

MAKERERE INSTITUTE OF SOCIAL RESEARCH ( 831 )  
Rural development research project.

[Working papers]  
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3rd March, 1970

A Preliminary Investigation Into the  
Economics of Game Animals as an Alternative  
Method of Land Use, with a Proposal for an  
Investigation into the Problems of Marketing Game Meat.

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Introduction

The economics of the East African nations are largely dependent on the production of primary products from their land resources. The major proportion of the population depends on cultivated agriculture for its livelihood and the nations depend on crops as their major foreign exchange earners. Rangeland provides the habitat for herds of domestic and wild animals. Most rangelands are designated as areas with annual rainfall of 30 inches or less, however many acres of land with higher rainfall are used for livestock and wild game grazing.

Large areas of the present East African rangeland, including the greater proportion of Uganda, could be successfully cultivated with scientific advances, population growth and growing pressure on the land for food production there is a need to examine the cost-benefit relationships in the use of land. In recent years governments have placed great emphasis on the expansion of cattle ranching schemes. The development of these schemes involved large expenditures of funds on the eradication of tsetse installation of fencing, roads and water supplies on the ranches. Tsetse fly eradication programs included shooting large numbers of game animals and removal of many trees and bushes. Often little attention was paid to the real cost of those activities.

The 1967 East African Livestock Survey report stated that there are 160,000 square miles in parks and forests and 410,000 square miles available for pasture and rangeland. These 470,000 square miles, about 90 per cent of East Africa, support more than 20 million cattle, 11 million goats, 7 million sheep and 1.5 million donkeys and camels.<sup>1</sup> Game animals are also part of the animal population supported on these rangelands but no accurate count has been made of them.

Many areas which presently carry up to 100,000 pounds of wild game biomass per acre are tsetse infested bushland. In

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1. Mac Gillivray, Sir Donald et al: East African Livestock Survey, United Nations Development Program/FAO. Rome, Vol. 11, p. 15

the next twenty to thirty years a much larger proportion of all available rangeland will be populated by domestic livestock. Schemes for development, clearing tsetse and enclosures are receiving great amounts of priority treatment.

Parts of the large rangeland potential have been developed for tourism and livestock production schemes. Most rangeland has received only minimal attention or investment. The situation which exists in many range areas, especially where pastoral people live and graze their herds of cattle, consists of high stocking rates and very low off-take rates. Many of these traditional livestock areas add little to the meat supply because of low off-take and small sized animals, while new tsetse cleared areas with developing ranching schemes are experiencing difficulty in stocking up.

Game areas are usually not overstocked, but little attention is given to the potential economic value of using this readily available resources. In parks and game reserves the main source of revenue is tourism, the economics of game cropping and game ranching are largely ignored. The economic, social and general development problems of game rangeland need to be studied and analysed in order to make policy recommendations and plans for its efficient use.

This paper will present a brief review of the economic contribution of game animals to the economics of East Africa via tourism. It will also show some results of experiences in game cropping in southern Africa and a trial cropping experiment in Uganda. The last part will present some preliminary ideas on a study of the potential for marketing game meat from a game cropping scheme in Uganda.

#### Tourism

There are several approaches that can be used to increase the returns from land inhabited by game animals. These include tourism for photographers and licensed hunters in National Parks and game reserves. Game cropping for meat, hides and novelties plus game ranching and game management with the purpose of increasing the yield of various species for ultimate marketing. Another, but less acceptable to many people is organized-but-controlled hunting by the indigenous population. Game domestication has possibilities for ranching but has limited popularity because of legal restrictions on marketing game meat from private game ranchers.

In medium to high potential rangeland, game animals will have to compete with domestic livestock. Domestic livestock

production will be developed in many of these areas and growing population will require the expansion of cultivated agriculture to develop where it is economically feasible. The long-run prospects for game animals habitat will be in National Parks and low potential rangeland. Developing nations have a much narrower range of export alternatives than highly developed industrial and agricultural nations. Consequently they are dependent on primary product exports. The East African nations have recognized that they have a unique game resource that has great potential as a foreign exchange earner through tourism. Exploitation of wildlife in the form of game viewing and photography, and to a lesser degree hunting safaris, have become an important source of foreign exchange earnings. The large network of national parks and game reserves are the major attraction for the large number of tourists visiting East Africa.

The export of primary products and tourism earn 90 per cent of Kenya's total foreign exchange and agriculture, livestock and tourism account for 40 per cent of the country's total product.<sup>2</sup> Agriculture is relatively more important in Uganda, with tourism playing a minor role.

The development of game viewing and hunting safaris have provided major economic benefits to East Africa. Hunting safaris employ more people per tourist and returns are higher per day than photographic and viewing safaris.

Table 1: Visitor responses broken down by length of stay<sup>3</sup> and days spent on and off safari in Kenya, Tanzania and Uganda, 1966.

<u>Hunting Visitors</u>	<u>Average No. of days</u>	<u>Days "Off" safari</u>	<u>Average No. of days</u>
Days "on" safari			
Kenya	26.7		4.2
Tanzania	2.2		0.4
Uganda	0.2		0.3
East Africa	29.1		4.9
<u>Photographic Visitors</u>			
Days "On" safari		Days "Off" safari	
Kenya	12.5		6.3
Tanzania	8.1		0.2
Uganda	3.1		0.2
East Africa	23.7		6.7

2. Davis, R.K., Some Aspects of Range Management in Kenya, Report of a Symposium of East African Range Problems, Villa Serebelloni, Lake Como, Italy, 1968, p. 73.

The average expenditure for persons on hunting safari is £1611 and those on photographic safaris average expenditure of £972 in East Africa. The study states that 1,185 hunting licenses were issued in Kenya in 1966. Tanzania reported 350 foreign hunting clients in 1968 with the expectation of 550 by 1974.<sup>4</sup>

Inspection of the current 5-year plans indicates that wild game received little attention in Tanzania and was only mentioned in the Uganda Plan. In all cases wildlife was mentioned exclusively in the tourism section, giving no indication of the potential game animal contribution to meat and food supplies.

Tanzania estimated 40,000 tourist visitors in 1968, staying an average of 6 to 10 days. Income from tourist trade was Shs 60 million, which was eight in size of foreign exchange earners. Estimates are that 40 per cent of tourist expenditures are for imported items, making a net foreign exchange contribution of 60 per cent. Kenya on-the-other-hand reports a 75 per cent net foreign exchange earning from tourist income.

Tanzania hopes to double its tourist income by 1974. This was the only country that had specific plans to train manpower in game management which include increases of 15 graduates, 41 diplomates and 256 certificate holders.<sup>5</sup>

Kenya's tourist industry is its second largest foreign exchange earner. It employed 20,000 people in 1968 to care for 268,000 tourist with projections for doubling these figures in 1974. Gross foreign exchange earnings are projected to increase at a rate of 15 per cent annually from £9 M. in 1964 to £36.5 M in 1974.<sup>6</sup> Investment in new tourist facilities over the next Five Year Plan are projected at £13.5 M of public funds. The hotels which will be included in this expenditure

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3. Clarke, R. and Mitchell, F., The Economic Value of Hunting and Outfitting in East Africa, Institute of Development Studies, University College, Nairobi, East African Journal of Agriculture and Forestry, June 1968, p. 90.
  4. Tanzania Second Five-Year Plan for Economic and Social Development, Government Printer, Dar es Salaam, 1969, p.147.
  5. Ibid. p. 35.
  6. Republic of Kenya, Development Plan 1970-1974, p. 430.

will be distributed, 43 per cent on the coast, 30 per cent Nairobi and 27 per cent in game parks.

The Kenya 1970-1974 Five Year Plan was the only one which made any statement about the need for more fully utilizing its wildlife resource. It stated on page 447 the following,

Sport hunting takes up fewer numbers of game animals from the hunting blocks than are produced, except in the case of trophy animals, and assuming that sufficient unsatisfied demand for hunting exists this is a field that can profitably be developed. Cropping under quotas established by the Department is practiced on a number of private ranches which sell the resulting hides but because the sale of game meat is illegal, the economic benefits derived from wildlife in this way is inadequate to offset the disadvantages (from damage, disease and competition from grazing) of conserving wildlife on ranching land. The economic potential of game cropping on ranch land is far from being realized.

This is the only mention of the potential value of game animals, for purposes other than viewing and hunting, made in the three East African countries' Five-Year Plans.

Uganda receives the smallest proportion of East Africa's tourist trade. It has many game animals in its National Parks, but does not have the coast which complements the game viewing or hunting holiday. Tourism is expected to increase with the increase in numbers of international airlines carrying passengers into Entebbe. This will grow at an accelerated rate with the introduction of Jumbo Jets and greater number of package tours.

Tourist numbers are increasing fairly rapidly in Uganda and their expenditures are making increasing contribution to the economy.

Table 2: Visitors arrivals in Uganda 1962-1968.<sup>7</sup>

<u>Year</u>	<u>Immigration Department</u>	<u>Ministry of Tourism</u>
1962	8,970	N.A.
1963	12,250	N.A.
1964	12,690	N.A.
1965	9,130	N.A.
1966	11,770	24,000
1967	15,620	38,200
1968	16,140 (Jan-Sept)	53,960

7. Current Economic Position and Prospects of Uganda, International Bank for Reconstruction and Development (IDA), June 1969.

The discrepancy in figures between the Immigration Department and Ministry of Tourism came about because the Ministry of Tourism has a more complete coverage in recent years. In 1968 all visitors from Kenya and Tanzania are counted; this was not done before that date. The Immigration Department only counts visitors from outside East Africa who make their first stop in Uganda.

Expenditures on National Parks and game reserves development have been small in recent years. Encroachment by farmers on park lands has caused greater concentrations of hippo and elephants and selective cropping was necessary to forestall overgrazing. Plans for expenditure on greater numbers of tourist hotels are planned to accommodate the larger numbers of tourist which are expected in the future.

Tourism has been the only major use of game animals as an economic resource in East Africa in the past. Uganda expects to expand its tourist numbers to 67,500 by 1971 with a gross foreign exchange earning component of \$5,062,000 or about 6 per cent of foreign exchange earnings.<sup>8</sup>

#### Land Use and Game Population Prospects

Land used for grazing extends through the six ecological zones as described by Pratt, Greenway and Gwynne.<sup>9</sup>

Zone I high elevation moorland and grassland, limited use and potential for livestock, but high values for wildlife, tourism and water catchment.

Zone II humid to dry sub-humid and supports forest, bush and derived grassland, potential for timber, wildlife, tourism and crops such as pyrethrum, tea, coffee and intensive pasture for domestic livestock.

Zone III dry-sub-humid to semi-arid, vegetation is woodland, (Corbretum) bushland and savanna with high agricultural woodland.

Zone IV is semi-arid and covered by Acacia Thymeda has only marginal agricultural potential. It is highly productive rangeland and has high densities of livestock and wildlife.

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8. Tourism in Uganda, Sessional Paper No. 4, Government Printer, Entebbe, 1968.

9. Pratt, D.J., Greenway P.J. and Gwynne, M.D., A Classification of East African Rangeland, Journal of Applied Ecology, 1966, pp. 369-382.

Zone V is arid, supporting bush and perennial grasses. Agriculture has limited possibilities, wildlife is important in the dry thorn bush, but livestock potential depends on bush control.

Zone VI is very arid and consists of dwarf shrub grassland, forage is seasonal and nomadism is the way of life. Many wild animal species are adapted to this area.

All East African countries have land which fits into each ecological zone, but Uganda has the smallest proportion fitting the description of Zone VI. The authors showed the relationship between environment and carrying capacity for domestic animals in support of human population.

Ecological Zones

	<u>II</u>	<u>III</u>	<u>IV</u>	<u>V</u>	<u>VI</u>
Hectares per stock unit	0.8	1.6	4.0	12.0	42.0
Livestock units required per head of population	2.5	3.0	3.5	4.0	4.5
Hectares needed per head of population	2.0	4.8	14.0	48.0	189.0
Maximum population density per sq. mile (259 ha) under pastoral economy.	129	54	18	5	1

Much of the higher potential lands carries heavier populations because they have been developed in cultivated agriculture or mixed livestock and crop farming. Governments have invested capital in some rangeland areas for improved returns to livestock and tourism. Pastoral people have received little, if any, benefit from these investments. Some of the investments e.g. boreholes, dams for water catchment and funds used for the elimination of tsetse fly have had short term benefits but in the longer term have caused overstocking with subsequent land deterioration. Land which was formerly productive grazing area for game animals have been turned into desert when it was overstocked with domestic animals.

By increasing cattle numbers through greater availability of water (even disregarding disease control measures) large areas were overgrazed with the subsequent encroachment of bush and decrease of perennial grasses. The tempo of increasing numbers of cattle was greatly accelerated with the introduction of rhinderpest inoculation in the 1940's. The movements of huge herds of cattle around watering areas has caused serious erosion problems. Cattle, goats and sheep pulverize



the soil and grass in these areas.

Cattle numbers were increased at the expense of game animals. The II Kisongo area of 2,000 square miles, which includes Amboseli had a cattle population of 77,000 in 1948; following rhinderpest inoculation on a wide scale, numbers increased to 250,000 in 1960.<sup>10</sup> Domestic cattle suffer the heaviest toll when water and grass supplies are reduced. During the drought in 1962, the cattle numbers in this area was reduced to 65,000 by extensive sales and through large scale death losses. Game animals were able to withstand long periods of water and grass shortage with less devastating effects.

Uganda is embarking on a large scale tick control program in order to reduce calf mortality from the present 50 per cent to 5 or 10 per cent. The long range effects of this program on cattle population and the extension of ranching schemes into game areas are difficult to evaluate at this time. The full implementation of this program will bring increased competition for expansion of domestic animal grazing areas. The real economic cost and benefits of expenditures on tsetse control, investments in development and operation of full scale tick control programs and the development of cattle ranching schemes as related to cost and benefits of developing some of these areas into game ranching and game cropping schemes needs serious evaluation.

Uganda has an area of 91,125 square miles which includes 16,386 square miles of open water and swamp, leaving 74,739 square miles of dry land. National Parks, game reserves and limited hunting areas consist of 11,404 square miles. Human population settlement is not legally prohibited in controlled hunting areas and game sanctuaries.<sup>11</sup>

Population in Uganda is increasing in excess of 3 per cent per annum. The 1948 census showed 4,958,520 people, a density of 67 per square mile of dry land. The unofficial 1969 census figure indicates a population of over 9 million or over 120 people per square mile of dry land and projections are that this country will have 21,000,000 people by the year 2000.

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10. Western, D., Amboseli, *Africana*, Vol. 3, No. 12, 1969.

11. Ruhweza, S., Game Management Practices in Uganda, *East African Agriculture and Forestry Journal*, June 1968, p. 275.

The livestock population in Uganda is presently increasing at a rate of 2.3 per cent per year but with improved disease control measures it could increase faster in the future. The reduction of calf loss from rhinderpest and control of tyypn-osamosis brought a 50 per cent increase in number in the past 33 years. Well enforced tick control measures will cause numbers to increase faster in the near future.

Table 3 Uganda Livestock Population 1939-1968

Year	Cattle	Percentage Increase			Karamoja Cattle
		over 1939 000's	Sheep of head	Goats	
1939	2,590.5	-	1,193.9	2,415.9	393.4
1949	2,484.2	-	1,076.7	2,309.5	392.1
1955	3,094.4	19.8	1,093.2	2,513.7	557.0
1960	3,618.2	39.7	865.0	2,592.0	645.0
1965	3,626.6	39.9	790.9	1,997.7	720.0
1968	3,857.5	48.9	766.3	1,872.6	700.0

\* Source: Annual Reports, Department of Veterinary Services and Animal Industry - various years.

Karamoja had one of the fastest growth rates in cattle numbers during this period; 77 per cent as compared to 49 per cent in the entire country. Karamoja is presently the most overgrazed area in Uganda, and is also the area of great game potential. The northern region which also has large numbers of game, is projected to have one of the largest percentage increases in cattle numbers.

The future cattle population growth in Karamoja is expected to be at a fairly low level because of the problem of overstocking. The greatest growth has been experienced in the Buganda region (see Table 4).

Table 4 Uganda Past Trends in Cattle Numbers by Region 1945-1967 and Expected Growth Rate 1967-1981.<sup>12</sup>

Region	Compound Growth Rate per cent			Projected Growth Rate
	1945-1955	1955-1967	1945-1967	
Northern	1.6	2.8	2.2	3.0
Eastern	2.4	0.5	0.7	1.0
Karamoja	3.6	2.3	2.8	1.0
Western	2.2	3.6	2.9	2.5
Buganda	7.0	3.1	4.9	3.0
Uganda	3.0	1.7	2.3	2.0

12. Report of the Committee on the Marketing of Livestock, Meats, Fish and their Products in Uganda 1969; Government Printer, Entebbe.

Continued increase in domestic livestock numbers will inevitably cause a restriction of land available for game. Government sponsored private ranching schemes in Acholi, Ankole, Bunyoro, Masaba, Meno, Lango and Teso districts cover an area in excess of 1250 square miles; undoubtedly these areas will be expanded in the future.

The 1962 Uganda Atlas shows a reduction of approximately 75 per cent of the habitat for most game species in the past half century. The slaughter of 60,000 game animals in the Ankole district has made cattle ranching possible. Natural game population increase and migration back to the area has required continued shooting. Removal of woody vegetation and conversion to grassland is also a continuous job as shrubs and trees return. Where several species of tsetse occur together, changes in the vegetation have been known to favor one species while reducing another.<sup>13</sup> There is a need to make an evaluation of the net ecological effect of tsetse control and animal habitat change.

With the rapidly expanding population in Uganda, farming will expand. The present overall land use per capita is 1.1 to 1.2 acres. Presently there are approximately 9.5 million acres under cultivation and by the year 2000 this area is projected to expand to 20 million acres.<sup>14</sup> Uganda has approximately 43.8 million acres that could be used for crops, some of which is now occupied by game animals.

The future of game depends on scientific advances in increasing agricultural output per acre, population growth and the public attitude toward using game as a source of meat and income. The feasibility of game cropping, game ranching and domestication must be evaluated on an economic basis to determine if land used in game production provides as high returns, as alternative uses. High potential and medium potential land will ultimately move to agriculture and livestock production. Game cropping, game meat marketing research now will provide information to aid planners when making intermediate and long-run plans concerning the economic use

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13. Report of Symposium in East African Range Problems. Villa Serbelloni, Lake Como, Italy, 1968, p. 25.

14. Thornton, D.D., Intensive Domestic Use of Rangeland. East African Agriculture and Forestry Journal, Proceeding of a Symposium on Wildlife Management and Land Use. June 1968, p. 149.

part of this relatively little used resource.

#### Game Cropping

There are three methods used in wildlife management which make it possible to use this resource for the production of meat, hides and trophies. Game Culling is the selective shooting of game animals in national parks and game reserves in order to reduce numbers. The main purpose of this activity is to preserve the habitat in which these animals live. The culling of hippopotamus in Murchison Falls National Park and Queen Elizabeth National Park in Uganda were examples of this. The meat was sold to local population and ivory provided considerable income.

Game ranching involves management of game animals outside national parks. Animals are encouraged to graze in an area, usually on plains with relatively low rainfall. Animals are cropped for their meat and trophy products.

Game farming involves domestication or near domestication. Animals may be bought and sold live or in carcass. Fences are used and occasionally supplementary feeding may be used.<sup>15</sup>

Schemes are sometimes set up to eliminate game animals for the purpose of setting up cattle ranching schemes. The elimination of large numbers of game animals in the Ankole ranching site was an example of this kind of game shooting. Another example drawn from a Rhodesian experience indicates that ranchers tried to eliminate game animals from ranches but instead found it profitable to sell game meat and hides.

The good market for beef encouraged Rhodesian ranchers to expand their investments in cattle ranches in the 1950's. As land was enclosed and in the process wildgame was also enclosed and became troublesome. Ranchers did not try to keep cattle and game on the same land, but tried to eliminate all game animals.

In 1954 ranchers received permission from the Game Department to shoot game and market biltong (dried-salted meat) from the killed animals. During the five years which followed an average of 80,000 pounds of biltong was marketed and a total of 5,193 zebra and 746 wildebeest were shot. In the years 1956-59 the annual kill of zebra was 1,343 and 203 wildebeest.

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15. ibid.(1) East African Livestock Survey, p. 133-134.

The annual gross income was £12,000 for biltong and an additional annual income of £12,500 for hides and trophies. The average value per animal for biltong and hide was £8 in Rhodesia.<sup>16</sup>

Ranchers would have had to sell 400 head of cattle to earn £12,000 which would have required an increase of about 2400 head of cattle. No estimate was made of the opportunity cost of what would have been involved in making the investment in cattle or if they would have survived on the available grass.

Another Rhodesian rancher had a density of 30 impala per square mile with a cropping rate of 20 per cent. This is higher than was possible with any African cattle. The ranch could have supported 3,000 impala with the capacity of cropping 600 annually at a value of £2,400 in Rhodesia and as shipped to South Africa the meat would have had a value of £3,600 to £4,200 annually. The ranch also supports eland, kudu, elephant, waterbuck and other animals. The grass cover was too sparse to carry the extra number of cattle it would have required to equal the income from game meat and hides.<sup>17</sup>

In late 1960 game cropping was developed on a multi-species basis under managed conditions in Rhodesia. The scheme involved 44 firms which held cropping permits on 4,358,290 areas. The gross value of game cropped in 1963 was £100,000 and the retail value was approximately twice that amount.<sup>18</sup> It was estimated that 35,776 game animals, producing 4.5 million pounds of venison annually could be cropped on a sustained basis in a 7,816 square mile area in a game ranching scheme in Rhodesia.<sup>19</sup> The area in which this game was harvested was classified for use as extensive livestock production only, cultivation was not possible in this arid area.

Game cropping in Transvaal has also produced economic returns. The cropping of 10 species in the period 1949 to 1951 which included cropping 85,698 animals produced 12.5 million pounds of meat. It was estimated that this was equal to meat production of 250,000 sheep and if valued at the same price was worth £12.5 million in 3 years.<sup>20</sup>

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16. Dasmann, R.F. and Mossman, A.S., The Economic Value of Rhodesian Game, Reprinted from the Rhodesian Farmer, 15 April, 1960.

17. ibid.

18. Mossman, A.S., Experience in Wildlife Utilization in South Rhodesia, Report on an International Conference of Wildlife in Developing Countries, Bad Godesberg, 1964, p. 78.

19. Roth, H.H. Game Utilization in Rhodesia 1964, Extract de Mammalia, Tome, No. 3, Sept. 1966, pp. 399-422

There are no similar results from game cropping in East Africa. The value of trophies from game cropping in Uganda is presently in the range of £10,000 annually,<sup>21</sup> but no figures are given for the value of game meat sold.

#### Game ranching and domestication

Research workers have proposed wild game ranching for East Africa because these animals are better suited to the ecology of the rangeland than cattle and produce more per acre. There is little empirical evidence to support this statement, but the evidence from the Rhodesian experiences indicate that marginal areas are more productive if game animals are included in domestic ranching areas.

There is a gathering evidence that game animals are nutritionally and reproductively more efficient than cattle or sheep. Talbot et al<sup>22</sup> made the following claims:

In terms of liveweight pound for pound, a crop of wild ungulates is significantly more productive than domestic livestock from the standpoint of age and reproduction; liveweight gain and speed of maturity, killing out percentage, carcass balance and protein yield. Through their differential, non duplicating preferred diets and more flexible water requirements and disease tolerance, a mixed population of wild ungulates makes for more efficient use of the available forage and water than domestic animals.

Data collected on East African animals indicates that the 16 species included all had a higher percentage carcass weight to liveweight than thin Zebu cows. All wild game except the hippo, have a higher percentage of carcass lean to liveweight than either fat or thin Zebu cattle (see Appendix A). Carcass weight as a percentage of liveweight for meat game animals is above 50 per cent, only fat Zebu cattle dress out above 50 per cent, but body fat makes up a greater percentage of the carcass.

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20. , Hunting and Marketing Wild Game in Transvaal, African Wild Life, March 1952.

21. ibid. (12) Ruhweza, p. 275.

22. Talbot, E.M., Payne, W.J.A., Ledger, H.P., La Danse, V. and Talbot, M.H., The Meat Production Potential of Wild Animals in Africa, Commonwealth Bureau of Animal Breeding and Genetics, Technical Communication No. 16, 1965.

Ledger and Smith<sup>23</sup> made a comparative study of 40 Uganda Kob and 70 unimproved grass fed Boran slaughter steers to determine dressing out percentage and percentage of carcass fat. The Kob mean dressing out percentage was 58.5 per cent of live weight and the lean meat as proportion of carcass weight was 81.3 per cent. The Boran steer dressed out at 57.6 per cent with an 54.8 of carcass weight as lean meat. Carcass fat as a per cent of carcass weight were 3.1 and 28.6 per cent for Kob and Boran steer respectively.

Little information is available on reproductive rates but those studied by Bindernagel<sup>24</sup> in Uganda all but the buffalo have higher reproductive rates than Zebu cattle (see Table 5).

Table 5: Life cycle, Gestation periods and Reproduction rates of Uganda Wild Animals.

Species	Minimum	Gestation	Calving	Reproduction
	Breeding Age	Period	Interval	Rate
	Months	Days	Months	Annual calves
Buffalo	50	340	22	0.54
Uganda Kob	13-14	266	10	1.20
Jackson Hartebeest	14	242	-	1.00
Oribi	-	220	10	1.20
Warthog	20	175	-	3.40

The reproduction rate is higher and the sexual maturity age for the small animals is younger than for Zebu cows. The buffalo has a first calf at an older age than the Zebu and the calving interval is nearly the same, because of its greater weight the lifetime biomass production is greater for the buffalo than for the Zebu.

#### Mixing Species and Disease Problems

Eland has been domesticated in Rhodesia and experiments have been carried in domesticating kudu. Ox eland dressed out at 600 pounds at 3½ years and sold at one shilling per pound.<sup>25</sup> These animals are browsers and subsist on forage

23. Ledger, H.P. and Smith, N.S., The Carcass and Body Composition of the Uganda Kob, Journal of Wildlife Management, April 1964, pp. 827-839.

24. Bindernagel, J.A., Game Cropping in Uganda: A Report on an experiment project to utilize population of wild animals for meat production in Uganda, Uganda Game Department, 1968.

25. ibid. Dasman and Mosman (15), p. 3.

that cattle rarely use and are resistant to disease to which cattle are susceptible.

Mixing domestic cattle and game is a means of utilizing a given area more efficiently because a wider range of vegetation is consumed. The fear of game animals harbouring disease lethal to animals is real, but often unwarranted. Riney<sup>26</sup> states that game animals are immune to heartwater and there is mounting evidence that they are not wide scale carriers of corridor disease or bovine pleuro pneumonia. Wild game<sup>are</sup> carriers of foot-and-mouth disease, African hog cholera and African swine disease.

The problem of eliminating wildlife in the savannah is difficult because as an area is cleared, new animals migrate in and tsetse advances with them. In Uganda the present cost of clearing tsetse is claimed to be 16 shillings per acre but this estimate seems rather low. The true opportunity cost in terms of lost income from wild game and alternative uses for the funds invested in tsetse clearing and ranching development has not been fully studied. C.R. Field<sup>27</sup> remarks on the cost of the introduction of domestic animals into rangeland:

The establishment of large cattle ranching schemes in Western Uganda has cost thousands of pounds and it is still uncertain if it will be a success. Initially, indigenous game species were removed by shooting. Some carry trypanosomiasis and would act as a reservoir for tsetse fly to feed on before transference to cattle. Shooting was later followed by spraying since it proved impossible to eliminate the smaller and more elusive species... chaining of the bush eventually cleared the cover which the fly relies upon. However, this too appears to be no more than a temporary measure for the Acacia trees are sprouting fresh growth and the tsetse fly has returned.

Field recommends the alternative of mixed domestic and game ranching but cautions on the disease problem. Markets for game meat have not been developed, but research, which is the topic of this paper, is planned to be undertaken soon. Conflicts between the proponents of game cropping and game

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26. Riney, T., An Outline for Priority Needs for International Help for the Development of a Wildlife Resource in Africa, FAO/IUCN, African Special Report, 1964.
27. Field, C.R., The Food Habits of Some Wild Ungulates in Relation to Land Use and Management, East African Agriculture and Forestry Journal, Special Issue 1968, p. 162.



ranching and cattle ranchers supported by health officials exist. It is known that game animals are resistant to many diseases which are fatal to domestic cattle and that they harbour these diseases, but people with a bias toward game animals claim the problem has not been fully studied. Inquiries have shown that the percentage of animals stricken with parasites is lower in game population than in cattle and this can be easily detected during slaughter. This argument is especially valid when the claim is made that game meat may carry disease which can be transferred to humans when they consume it.

Roth<sup>28</sup> claims the competition between game enthusiasts and cattle ranchers is a fear of game meat competition with beef in the market. The greater efficiency of game in utilizing savannah can increase production and if the game were fully utilized it could affect meat prices. This possibility seems rather remote in East Africa, where beef demand is tending to outrun supply. A recent study, *Marketing of Livestock, Meat, Fish and their Products in Uganda*, stated that net imports 1962-1966 were 500 - 2,700 cattle annually. This importation did not exist in 1967-1968.

#### Marketing Wildgame Meat

The problem of game meat harvesting, processing and marketing have not been studied in detail in East Africa. Market data is available from Rhodesia and South Africa, but these data merely indicate quantities of game meat sold and value obtained from sales. No published information on market development and stratification are available. The development of game cropping and game ranching schemes are dependent on information concerning the marketing of meat at maximum net returns in order to make the most efficient use of the game resources.

Studies of game cropping and income from game in East Africa have been mostly related to the value in terms of hides, novelties and tourism. A study of market demand for game meat and the development and distribution problems has not been done. This first part of this paper has been written to show some of the developments in the economic use of game animals in Africa.

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28. Roth, H.H., How to overcome the conflicts between a utilization of wildlife and other forms of rational exploitation of land, *Utilization of Wildlife*, International Conference, Bad Godesberg, 1964, p. 91.

The remainder of this paper will review what has been done in Uganda in game cropping research and to suggest some initial ideas on a proposed study of potential game meat marketing from a game cropping scheme.

A game cropping project was initiated in the West Acholi District in 1965. The area consists of 1,000,000 acres which is  $\frac{1}{4}$  woodland and  $\frac{1}{4}$  medium high scrub and about  $\frac{1}{2}$  grassland. Rainfall in the area averaged 35-40 inches during the study period 1965 to 1968.<sup>29</sup>

The traditional game management practices have been based on trophy hunting, by tourist and resident hunters. Revenue from all forms of game management in Uganda were:

Table 6 Revenue yields from all forms of game management in Uganda, 1961-1966<sup>30</sup>

<u>Year</u>	<u>Expenditure £</u>	<u>Revenue £</u>
1961/62	61,131	38,063
1962/63	59,050	76,615
1963/64	63,069	64,233
1964/65	87,007	110,648
1965/66	82,898	115,310

In addition to the game trophies and meat sold, foreign exchange income is estimated at £200,000 annually from the hunters and tourists who visit Uganda. The game department estimated an income of £13.3 per square mile of game area. An organized game cropping scheme under internal agency auspices, with the main objective of selling game meat, may yield less foreign exchange because revenue from foreign hunters visiting Uganda would be relatively smaller. However, a well developed game cropping scheme could provide meat for local and tourist consumption and hides and trophies for sale in foreign trade. A well developed program could increase the yield from game areas to provide more protein to local population and increase foreign exchange above the present level through the sale of larger quantities of hides and novelties.

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29. ibid. Bindernagel (24), p. 6.

30. Ruhweza, p. 276.

The Acholi Game Ranching Project which was started in 1965 has encountered its main difficulties in finding continuous and sustaining markets for game meat. The main constraint was the lack of an organized marketing program and lack of facilities for holding meat. Local butchers were contracted to come into the cropping area to pick up the carcass when the animals were shot. There seemed to be no lack of demand for meat at the price of only -/50 per pound of carcass weight. The marketing practices used in the project proved unsatisfactory so a study is being proposed to determine the market potential for game meat in order to more fully utilize the cropping potential.

There was monthly and seasonal variation in sales because cropping was difficult during the rainy season. Farm income is low in the pre-harvest season which also had an effect on demand for meat.

A relatively small number of animals were cropped during the first three years of the program in the Acholi District. Revenue figures were (see Appendix B) in vicinity of £3,000 annually, but no cost figures were included in the report. The biomass per square mile in a 38 square mile portion of the study area was determined. It was 45,422 lb. per sq. mile (excluding elephants which were present).<sup>31</sup> Game population was related to grazing capacity and it was determined that biomass was higher than in most areas of East Africa (see Appendix C). The cropping rates proposed, by species, in Bindernagel's report were based on calving rates and existing populations of various species in the 1600 sq. mile study area.

Table 7 Game cropping potential in the Acholi Game Ranching Project, by species

Species	Estimated Number of Animals	Calving Rate Per Year	Percent Total Population as Calves per year	Cropping Rate %
Buffalo	8,000	.54	14.1	10
Kob	7,000	1.20	23.0	20
Hartebeest	1,000	1.00	20.6	20
Oribi	4,000	1.20	25-40	25-35
Warthog	8,000	3.4	53.3	13

Population of various species in Table 7 are subject to some error, because the figures are estimates made

<sup>31</sup>. ibid. Bindernagel (24) p. 133

from aerial surveys, The study area has other animals which which have not been cropped e.g. elephants and waterbuck.

Bindernagel's report states that the cropping scheme cannot reach its full productive potential until some bridges and improved tracks are installed in the area. Presently animals move across rivers which do not have bridges and cropping is impeded. If the potential number of animals are cropped as shown in table 7, the production of meat will be approximately 1,000,000 pounds annually, plus edible offal. The main constrictions which impeded development of the full potential of the game cropping scheme were inadequate market organization and lack of market development of market outlets. The remaining portion of this paper will present some early thinking and ideas which will be incorporated into a game meat marketing study which will be undertaken soon. An attempt will be made to point out the problems that will most likely be encountered in the development of a market for game meat.

Information Needed: in order to sample the consumers of meat and potential consumers of game meat, certain basic information about the population will be necessary.

1. population size and structure, including age and sex.
2. income of rural people who will be consumers of game meat, this information should include seasonal and annual income variations. If there is a seasonal pattern it will affect meat sales and cropping operations.
3. information about the present and past experience of consumers with eating game meat and their attitude toward substituting it for beef, sheep, goat or chicken meat.
4. determination of prices consumers would be willing to pay for game meat relative to other meats or other food products.
5. local taboos connected with eating game meat.
6. attitude of rural people toward eating meat which has not been freshly killed, because this will affect the decision on the installation of cooling facilities to cool and hold meat. This whole picture will affect the efficiency of the marketing and cropping system.

7. past experiences of tourist hotels and game lodges in serving game meat will be helpful in making projections for the future.
8. Experiences and reactions of butchers and meat retailers toward selling game meat will be needed, any reliable information on marketing problems from butchers who have handled game meat in the past should be sought and evaluated.
9. the attitude of livestock health authorities regarding the movement of game meat and the marketing of it in urban centres need full investigation. If game meat cannot be moved through livestock areas or marketed in the cities, the possibility of selling high value cuts in higher income markets will be severely restricted.
10. information on the total size of the market for game meat, the potential supply and the consistency of demand and supply will be important aids for making decisions on market organization.
11. more complete biological data, on volume of meat available, proportion of total that will be high value cuts, lower value cuts, and edible offal, are necessary when making potential income projections.
12. estimates of the costs of cropping and costs of marketing meat, by the cut, or by the carcass will be needed. It is very important to determine the prices at which various cuts of meat will sell. The effect of selling the loin, steak and roast cuts in a high value market will most likely cause prices of remaining cuts to fall.

In order to determine if selling game meat into two markets is economic, an evaluation must be made regarding the marginal increased return from selling the higher value cuts in one market and the marginal decreased return from remaining portions of the carcass when sold in the local market. It may prove more economic to sell the entire carcass on the local market at an average price per kilogram or per carcass.

Cost which must be considered are labour, transportation, cooling and handling which will all increase as market differentiation is increased. The past method of contracting with butchers to pick up the carcass in the game area when shot proved unsatisfactory. So the possibility of installing a stationary or mobile abattoir must be considered in relation to its contribution to increased meat sales and income. Another

investment which will be considered is the installation of a meat cooling facility. Both the abattoir and cooling facility investment and operating costs must be weighed against the increased revenue they will generate through increased total market efficiency and increased revenue.

Alternative methods of marketing game meat will be investigated. The returns from increased tourist hunting in terms of licence, safari expenditures and tourism has some potential, but will perhaps have little marginal increase on the near future. The possibility of organized hunting parties by local people on a fee basis should be considered. The problem of collecting fees and controlling poaching under this system seem insurmountable at this point. Another problem connected with both trophy hunters and organized local hunting parties is the difficulty of cropping out the proper animals from each species to maintain the optimum herd makeup. A well organized cropping project can most likely best control the shooting of the proper animals to maintain herd balance.

#### Summary

This paper has summarized information on the economic value of wild game and the present use of this resource in East Africa. It has also shown some of the alternative uses for wild game as an economic resource in Rhodesia and South Africa. In East Africa, game is used primarily to attract tourists and little attention has been paid to game meat as an economic resource. In Rhodesia and South Africa game meat as a marketable commodity has been developed. The present priority to development of beef ranches in East Africa could preclude development of large scale game ranching or game cropping schemes. There are also legal restrictions on the sale of game meat in East Africa.

A small experimental trial game cropping scheme has been developed in Uganda by the Game Department. Success has been limited because of an insufficiently developed marketing system. A request has been made to the Rural Economy Department to make an investigation into the potential market for game meat. This paper is a first attempt at developing a marketing study. The details have not been worked out e.g. the size of sample, the questionnaire for various groups etc. The main purpose has been to point out information that will be needed and problems that will be encountered. The final details of the study will be worked out after an

initial visit to the study area and the potential market area. Some published information on population and income from the area will also be used as a basis of refining and developing the final study design.

This study will be an initial study which hopefully, will be followed by further studies on resource management. Other studies that should be considered are studies of the economics of beef ranching versus game cropping or game ranching, the economics of tsetse control related to game cropping and ranching in the same area. There are numerous other related studies that should be considered, but the present interest in game cropping and marketing of game meat will receive early attention.

Appendix A

Liveweights and Carcass Weights of Mature East African Animals

Species	Liveweight Average lb.	Carcass Weight Average lb.	Carcass as a % of Liveweight	Carcass Lean as a % of Liveweight
Hippopotamus	3284	1412	43.0	32.3
Buffalo	1660	839	50.5	40.6
Eland	1120	664	59.1	46.7
Zebu bulls	1067	618	58.0	39.8
Zebu steers	1036	596	57.6	31.6
Zebu fat cows	871	518	59.4	31.9
Zebu thin cows	658	303	46.8	30.3
Wildebeest	530	299	55.7	43.8
Waterbuck	524	308	58.6	48.5
Oxyx	389	222	57.2	46.1
Kongoni	314	180	57.2	46.1
Topi	288	156	54.2	43.6
Kob	213	123	57.7	47.8
Lesser Kudu	203	126	62.1	50.0
Warthog	194	106	54.7	45.4
Grant Gazelle	133	80	60.5	48.2
Impala	125	73	58.1	47.3
Geranuk	69	45	65.0	52.4
Thomson Gazelle	56	33	58.6	48.1
Zebra	566	311	55.0	43.2

\* Source: Institute of Development Studies, University College, Nairobi.

\*\* All game animals were the male of the species.



Appendix B

Acholi Game Ranching

Number of Animals Cropped, Pounds of Meat Marketed & Revenue Profit 1965-1967

Animal	Number Cropped			Pounds Meat Sold			Revenue		
	1965	1966	1967	1965	1966	1967	1965 shillings	1966	1967 Jan-Sept
Buffalo	129	140	99	87,822	65,547	47,834	44,384.60	37,251.30	22,912.15
Ugansa Kob	139	291	45	15,515	35,718	5,711	8,022.20	19,462.25	2,888.20
Jackson Hartebeest	32	40	44	5,960	7,288	8,169	3,199.00	4,504.20	4,113.40
Oribi	10	30	7	229	610	147	183.00	329.60	81.00
Warthog	6	5	6	571	511	610	266.10	304.80	292.40
Other	-	5	13	-	440	3,056		297.80	1,503.40
<b>Total</b>	<b>316</b>	<b>511</b>	<b>214</b>	<b>110,097</b>	<b>112,114</b>	<b>65,527</b>	<b>56,074.90</b>	<b>62,149.95</b>	<b>31,790.55</b>
<b>Total Revenue £</b>							<b>2,803.75</b>	<b>3,107.50</b>	<b>1,589.53</b>

Bingernagel, J.A., Game Cropping in Uganda, Aug. 1968, pp. 21-23.

Appendix C

Grazing Capacity Data for Some  
Natural Big Game and Livestock Ranges

<u>Wt. of Animals per mi.<sup>2</sup></u>	<u>No. of Animals per mi.<sup>2</sup></u>	<u>Size of Area mi.<sup>2</sup></u>	<u>Species and Range Condition</u>	<u>Location</u>
11,200- 16,000	-	-	Domestic livestock Savannah Tribal grazing land	Serengeti- Mara Plains Kenya, Tanzania
12,600	33	11	9 wild herbivores moderately grazed	Nairobi Ntl Park
21,000- 32,000	21-32	-	Cattle; average for Themeda grassland	Kenya
25,000- 30,000	80-90	-	Wild herbivores est. Average for Themeda- Acacia	Nairobi Ntl. Park
28,000	28	-	Cattle, average for virgin tall grass	Western U.S.A.
30,000	-	2,000- 3,000	Wild ungulates bush	Serengeti- Mara Plains
45,400	227	38	5 wild ungulates= 69% Kob, 17% oribi, 9% hartebeest; 3% warthog; 2% buffalo (elephant present but not included) moderately grazed.	Uganda (this study)

Sources:

1. Bindernagel, J.A. Game Cropping in Uganda
2. Talbot, L.M. and Talbot, N.H., The High Biomass of Wild Ungulates in East African Savannah, N.A. Wildlife Conference, 28; 465.
3. Petrides, G.A., Big Game Densities and Range Carrying Capacities in East Africa, Trans. N.A. Wildlife Conference 21. 525-537.

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