districts.

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Table 14: Estimated Value of Dryland Gums and Resins in Kenya (Chikamai & Odera, 2002)[13]

Year	Gums and resins exported (tonnes)[14]	Value of gums & resins to collectors[15]	Value of gums and resins to marketers[16]
1994	959.7	$479,850	$719,775
1995	710.3	$355,150	$532,725
1996	762.2	$381,100	$571,650
1997	837.2	$418,600	$627,900
1998	1,128.9	$564,450	$846,675
1999	473	$236,500	$354,750
Total	4,871.3	$2,435,450	$3,653,475
Average	812	$405,942	$608,913

Table 15: Household income from Gums and Resins in Kenya

	Gum Arabic & Talha	Myrrh	Hagar	Frankincence
Average per person per day (Kg)	5	5	5	3
Average collected per month (Kg)	100	150	150	90
Sale price Per Kg ($)	0.35	0.75	0.25	0.35
Monthly income per collector ($)	34	110	40	30

Charcoal represents a significant, if controversial, economic value of the drylands and by extension pastoralism (Mutimba & Barasa 2005). Over 40% of Kenya's 200,000 charcoal producers come from the drylands and these producers are roughly evenly split between part time and full time manufacturers. However, production methods in the dryland areas are inefficient and charcoal is produced more as a by product of other forms of land use change (e.g. clearing), and felling of whole trees, rather than lopping of branches as is the more customary pastoral practice of wood harvesting. This is not sustainable and places short term gain ahead of long term sustainability, leading to depletion of important dryland resources. Yet the charcoal industry in the drylands could be carried out on a more sustainable basis (using branches not whole trees, managing for sustainable use and regeneration for instance) and the value of charcoal is worthy of recognition.

Table 16: Charcoal Vital Statistics for Kenya (Mutimba & Barasa 2005)

Number of producers	200,000
Estimated No. of people involved in charcoal trade	500,000
Amount of charcoal produced annually	1.6 million tons
Annual total income from charcoal	Kshs 32 bill ($0.4 bill)
Estimated government lost revenue per annum (VAT – 16%)	Kshs 5.1 bill ($63.7 mill)
Average gross monthly income from charcoal	
• Producers	4,496/=
• Vendors	7,503/=
• Transporters	11,298/=

Table 17: Gross revenue from charcoal compared to other crops (CBS 2004; Mutimba & Barasa 2005)

Rank	Crop	Revenue (Ksh Mill)
1	Tea	34.63
2	Charcoal	32.21
3	Livestock (and related products)	18.98
4	Sugar Cane	7.57
5	Coffee	5.96
6	Cereals	5.47

[13] These are export figures from Kenya and do not take account of the domestic market for gum.

[14] Based on Customs Department, Kenya Revenue Authority, and for a combination of gums and resins including Gum Arabic (dominant – Acacia senegal and Acacia seyal), Myrrh (Commiphora myrrha), Hagar (Commiphora holtziana), Frankincense (or Olibanum – Boswellia neglecta)

[15] Based on an average price to the collector of Kshs 35/= ($0.50) – price range varies from Kshs 20/= to Kshs 50/=

[16] Based on an average price to the exporter/marketer of Kshs 55/= ($0.75) – price range varies from Kshs 40/= to Kshs 80/=

Indirect values, unmeasured

Environmental services

Table 18: Some Key Values of the Loima Hills to Turkana Pastoralism (source? Ed)

Attribute	Value
Dry season forage	$4.72 million per annum
Water values	$5.7 million per annum
45,000 livestock survive the 2005/06 drought on the 30,000 Ha of Loima Forest[17]	$1.4 million

The following table presents examples of the economic value of forest resources to different pastoral systems. The Tana River example illustrates the importance of riparian river systems which flow through large dryland areas, although clearly there are missing values, such as water for livestock. The Oldonyo Orok example shows the importance of rich patch vegetation, in this case on hills and small mountains, as critical dry season refuges for livestock.

Table 19: Economics of selected dry and high forests in Kenya[18] (Emerton 1996b, Brown & Emerton, 1997 ? check)

	Tana Riverine Forest		Oldonyo Orok	
Sample (households)	17,000		1,000	
Area (ha)	3,658		12,000	
	Value ('000 Kshs)	Value ($)	Value ('000 Kshs)	Value ($)
Fuelwood	2,839	37,850	900	12,000
Grazing/fodder	-	-	1,800	24,000
Construction	-	-	1,125	15,000
Wildlife	-		-	-
Timber	170	2,270	-	-
Medicines	-	-	825	11,000
Honey/hives	457	6,090	525	7,000
Charcoal	-	-	-	-
Hunting	-	-	300	4,000
Thatch	-	-	-	
Water	-	-	1,575	21,000
Poles	2,569	34,250	-	-
Fibres	-	-	-	-
Wild foods	-	-	150	2,000
Other	429	5,720	225	3,000
Total value	*6,464*	*86,190*	*7,425*	*99,000*

In Kenya, there is no available data on the value of forest restoration that can accrue to pastoralists. However, an example from a similar environment of Tanzania gives an indication of the order of magnitude of the value of such resources. The Shinyanga Region, declared by President Nyerere 'the desert of Tanzania' in 1986, covers an area of 50,764 km[2] of which 31,140 km[2] is arable, 12,079 km[2] grazable, and 7,544 km[2] is in forest reserves (HASHI, 2002). In total, between 300,000 Ha and 500,000 Ha were restored through community management in 830 villages, affecting 2.3 million people.

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[17] The value of the livestock is their direct asset value, not their potential value or the value of lost production.

[18] Number of households in sample – 1700, (3,658 Ha sample)

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Table 20: Economics benefits of forest restoration in Shinyanga, Tanzania (Monela et al., 2005)

Issue	Outcome	
Economic value of restored forest	$14 per person per month (pppm) (National average rural consumption is $8.50 pppm)	
Wildlife damage as a result of restored forest	$65 per family per year (about $0.70 pppm)	
Average value of the 16 natural resource products used per annum	Per household	$1,200 per annum
	Per village	$700,000 per annum
	Per district	$89,620,000 per annum
Reduction in time for collecting various natural resources	Fuelwood	2 to 6 hours
	Pole	1 to 5 hours
	Thatch	1 to 6 hours
	Water	1-2 hours
	Fodder	3-6 hours
Percentages of households using forest products for various reasons in the 7 districts	Education	36% (10% - 61%)
	Diversify nutrition	22% (7% - 55%)
	Fodder and forage	21% (10% - 37%)
	Medicinal plants	14% (5% - 36%)
	Fuelwood	61% (54% - 63%)
Species of tree, shrub and climbers found in restored forest	152	
Other flora found (dry season only)	Up to 30 different families of grass, and herbs	
Bird species recorded (dry season only) and mammals	145 bird species and 13 mammals	

Economic value of wildlife conservation

The following data was gathered from the 8,100 Ha Game Ranching Co. on the Athi Plains, where returns of $24,182 were realized per annum between 1987 and 1990, representing a return of $3 per hectare (using the dollar rates of the time). However these returns do not include the domestic livestock which are also found on the ranch (wildlife biomass exceeded livestock biomass by about 27% on the land). During the 1990's a number of commercial and group ranches were allowed to crop wildlife. However during the past six years wildlife cropping has decreased and is no longer an important economic option for land users.

Table 21: Economics of game ranching in Kenya (Sommerlatte & Hopcraft 1992)

	Total 1987-1990 in Kshs	Average per annum	$ value (5 years)	$ value per annum
Sale of game meat	3,132,624	783,156	$187,022	$46,756
Sale of hides etc.	171,754	42,939	$10,254	$2,564
Sub total	**3,304,378**	**826,095**	**$197,276**	**$49,319**
Expenses of ranching	1,684,200	421,050	$100,549	$25,137
Net income	**1,620,178**	**405,045**	**$96,727**	**$24,182**
Net income per ha		**50**		**$3**

Total economic value of pastoralism in Kenya – based on a Turkana case study

During 2005-06, IUCN carried out a study among the pastoralists of the Loima-Lorugum area to the west of Turkana with the intention of understanding the drylands economy, particularly in relation to the drought that had been experienced in the previous year. The study made use of a range of methodologies, including Contingent Valuation Method (CVM) and market analysis, in order to value dryland resources and services at the household level.

The direct approach attempts to elicit peoples' preferences over dryland resources through measurements or questionnaires, so as to determine preferences placed on dryland goods or services that do not have a market value and/or are not traded in formal or informal market systems. Such services include climate amelioration, biodiversity conservation, soil and to some extend agricultural productivity enhancement. In particular, the CVM was applied to estimate the value that Loima residents place over forest resources in supporting agricultural production, biodiversity conservation and climate amelioration. The heifer which is a socially acceptable indicator of wealth with a definite market price was used as a proxy. However, most other dryland goods have market prices, although they are not well developed. Here the indirect approach was applied using market analysis and opportunity costs. These are techniques which seek to elicit preferences from actual or observed market based information (Pearce & Moran 1994).

The Turkana, like many pastoralists, have very diverse livelihood strategies. They keep diverse grazing and browsing livestock to make best use of the forage in space and time. These are kept more as capital, and have a high asset value. While the Loima area is one of the richest parts of Turkana, and the numbers of livestock per household are probably higher than in other parts of the district, the data demonstrates a number of important points, including the relative importance of milk to the household. However, a very wide variety of other products also constitute an important part of the household income.

Although households appear asset rich, the numbers of livestock vary a lot, depending on recent climatic events, and can be subject to rapid losses and gains. Medicinal plants are considered very important and may be over-valued, reflecting the relative lack of other health and veterinary facilities in the area.

The value of the dry season forage of the Loima Forest, based on biomass productivity is approximately Ksh 330.7 million ($4.72 million), while the water is valued at Ksh 399.3 million ($5.7 million). These figures either represent the value of the key productive inputs, or the asset value of the natural resource base, rather than values of pastoralism per se. Nevertheless, their value is greater than the total mass of forage supplied, since this reserve makes greater areas of rangelands accessible for the rest of the year.

Some of these data have been presented earlier in this report and have therefore been commented on. In general, this data set suffers from a perennial problem in pastoral areas, which is that the data cannot be corroborated, relies on individual testimony and therefore raises questions over its veracity. For example, asset values appear higher than would be expected, livestock off take and meat consumption figures also appear higher than might be expected, the value of tree and forest resources seems extraordinarily high, both in terms of the level of consumption and the unit value, and the unit value of hides, and the level of usage (particularly for roofing) also seem unrealistic. However, it should be pointed out that such judgement is entirely subjective and this data is presented as much as anything to demonstrate how much contention arises in valuing pastoral systems.

Table 22: The value of dryland resources and services to a Turkana Household (Barrow, 2006)

	Estimated consumption	Value per unit	Estimated value (Ksh)	Estimated value (US$)
Livestock assets				
Goats	200	800	160,000	2,222
Sheep	50	700	35,000	486
Cattle	400	5,000	2,000,000	27,778
Camels	100	7,000	700,000	9,722
Donkeys	20	1,500	30,000	417
Sub-total			2,925,000	40,625
Livestock sales				
Goats	12	800	9,600	133
Sheep	3	700	2,100	29
Cattle	2	5,000	10,000	139
Camels	1	7,000	7,000	97
Donkeys	4	1,500	6,000	83
Sub-total			34,700	482
Livestock products				
Milk (for food, litres)	5,475	15	82,125	1,141
Meat (kgs)	648	160	103,680	1,440
Animal blood (litres)	1,920	20	38,400	533
Animal skin (shoes)	3	50	133	2
Animal skin (Sleeping mats)	2	2,000	4,000	56
Animal skin (roofing)	15	2,000	30,000	417
Sub-total			258,338	3,588
Tree/forest resources				
Charcoal (sale – bags)	36	150	5,400	75
Honey (gallons)	180	250	45,000	625
Fruits (kgs)	480	8	3,840	53
Medicines (Humans)	72	2,000	144,000	2,000
Medicines (Livestock)	120	1,500	180,000	2,500
Basketry	180	130	23,400	325
Sub-total			401,640	5,578
Agricultural production				
Sorghum (Kgs)	180	14	2,520	35
Maize (Kgs)	100	20	2,000	28
Sub-total			4,520	63
Ecosystem values				
Climate amelioration	65	5,000	24,074	334
Agricultural improvement	12	5,000	4,444	62
Biodiversity warehouse	20	5,000	7,407	103
Sub-total			35,926	499

Opportunity Costs

Economics is the study of how decisions are made over the use of scarce resources, and where resources are scarce, trade offs have to be made, which lead to opportunity costs. The opportunity cost of a given decision is based on what must be given up as a result of that decision. Opportunity cost is the value of the next best choice that one gives up when making a decision.

The opportunity costs associated with different land use choices within a system are perhaps not so simple, since one choice does not necessarily entirely exclude another land use option. For example, if a wetland zone in a dryland pastoral region is irrigated for cultivation, that land is not entirely lost to livestock production since crop residues and industrial by-products may become available as livestock fodder and manure can be made available as an agricultural input. Similarly, conservation of wildlife in game reserves does not, necessarily, mean that

livestock cannot be reared in the same place. Nevertheless, costs are invariably implied when one form of land use is promoted over another and it is prudent to make such choices on the basis of sound information regarding both the current and potential returns to land under different production strategies.

The paucity of data on pastoral production in Kenya creates challenges in understanding the opportunity costs associated with alternative uses of the drylands. Where net returns are used as a basis for measurement, they only consider cash income and thereby neglect a major part of the value that will be forgone. For this reason it is necessary to consider the potential returns based on monetised value of the subsistence economy. It is also desirable to project potential technological developments in the pastoral sector that could raise total productivity per land area. This creates many more challenges, since it is widely assumed that meat-oriented ranching systems are more productive than pastoral systems, yet academic literature roundly refutes this (Scoones, 1995). As a result opportunity costs may be assessed on the basis of ranching performance and thus fall short of the real opportunity cost. Another challenge is that, when considering potential opportunity costs, it is also pragmatic to consider the costs of reaching that potential and the returns to investment over a sensible period of time, which may be a matter of some subjectivity.

This section cannot go into the subject in such detail, but with the data presented earlier, and other data from the literature, it is possible to compare returns from different land uses in the drylands of Kenya. At the very least this should cause policy makers to think again before automatically assuming that pastoralism does not represent a viable economic land use system.

One example from the literature is provide by Norton-Griffiths et al (2006), who present data on agricultural rents[19] from the Mara Area (Table 23).

Table 23: Rents from land use in the Mara Area (Norton-Griffiths et al, 2006)

	Mean $ ha -1 y -1	Total Rents $m
Agricultural Rents	$155.51	$180.6m
Livestock Rents	$30.40	$34.6m
Wildlife Rents	$10.27	$11.7m

In the same article a range of land use strategies are presented to show the optimal strategy, or combination of land uses, at different levels of rainfall (Table 24). It should be noted, however, that only a small proportion of wildlife rents (5%-10%) are captured by land owners, the rest been taken by tourism cartels and outsiders (Norton-Griffiths and Butt 2006). The following table gives an indication of the gross overall land use options for Kenya, but does not necessarily portray the desirability of land use from the perspective of the land owner.

Table 24: Optimal land use strategies in the Mara Area

	Rainfall	
Land uses	700mm	300mm
Agriculture only, no livestock or wildlife		
normal year	$63.6	$7.6
drought year	$26.8	$2.6
Agriculture with livestock, no wildlife		
normal year	**$89.2**	$10.6
drought year	**$34.3**	$3.9
Livestock only, no wildlife[20]		
normal year	$25.6	$3.0
drought year	$7.5	$1.3
Livestock with Wildlife		
normal year	$27.5	**$12.2**
drought year	$15.3	**$11.1**
Wildlife Only		
average rents	10.2	10.2

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[19] In the article, 'agricultural rent' refers to net returns to all agricultural activities.

[20] Net returns to livestock are 48% higher when wildlife are eliminated (Norton-Griffiths and Butt 2006).

According to this data, the combination of agriculture with livestock is the optimal strategy for the higher rainfall areas of the Mara, whilst livestock and wildlife combined is ideal in lower rainfall areas. Not all of the scenarios above are additive, and indeed it is questionable whether any of the values should be simply added without consideration of the costs and benefits of one production system to another. However, livestock returns in particular are reduced by the presence of wildlife: 35-40% reduction in benefits through grazing competition alone (Norton-Griffiths, 1996) plus costs from predation.

It is worth comparing these estimates with the data gathered previously in this report. Nyariki (2004) find a direct return per hectare of $9, which does not compare favourably with the data gathered in the higher rainfall part of the Mara area, although it is considerably greater than the returns in the 300mm belt. In contrast, the data gathered from Turkana compares favourably with the rent from the 'agriculture only' strategy in the higher rainfall area (700mm), which is surprising considering that the Turkana district is significantly more arid. The 'proposed estimate' from this report indicates a return of 45$ per hectare across all pastoral lands, although making no allowance for normal or drought years.

A few points are worth drawing from this cursory investigation of opportunity costs. First, the Mara region is relatively less arid than many other pastoral areas of Kenya, which makes it more suited to crop production. Comparison of opportunity costs should not detract from the fact that vast swathes of Kenya are simply unsuited to agricultural production. In the most arid districts, irrigated cultivation may be possible in pockets of land that have access to water, but this could come at a very high cost to livestock production in terms of lost buffer zones. Where irrigation is promoted, one of its greatest benefits may be in providing inputs to extensive livestock production, whether as by-product or through direct cultivation of fodder.

Another point that emerges form the above data is that, if wildlife conservation leads to a 35-40% reduction in livestock production (through grazing competition), then where livestock rearing is 35-40% more productive than wildlife conservation, the incentive to conserve wildlife is lost. If the real net returns from pastoralism are as high as 45$ per hectare, then wildlife conservation implies a much greater cost and disincentive than has hitherto been accepted. To encourage pastoralists to conserve wildlife on their land is therefore likely to require far greater compensation.

Finally, it is worth remembering that this juggling of data is restricted to a select few direct values, and notably those which lend themselves to easy measurement. This report illustrates that there are far more values to pastoralism than only these direct, measurable returns. It remains to be seen how these other values can be demonstrated and presented in a way that convinces policy makers that they are worth protecting.

Impact of drought

In Africa it is widely assumed that pastoralism is synonymous with drought and famine, which conveniently endorses the widespread belief in the irrationality of pastoralism. Yet a wider look at pastoralism around the world shows that this particular phenomenon is only really prevalent in Sub Saharan Africa, which suggests that there are factors other than the practice of pastoralism which lead to famine. Certainly drought on its own is insufficient, since pastoralism is an adaptation to exactly such events and pastoralists throughout the world cope with frequent and recurrent drought.

Little thought is ever given to the economic impact of drought in Kenya, particularly the impact felt in the drylands, reflecting the low regard for drylands economies. Yet the figures presented in this report indicate that pastoralism is a vital part of Kenya's national economy and therefore drought presents a cost not only to the drylands inhabitants, but to the Nation as a whole. In fact, the cost of drought is felt widely in Kenya through the impact it has on downstream users of drylands resources, such as water or environmental services.

Summarised below are some of the lessons from the 1999-2000 drought in Kenya (UNEP and Government of Kenya, 2000) which illustrate some of the economic costs of drought and also the costs that were incurred as a result of allowing the drought to proceed to famine.

Some Impacts of the 1999-2000 Drought (UNEP & Government of Kenya 2000)

- GDP (growth) fell from 1.4% in 1999 to 0.7% in 2000;

- Inflation rose from 7.6% to 9.8% from August 1999 to August 2000;

- By September 2000, 4.7 million people were affected by drought, representing 16% of the population of Kenya, and all needed famine relief food;

- 25-30% of people suffered from malnutrition, which is two to three times higher than the rate in other developing countries;

- In October 2000 the water deficit was 704,552 m3 for the country;

- In September 2000 the mean discharge from streams in Muranga dropped by an average of 60%; Masinga dam water level dropped by 98%; Nairobi water supply decreased by between 55% and 70%;

- This resulted in economic losses of about US$2 million per day, and a total of between US$400-US$635 million by the long rains of April 2001 which is equivalent to between 3.8 and 6.5% of GDP;

- Time spent collecting water increased massively, incurring a huge labour cost, especially for women;

- Charcoal burning in the ASAL increased as an economic opportunity to supplement food, which resulted in increased degradation of the very resources needed for livestock and human sustenance in the drylands;

- Hydro-power dropped by 20% incurring losses of US$2 million per day, as well as the need to import expensive oil-based power generating plants;

- The El Nino event of 1997-1998 caused much flooding damage, and the effects were exacerbated by the La Nina event from 1998-2000;

- Forest fire losses in 1999-2000 were approximately 3,807 Ha (plantation, natural, and bush), costing Ksh 0.561 million in suppressions, and causing Kshs 36.625 million worth of damage;

- There was substantial drying of wetlands, so important for human life, especially in the medium and marginal land areas.

The same study analysed the contributing factors that exacerbated the drought and allowed famine to develop, many of which reflect long term policy and political failures that affect the drylands.

Some contributing factors to the 1999-2000 Drought (UNEP & GoK, 2000)

- Prolonged (rains failed for at least 4 seasons) affecting most of the country;

- Lack of national drought policy and strategy, and lack of policy for managing water and drought;

- Deforestation (leading to lost resilience);

- Ineffective enforcement of forest rules, and inadequate enforcement of the water act and other legislation;

- Breakdown of traditional weather forecasting and coping mechanisms;

- Blockage of wildlife migratory routes;

- Floods prior to drought;

- Inadequate water storage, inequitable distribution of water, and inefficient water schemes;

- Poor management of water catchments;

- Cultivation of unsuitable areas, poor crop choice and inappropriate technologies;

- Lack of, or inadequate marketing and credit systems; and the

- Recurrence of droughts (1992, 1994, 1998-2000) combined with El Nino event of (1997-1998) meant a focus on relief not development.

In addition to the massive national economic impact, there were huge local economic costs of this drought episode, particularly in terms of livestock losses as the following table illustrates.

Table 25: Livestock Deaths for October 1998 to October 2000 (UNEP & GoK, 2000)

Species	Population	Mortality	%	Estimated cost
Cattle	8,900,000	1,725,000	19.4%	Kshs 12.2 Billion (US$162 mill)
Sheep and goats	13,600,000	2,184,000	16.1%	
Camels	800,000	8,000	10%	

As the following table illustrates, the total national cost to Kenya was around US$1.5 billion (about Kshs 110 billion) – close to 10% of GDP.

Table 26: Summary of the costs of the 1999-2000 drought (adapted from UNEP & GoK, 2000)

	Value (Kshs millions)	Value US$ millions
Livestock deaths (direct costs, not including future	12,200	162

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costs associated)		
Lost productivity in Nairobi due to water and power rationing	28,000 to 44,450	400 to 635
Forest losses	37	0.53
4.7 million people on famine relief (estimate of value based on 6 months at $1 per day)[21]	59,220	846
Total	**99,457 - 115,907**	**1,408.5 - 1,643.5**

As was mentioned at the outset of this section, although drought is an inevitable and unpredictable occurrence in the drylands, famine and associated loss are not inevitable and can be avoided. Pastoralism is one of the most resilient production systems in the drylands that can incur high drought related losses, whilst sustaining a human population and retaining its ability to recover in the aftermath of drought. However, in Kenya, as in much of Sub Saharan Africa, it is failing to do this. The continual encroachment on key pastoral resources, the persistent failure to provide basic support and social services, and the on-going efforts to settle pastoralists and undermine their production system are all factors in the creation of famine during drought.

If the value of pastoralism is better understood then the cost of abandoning pastoralism can also be recognised. These costs are sometimes overlooked because they are either not taken seriously, or because they are thought to accrue to the pastoralists and not to other Kenyans. In fact pastoralism contributes healthily to Kenya's economy and pastoral lands are crucial for Kenya's economic health. Far from being considered as out-moded and a drain on the country, on the evidence presented here, pastoralism should be elevated to status of a public good.

Missing values

As the previous sections illustrate, a great deal remains unknown about pastoralism in Kenya, yet it may be possible to prioritise certain important values for future research from this study. Some values are partially understood and with a little more research or verification a concrete figure could be presented. Some values remain to be qualified and cannot be measured, such as the cultural values of pastoralism. Other values will remain contentious, particularly the value of services that are ascribed to pastoralism, and require a lot more research to understand the role that pastoralists play in their provision.

It must be borne in mind that almost no consultations have been held with pastoralists over this document. The document has been drafted to test the methodology and the conceptual framework, but in doing so it negates some of the value of the framework.

A crucial oversight in this report is detail of the gender division of labour and perceptions of economic value. This is particularly important given the prominence of milk in pastoral livelihoods and the important role that women play in collecting and distributing this product. The accumulation of social capital through exchange of items such as milk represent a vital component of the pastoral economy: a component that is largely managed by women. By aggregating figures on the subsistence economy with the market economy, this report implies that the subsistence product is also a latent commercial product. However, this ignores the social (and by extension economic) cost that such a change in the use of pastoral products would represent.

Presenting the values to policy makers

As it stands, the data in this report is somewhat controversial and open to criticism. This is part of its purpose and the process of refining the Valuation of Kenyan Pastoralism will continue. However, is immediately useful, indeed is already being used, to inform Kenya's policy makers, not only those in government, but also those in Civil Society and Multilateral and bilateral agencies.

Some conceptual and methodological issues have to be resolved, including the most appropriate way to present the measurable values of assets, income and inputs. These are some of the data that are likely to be of greatest interest to policy makers. However, it is already possible to present a rough estimate of the direct values of pastoralism to Kenya's economy and to use this to compare with other published estimates of opportunity costs, or economic values, or alternative land use options.

The overriding question may be 'value to whom?' Many policy makers may be unimpressed by the cultural values attached to pastoralism by pastoralists, although pastoralists may consider this to be an issue for advocacy in its own right. Kenya's non-pastoral general public may be interested in the contribution that pastoralism is making to

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[21] Estimate only – the number of people on famine relief may have been fewer, but famine for some communities was spread over a longer period (for example 12 to 18 months). The $1 figure is the basic minimum required including logistics and administration.

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their national economy, but also the indirect service values related to nature conservation that are not commonly associated with pastoralism. There are clearly hidden values to pastoralism that may not be noticed as they go, but will be missed when they are gone. It is prudent to make the public and the appropriate government ministries aware of these values whilst they still exist.

Conclusion

A number of points are clear from this report, despite the ambiguity in some areas:

- Pastoralism is a serious economic contributor to Kenya's economy

- Pastoralism could be an even more serious contributor to domestic trade and export earnings, given the high value of the subsistence economy

- Pastoralism is predominantly a dairy production system, so a policy focus on meat sales is incomplete

- Pastoralism does not have to compete against other land uses and there are important complementarities to explore

- Pastoralism should not be swept aside by investment in alternative land use systems – it is making its significant contribution on the basis of minimal government investment, which suggests that it could become a much greater contributor with greater investment

- Data from pastoral areas remains poor, and this comes at a cost to the nation, since the government unable to make appropriate policy decisions in an information vacuum

- Unmeasured values of pastoralism remain contentious, but almost certainly significant

- Indirect values of pastoralism are also poorly understood, but pastoralists have a major role to play in service provision to a wide national and international clientele