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STUDY CONFERENCE ON ECOLOGICAL ASPECTS OF INTERNATIONAL DEVELOPMENT, WARRENTON, VIRGINIA

"The Ecological Impact of the Introduction of Domestic Cattle into Wild Life and Tsetse Areas of Central Africa"

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I ABSTRACT

The introduction of domestic cattle into countries from which they were absent usually accompanied the migration into those countries of cattle herding people, who were of a different and perhaps more advanced culture than the aboriginal inhabitants. The impact of these immigrants bringing with them new ways of life, forms of agriculture and tools, on the ecology of their new environment must obviously have been of enormous significance and cannot really be separated from the supplementary impact made by their cattle which were domesticated and subject to the management of their owners.

In Rhodesia, a Central African Territory, the introduction of domesticated cattle coincided with the close of the Later Stone Age and the beginning of the Early Iron Age, about A.D.90 (Clark 1959) to A.D.700 (Oliver 1966). The first cattle entered with the migrations of cultivating, cattle owning, Iron Age peoples, who in successive waves made their way down Africa displacing the hunter-gatherer, Stone Age peoples who had occupied the country prior to their arrival, and settling where conditions were suitable until they in their turn, were displaced by the arrival of fresh hordes from the North.

In modern times important periods of cattle introduction were marked by the return of the Southern Bantu (1820-1870) and by the beginning of European settlement in 1890.

The arrival of European settlers brought in its train many changes. Prior to this last settlement, the population both of humans and of domestic livestock was low and could move over vast areas of unoccupied land. It was kept low by inter-tribal wars, drought, famines, disease and other biological controls which

the European settler immediately set about to undo. The rule of law was introduced, tribal wars and raiding were suppressed, famine relief was provided, as was medical aid for both man and beast. This resulted in a rapidly increasing rise in both human and livestock populations, which created an ever increasing demand for land. Thus the cattlemen rapidly lost the room to manoeuvre by which formerly they had been able to avoid contact with Fly. The position was complicated by land enclosure involving the demarcation of tribal and farming areas, which stabilised the people and by the steady advance of the Fly from the foci to which it had been reduced after the Rinderpest epizootic of 1896.

Prior to 1918 cattle shared Fly-free areas with wild life but direct contact between cattle and Fly was avoided. Eventually as was inevitable, contact between Fly and cattle was established in 1918 and the Government, in order to protect human inhabitants largely dependent on cattle, was forced to attempt to control the advance of the Fly. At first as an experiment and later as an established policy, it used what then appeared to be the only means at its disposal, the elimination of game, the hosts of the Fly; by shooting. At first the aim was total elimination of game animals. More recently after an interim period during which shooting was largely abandoned in favour of other methods of control and during which a great advance in the Fly front occurred, the policy was changed to selective elimination of favoured host species.

In this paper an attempt is made to recognise the effects of the impact of the entry of cattle owning peoples and their domesticated animals on the ecosystems of which they became part and to outline the measures required to undo and repair the harm to habitat and wild life produced by some of these effects.

II INTRODUCTION

Because the introduction of domestic cattle into lands or continents from which they were formerly absent must usually have

accompanied the migration into those areas of cattle herding people of a different and herhaps more advanced culture than the aboriginal inhabitants, bringing with them new skills, tools, forms of agriculture and ways of life, it is fair to say that in any land the impact of the introduction of domestic cattle could only be supplementary to the impact made by the new people, the cattle owning immigrants.

In North America where cattle were introduced in recent historical times by settlers from the old world, the impact made by the settlers and their cattle is well documented and fairly plain, but in Central Africa where the presence of domesticated cattle has for so long been a feature of the environment that the history of their introduction is lost in the mists of antiquity, the impact made by their introduction is much more difficult to assess.

III HISTORY OF CATTLE INTRODUCTION

In Rhodesia, a Central African Territory, the introduction of domesticated cattle goes back to the beginning of the Christian Era and coincides with the close of the Later Stone Age and the beginning of the Early Iron Age, between about A.D.90 (Clark 1959) to A.D.700 (Oliver 1966). Cattle entered Rhodesia with the migrations of the Iron Age, cultivating, cattle owning, Bantu peoples who in successive waves made their passage down Africa from the North to the South. These people were not truly nomadic. Each wave or horde moved in response to pressure by other waves or in search of pastures new which might lie ahead. Where the Iron Age immigrants found suitable country, they settled, grew crops and depastured their cattle, displacing the aboriginal Stone Age hunter-gatherer population of bushmen and hottentots until they in their turn were displaced by the arrival of fresh hordes from the North. Because they owned cattle the country they inhabited was confined by the availability of water, the presence of grass and the absence of Tsetse Flies. For mutual support and defence

they settled in close-knit communities.

A glance at the map of Africa will show that the high-lying, Tsetse-free, watershed country, which forms the backbone of Rhodesia, provided a natural route from the North to the South by which cattle herding peoples were able to bypass the lowlying Tsetse ridden country to the East while avoiding the arid Western country where watering points are few and far between.

The cattle population of Rhodesia must have been continually refreshed by the arrival of new migrations from the North and later by the northward movement of cattle owning people displaced in the South. In historical times between 1820-1870, waves of southern Bantu displaced by the rise of the Zulu power in Natal made their way North and of these the Ndebele, who brought many cattle, settled in Rhodesia.

The arrival of the Pioneer Column in 1890 heralded the beginning of European settlement and marked the beginning of a new era of cattle introduction and a tremendous growth in the population of both humans and cattle.

IV THE GROWTH OF THE CATTLE POPULATION

According to Nobbs (1927) official estimates at the time of the settlement 1890, put the total number of cattle in Rhodesia then at about 500,000 head. This population was reduced to about 25,000 by the Rinderpest epizootic between 1896 and 1898. Fourteen years later in 1911, the number was still under 500,000 although there had been considerable importations of breeding stock. By 1917 the figure had risen to upwards of 1,000,000. In 1927 there were well over 2,000,000 head in Rhodesia of which number, half were owned by the Natives.

Vorster (1960) shows that Native cattle, which numbered roughly 400,000 in 1915, had increased to 1,900,772 head by the end of 1955.

Over the same period European cattle, which numbered slightly less than 400,000 in 1915, had increased to 1,246,000 by the end of 1955.

At the end of 1967 Native cattle numbered 2,182,870 while European cattle totalled 1,756,644 (Central Statistical Office, 1968).

V THE GROWTH OF THE HUMAN POPULATION

It was estimated in 1901, eleven years after the beginning of European colonization, that the indigenous African population amounted to 500,000; by 1920 it had increased to 850,000; by 1940 to 1,390,000; by 1960 a census revealed that it was then 3,400,000, which figure by 1967 had increased to 4,330,000.

The population of people of European stock is increasing much less rapidly and numbered in 1967 only 232,000.

VI REASONS FOR THE GROWTH OF POPULATION

Previous to the arrival of European settlers in 1890 the population both of humans and of domestic livestock was kept at a low level by inter-tribal raiding and warfare, as well as by drought, famine, disease and other biological controls.

Stock losses caused by Rinderpest shortly after the occupation illustrate how effective the control by disease could be. A cattle population estimated at approximately 500,000 in 1890 was reduced to about 25,000 by the end of the epidemic in 1898 (Nobbs 1927).

Droughts, in addition to causing human and stock losses by starvation, forced cattle owners searching for grazing, into Tsetse areas where their cattle died of Nagana.

The effect of raiding and inter-tribal warfare on both the human and animal populations is well illustrated in historical times by the cataclysmic waves of disturbance set in motion by the Zulu rise to power, which spread devastation over thousands of miles, from the Natal Coast and the Cape northwards to Malawi and Tanzania (Wills 1964).

There is no reason to suppose that this eruption was unique. In addition to large scale disturbances of this type there was constant petty raiding and minor warfare.

A situation which must have occurred over and over again in the history of the Iron Age peoples in Central and Southern Africa

is pictured by Sir Theophilus Shepstone in a paper read at a meeting of the Royal Colonial Institute.

Describing the condition in Natal before the Zulu eruption he says "The Country was thickly populated by numerous tribes under independent Chiefs. These tribes lived so close together that tribal change of residence was difficult if not impossible. They intermarried with each other - possessed flock and herds - lived in ease and plenty themselves and at peace with their neighbours; until this luxury occasionally culminated in a periodical quarrel (as is the natural tendency, the natives say, in all that grows fat) and this quarrel was settled by a periodical fight." (Moodie 1888).

The advent of European settlers in 1890 ended this epoch. The rule of law was introduced. The country was stabilised. Tribal warfare and raiding were suppressed; famine relief was provided as was medical aid for both man and beast. The controls which had operated in ages past were removed. Life became secure and populations began to soar. No end to this increasingly rapid growth can be seen.

VII CATTLE AND TSETSE FLY

In the middle of the 19th century, Tsetse Fly (Glossina morsitans) occupied approximately half of the area of Rhodesia. The insect was confined to altitudes below 4,000 ft. and the infested portions of the country were separated into two main areas, northern and southern, by the watershed, a great belt of high lying country which was Fly free.

Following the Rinderpest epizootic which swept through the country in 1896, the Tsetse areas were greatly reduced in size. In the South the Fly disappeared completely while the northern Fly area was reduced to a few isolated focii.

Thus the great barrier to the spread of cattle in Rhodesia was removed and cattle began to move into areas from which they were formerly excluded by disease. However the retreat of the Fly was not permanent and as early as 1900 there were signs of increase both of game and of Fly in the still unoccupied northern area.

The arrival of European settlers brought many changes. Prior to this last settlement, the population both of humans and of domestic livestock was low and could move over vast areas of unoccupied land.

European colonisation was followed by a rapidly increasing rise in both human and livestock populations, which created an ever increasing demand for land. Thus the cattlemen rapidly lost the room to manoeuvre by which formerly they had been able to avoid contact with Fly. The position was further complicated by land enclosure involving the demarcation of tribal and farming areas, which stabilised the people and by the steady advance of the Fly from the focii to which it had been reduced after the Rinderpest.

Eventually as was inevitable, contact between Fly and cattle was established in 1918 and the Government, in order to protect the human inhabitants largely dependent on cattle, were forced to attempt to control the advance of the Fly. At first as an experiment and later as an established policy, they used what then appeared to be the only means at their disposal, the elimination of game, the hosts of the Fly, by shooting. At first the aim was total elimination of game animals. More recently after an interim period during which shooting was largely abandoned in favour of other methods of control and during which a great advance in the Fly front occurred, the policy was changed to selective elimination of favoured host species.

In Rhodesia a tremendous amount of research and effort is devoted to Tsetse control. Resulting from this research the present policy is to combat Fly by the removal of the most favoured hosts and to assist this operation by the use of insecticides and to a limited extent bush clearing. In the face of an expanding Fly population these operations are achieving success and continuing advances in technique make them more successful as time goes on.

The first priority at present is given to stabilising the Fly fronts and when this has been achieved, to the attrition of the Fly belt in areas where the land reclaimed can be fully utilised.

Prophylactic drugs are being used to maintain cattle

populations in a healthy condition in Tsetse country where the Fly challenge is light but where formerly cattle could not have survived.

There are few who doubt that eventually Tsetse areas as we know them, will disappear leaving the country at present occupied by Tsetse and game available for cattle and cultivation.

VIII THE IMPACT ON THE ECOSYSTEM OF CATTLE OWNING HUMANS

Man affects his environment by various means, the most important of which in primitive times appear to have been fire, the axe, the hoe and his use and management of domestic animals.

Fire predates man. There are records of fires caused by volcanic eruptions and by sparks struck by quartzite boulders dislodged by a falling tree and rolling down a slope.

There are numerous records of fires caused by lightning. Lightning fires in some districts of Rhodesia are not uncommon. Three separate fires caused by lightning in one evening at Melsetter were recorded in 1962 (West 1965).

Undoubtedly fires resulting from such causes played their part in moulding the earth's ecosystems long before the advent of man (Harris 1958), but the full potency of fire in affecting vegetation by producing and maintaining fire sub-climax communities, could not have been reached if man had not discovered how to make fire and use it in furthering his activities.

According to Clarke (1959) the earliest evidence of the use of fire by primitive man in Central Africa is associated with the Chelles-Acheul and perhaps the Fauresmith, industries which flourished at the very end of the Earlier Stone Age and more than 53,000 years ago. (Carbon dating from wood at the Kalambo site on the borders of Zambia and Tanzania).

Stone Age Man was a hunter-gatherer. He kept no domestic animals nor did he cultivate the soil to grow crops. Presumably he first used fire for heat, for cooking and in gathering honey. It is fair to presume that he learned to use fire on vegetation to assist him in hunting, and in this way he began to modify his ecosystem more markedly than had happened previously when fire

resulted only from physical causes. He did not use fire in agriculture and so the effects of fire as used by Stone Age Man could not have been as marked in modifying vegetation and the habitat for animals, as they became later when the territory of Stone Age Man was invaded and occupied by immigrant Iron Age Man who brought with him cattle and practised a shifting, slash and burn agriculture.

(1) Iron Age Man: Bartlett (1955, 1957) has shown how universal were the primitive systems of shifting agriculture, by which forest was slashed or felled and burned for crops grown in the ashes.

By inference from studies of primitive Iron Age Man in historical times, gardens or fields produced in this way were cultivated for a few years only, until the fertility of the soil was exhausted. They were then abandoned in favour of new gardens slashed from virgin areas where the accumulated fertility of the ecosystem could again be exploited. In the abandoned fields perennial grasses following annual weeds in the natural course of the plant succession, provided areas where fire could take hold and eat into the surrounding forest. Presumably these cleared areas were regularly burned by the cattle owners to get rid of old grass and to encourage new growth for their grazing animals, and so the destruction of the forest proceeded apace. Because of the shifting nature of their cultivation a comparatively small population living in close-knit communities for mutual support and defence, occupying relatively small areas very densely for short periods, were able to produce profound changes over very extensive areas.

"The inroads made on the forest in this way by the cultivators produced the grasslands and savannas required by the stock owning graziers and the use of fire as a means of producing and maintaining grazing land became established custom among the primitive inhabitants of the tropics and sub-tropics" (West 1965).

As we have seen Iron Age Man, bringing cultivation and

cattle, entered Rhodesia early in the Christian era, during a period when the climate was much the same as the present, and the rainfall considerably less than it had been in the previous pluvial period (Summers 1960).

This means that the rainfall was marginal for forest then existing over large areas of Rhodesia and because of this forest was destroyed much more easily.

This is in accordance with the views of Aubreville (1937, 1947, 1949 A, & B, 1950) who presents a most depressing picture of forest destruction and its replacement by savanna vegetation over most of tropical and southern Africa. Aubreville maintains that while changes in climate may have induced a state of physiological disequilibrium with the environment which made forests in some parts easier to destroy, the major cause of destruction was man's activities assisted by fire. Fire upset the delicate balance that had been established between forest and the drier climate.

He maintains (Aubreville 1950) that by clearing and burning man has enabled the savanna to extend far across the original transitional zone between the Sudan Guinean flora and the Congo rain forests.

In the 1,800 years (approximately) which have elapsed since the first entry of Iron Age Man and the beginning of European settlement, spectacular changes in the vegetation of Rhodesia were brought about, mainly it is thought by the activities of Iron Age Man.

The tropical and montane forests of the high rainfall Eastern Districts were almost completely cleared and over enormous areas, hillsides formerly covered by evergreen forest were terraced and cultivated. (Swynnerton 1917, Summers 1960). Of these ancient forests only relic patches remain, despite the fact that the rainfall of this eastern area is and as far as can be ascertained, has always been sufficient for the development of forest.

The swamp forests which existing relics show must have covered much of the presently open vlei areas were almost entirely

destroyed by the activities of prehistoric Iron Age Man, who was enabled because of the wetness of the vlei soils to grow crops in these areas during the dry season.

There is much evidence to show that the Brachystegia woodlands as well as the stretches of grassland which cover great areas of the higher rainfall, watershed country have resulted from the effects of man's activities, fire, cultivation and the grazing of cattle, in ancient times.

These effects most marked in the higher lying, Tsetse free, watershed country, are less obvious though not absent in the lower lying, dry savanna capable of harbouring Tsetse. Here Riverine Forests have been reduced to relic proportions and much parkland savanna (cultivation steppe) has been created. Interesting thicket communities comparable with, but less extensive than the thicket communities of Tanganyika, occur on sandy soils in the North East, as in the Urungwe and Sebungwe areas of the Zambesi Valley and in the Sanyati Valley. Fossbrook (1957) has found that thicket in Northern Tanganyika hides prehistoric rainponds and wells associated with a former cattle owning people.

It is obvious that these great changes in the "habitat" brought about by Iron Age occupation must have produced correspondingly great changes in animal life, affecting profoundly the abundance and distribution of most species.

Because the population of humans and of livestock was small and there was plenty of room for tribes to move around in, it was possible for the cattle owners to keep their cattle out of Tsetse areas except perhaps when severe drought and lack of grazing compelled entry in search of grass.

The Tsetse country could not have been empty of people. The alluvial soils on the river banks were cultivated and hunters undoubtedly took advantage of the game population. It is certain that it was burned periodically.

The people who it is thought concentrated in temporary settlements, would be dispersed at intervals either voluntarily

because they had exhausted the country they occupied or because they were attacked and displaced by stronger tribes, and so areas damaged by cattle grazing and occupation would be depopulated and left to recover.

It is probable that a high level of human and animal predation maintained the game population, including the larger mammals such as elephant and hippo, at levels which enabled both the game and the habitat to exist in a healthy condition.

Thus over the country as a whole an equilibrium favouring open savanna and grass, and discouraging the development of dense bush and forest would have been established.

Such was the condition of the country when the pioneers of European settlement arrived.

(2) European Settlers: This equilibrium was disrupted by the entry of European colonists whose advent as we have seen resulted in an explosive increase in the human and livestock populations.

The effect was dramatic. Abruptly an ecosystem which for ages had been in balance with a small and shifting human population, divided into numerous tribes and clans, concentrating in selected areas for a while and then moving on, leaving nature to repair the disturbance created by their cultivation and the grazing of their herds, was saddled with a population so large that the old shifting life was no longer possible, a population fixed by the demarcation of tribal and farming areas and the fencing of the boundaries of individual holdings, forced to cultivate the same fields and to graze the same areas while all the while the area available for individual use was constantly reduced by population growth.

Over the country as a whole both human and animal populations rapidly grew to levels approaching subsistence densities which Dasmann (1966) has described as essentially a disaster level, but a level at which man has kept his domesticated animals in many parts of the world. Formerly in Rhodesia this happened only in

isolated areas and for short periods of time. Now it was being approached over most of the occupied area. Grass which formerly accumulated until periodically it was burned, was now consumed as it grew. This resulted in a loss of vigour and changes in the grass cover leading to the virtual exclusion of fire or to a great reduction in the efficiency of fires in controlling woody growth.

The trend throughout the period of Iron Age occupation towards a reduction of the importance of bush and forest and the development of open savanna communities and grassland was completely reversed.

Because of increased grazing pressure and because grass that formerly burned was now eaten, fire could no longer exercise its role in producing and maintaining grassland and so the bush thickened while the grass became less. Thus developed the paradoxical situation that as the numbers of cattle increased the grass available for grazing became less, not only relatively to the increasing numbers of cattle but actually in total amount of dry matter available for consumption.

The reduction in the amount of grass produced in any given area is reflected by the reciprocal increase in yield of grass obtained from plots cleared of bush, illustrated by the following figures from cleared and uncleared plots in various parts of the country.

The effect of clearing the trees on yields of grass herbage

Harvest date	Seasonal rainfall up to time of harvest (inches)	Herbage yields (lb. dry matter/acre) Trees not cleared	Trees cleared
Tuli Experiment Station (on paragneiss)			
6.4.1964	7	280	520
1.4.1965	11	220	760
5.5.1966	12	160	1450
15.6.1967		601	2851
Nyamandhlovu Experiment Station (on red Kalahari sand)			
1.5.1964	16	1220	2620
1.4.1965	15	1320	2080
4.5.1966	21	1040	2000
Matopos Research Station (on basement schist)			
21.5.1963	22	1370	2900
17.3.1964	13	1020	2060
7.4.1965	12	580	1150
14.6.1966	19	720	1070
Matopos Research Station (on granite)			
20.5.1963	29	1260	1350
17.3.1964	13	1040	1430
25.5.1965	15	940	1280
22.6.1966	24	780	1460
Makoholi Experiment Station (on granite) *			
1961	24	310	1070
1962	27	390	1350
1963	33	460	1430
1964	18	110	1350

* Yields of herbage for this site in air dry herbage/acre.

In the seventy odd years which have elapsed since the beginning of European settlement there has been a tremendous increase of bush in grazing areas in Rhodesia. This is evident both in the increased density of existing savanna and woodland and in the encroachment of grassland formerly clear of woody growth. The fact that this increase has taken place is obvious to the trained observer and is borne out by the accounts of early travellers such as Selous (1893), Swynnerton (1917) and many others, from the memory of living residents, by the comparison of old and present photographs of identical areas and from the records of experimental stations. It is still proceeding except where checked by management, at an increasing pace especially in the medium to higher rainfall regions.

In the drier areas particularly, the increasing pressure of uncontrolled grazing has led to the denudation of millions of acres of grazing land. Over much of this area perennial grasses have been virtually eliminated, the country now supporting a cover of annuals when sufficient rain falls. These are rapidly consumed when drought prevails leaving the ground bare and forcing the livestock to subsist almost entirely on browse and fallen leaves. Conditions are rapidly worsening and this is reflected in the changing balance of the livestock population in the Tribal Areas where the numbers of small stock, goats and sheep, are increasing in relation to the cattle population.

This trend is illustrated by the following table of livestock population figures for African land in the Districts of Beit Bridge and Nuanetsi :-

	Beit Bridge			Nuanetsi		
	Cattle	Sheep	Goats	Cattle	Sheep	Goats
1959	46,545	8,739	24,262	51,486	2,396	17,996
1967	52,111	17,393	55,406	77,940	10,735	59,058

It is considered that the changes shown in the numbers of the various species of livestock are a result of the increasing degradation of the environment which is now imposing a severe limitation on the growth of the cattle population, but is still capable of supplying the needs of the rapidly increasing small stock population able to exist on sources of nutrients not available to cattle.

The great danger in this trend is that the degradation which was initiated by cattle will be continued to the ultimate end (uninhabitable desert) by the more versatile goats and sheep which are known to be able to continue to exist in environments degraded below the level cattle are capable of tolerating.

The changes in the game population since 1890 are equally marked. Selous (1893) and other early hunters and travellers tell how numerous, varied and widespread was the game population of Mashonaland and Matabeleland at the time of the colonisation. During the seventy-eight years which have passed since that date this game population has been drastically reduced except in some Tsetse areas and on National Land; in Forest Reserves, Game Reserves and National Parks. It is sad to reflect that one can now travel the length and breadth of Rhodesia on tarred highways and see not a single game animal. This would have been impossible as little as twenty years ago.

There are still numbers of game animals on private land and in Tribal Areas if one knows where to go but the spectacle that game used to provide for the casual traveller in Rhodesia is no more except in the National Parks; where too it is interesting to note that the White Rhino, the only large animal actually exterminated in recent times, has been reintroduced.

IX DISCUSSION

"The natural prairie produced buffalo and prairie chickens which people could eat, but when the prairie was ploughed and planted to corn ..... the sparse population which could have

been supported by the native grasses and animal life became a dense population fed by agricultural produce. The prairie became a bread basket for the world" (Dasmann 1966).

The reasons for the disappearance of game animals from farming areas in Rhodesia are basically and historically similar to those which led to the disappearance of the Buffalo from the North American prairie.

In Rhodesia a primitive, shifting agriculture sufficient for the needs of a small, Iron Age population has been displaced by a stable agriculture able to cope with the demand created by a much larger and constantly increasing number of humans.

European settlers brought with them a conservative outlook and a traditional system of agriculture. They understood the management of domestic livestock and the growing of cultivated crops. This explains the reasons for their success in producing crop and livestock produce in quantities sufficient to supply both their own needs and to develop a considerable export trade.

They did not understand the management of their natural pastures nor did they know how to make best use of them. Because of this their pastoral efforts have been exploitive, causing great damage to the habitat as well as a great reduction in its potential productivity.

Dasmann (1966) points out that tinkering with ecosystems can be dangerous. To the conservationist in Rhodesia the two trends that are most alarming are the degradation of the habitat and the rapid reduction of the game population in the farming and ranching areas.

To put these two problems into a proper perspective it is important that we should consider the agricultural potential of the country in the light of the demand made by an explosively increasing population (Fig. I & II).

The land surface of Rhodesia has been classified on the basis of efficiency of rainfall and agricultural potential, into five Natural Regions (Vincent & Thomas 1961)

NR.	Use	% of area of Rhodesia
I	Forestry, Coffee, Tea, Horticulture, Intensive Livestock Production.	1.56
II	Intensive Arable Farming. Crops and Livestock.	18.68
III	Semi-intensive Region. Livestock and Crops.	17.43
IV	Semi-extensive Region. Livestock and Fodder Crops.	33.03
V	Extensive Region. Cattle Ranching.	± 26.20))29.30%
XX	Unsuitable for Agriculture.	± 3.10)

(1) Degradation of the Habitat by Cattle

This problem is most serious in the drier country of Natural Regions IV and V. Here the vegetation is delicately balanced and intolerant of heavy uncontrolled grazing pressure. The view that this country is unsuited to cattle [redacted] is not supported by results from Veld Management trials, which show that the degradation is due not to the incompatibility of cattle but to the way in which the cattle were run and the grazing was managed. Under proper management, in which the basic requirements for the maintenance of the vegetation are met, over utilisation avoided, rotational growing season rests provided and the encroachment of bush prevented, cattle do well and the veld can be maintained in good condition.

To persuade the tribesman and landowner to implement the basic requirements of sound management is the real problem and one for which, especially in Tribal Areas, a solution is difficult to find.

Approximately half of the area in question, Natural Regions IV and V, is tribal territory and this invariably is far more over-crowded with cattle, sheep and goats and in much worse condition than is privately owned ranching land in the same Natural Region.

Practically all of the occupied Tribal Land is stocked at or above subsistence density (Dasmann 1966).

Any cure must be begun by reducing the grazing pressure to the level which the vegetation in its presently degraded condition will tolerate. This means "de-stocking," an unpalatable measure in Tribal Areas at any time, one which could only be arrived at by compulsion and one which any Government in the present political age would be loath to enforce.

West (1968) has recently suggested that in the Southern Lowveld the problem could be approached in a different way, by making use of the very great but still largely undeveloped irrigation potential of this country, to provide growing season (summer) grazing at high stocking rates on fertilised, irrigated pastures.

It is calculated that over most of the Southern Lowveld the existing cattle population could be carried on irrigated land for the six months from the beginning of November to the end of March.

This would provide a growing rest every year and would have the effect of doubling immediately the carrying capacity of the dry season grazing which would be required for six months instead of twelve as before. It is anticipated that if this type of utilisation could be brought about, the resting during the growing season, assisted where necessary by conservation works, bush clearing and Harvester Termite eradication, would enable the veld to recover very rapidly. The carrying capacity of the dry season grazing would undoubtedly improve and the country should eventually be able to carry easily a stocking greater than the present cattle population under which it is being reduced to desert conditions.

It is discouraging to reflect that however successful any solution to the problem in Tribal Lands might be, no solution can be lasting unless some way of limiting, preferably reducing, the human population dependent on livestock in these dry areas can be found.

(2) The Conservation of the Game Population

a) Developed Farming Areas: It is often remarked that one cannot farm in a Zoo and unfortunately there is much truth in this observation.

Apart from the danger of the transference of disease between game and cattle (Condy 1968) farmers and ranchers must manage both grazing and stock. For this fences are required. Many species of large game break fences and can make the maintenance of fencing impossible. Many species compete directly with cattle for food; most species wreak havoc in growing crops; some species endanger human life while predators such as lion, leopard, hyaena and jackal kill livestock.

Efficient farming cannot flourish in the face of these hazards and so in the highly developed farming areas, large game that presents a hazard to the major enterprise must inevitably go and has by and large been eliminated.

Despite this there is a compensatory trend, as farmers become prosperous, to encourage those game species which can be tolerated in developed farming areas.

Small game such as Reedbuck, Oribi, Steenbok and Duiker, and game birds such as Guinea Fowl and Francolin as well as Water Fowl are greatly valued and encouraged on the majority of developed farms, and there is a growing demand for the supply of species suitable for restocking.

b) Game Ranching: Messrs. Riney, Dasmann and Mossman, Fulbright Ecologists who worked in Rhodesia and who did so much to encourage an appreciation of the value of game and the need to study the ecological problems concerned with its preservation and utilisation in this country, were much impressed with the economic potential of game on ranching land. They advocated its exploitation on a sustained yield basis because they were convinced from their experience elsewhere that, if its monetary value could be established, its future in these ranching areas would be assured (Riney 1960; Dasmann and Mossman 1960; Mossman 1966).

On the premise that because of the wide range of feed preferences exhibited by different species of game animals, a properly balanced mixed population of wild game animals should be able to use the productivity of a mixed bush and grass ecosystem more effectively and efficiently than could cattle alone, the ranching of mixed game populations in the drier areas that might be marginal for cattle production, was advocated. Estimates of the financial return from this type of farming, based on short term, preliminary studies, were optimistic showing profits that compared very favourably with the returns from cattle ranching in the same environment (Dasmann and Mossman 1960) but although game ranching has been attempted on a fairly large scale on a number of properties, it has not been a great success. No rancher has been persuaded to give up cattle in favour of game, though many enjoyed for a few years the addition to their income that the exploitation of their game population provided.

In many cases recent attempts to exploit the game population on a sustained yield basis appears to have succeeded only in reducing the population of game animals to the point at which the return from cropping became unprofitable and for this reason a number of potential game ranchers have gone out of business.

The reasons for the lack of success include :-

(i) The difficulty in counting or assessing the numbers of different species in bush habitats.

(ii) An insufficient knowledge of population dynamics, rates of reproduction and mortality of the species involved.

(iii) The disturbance caused by cropping activities leading to movement out of the ranch.

Whatever the reasons no proof has as yet been obtained that these mixed game populations can be managed on a basis of sustained yield except where very low yields are expected.

In fairness it must be pointed out that no critical trials comparing the performance of mixed populations of wild game with domestic stock have as yet been made. There is a real need for a thorough and critical investigation of mixed game ranching vis-a-vis ranching with domesticated animals in Natural Regions V and XX. In this connection it should be remembered that the value of goats as browsing animals complementary to cattle has been plainly demonstrated on the Matopos and Tuli Research Stations where it has been found that

goats correctly managed, can play an important role in improving the range for cattle and in increasing production.

c) Game in Tsetse Areas: There are considerable game populations in much of the Tsetse area. Mossman (1966) maintains that within the Tsetse zones, exterminative shooting should be converted to sustained yield cropping while the advance of the Fly is prevented by concerted effort on the periphery of Tsetse areas. This would be an ideal solution if the position could be allowed to remain static, but the basic facts are that, not only is it necessary to prevent the spread of Tsetse in order to protect the rest of the country in which livestock farming is an established industry, but that the land occupied by Tsetse is urgently required for human settlement.

The present policy in controlling and eradicating Tsetse is outlined in section VII above. In this section it is pointed out that because of important advances in the control and eradication of Tsetse Flies and in the prevention of Trypanosomiasis, there is a very real prospect that in a relatively short period of time, Tsetse areas, as we know them, will have disappeared and cattle will be free to move into the areas from which they have previously been excluded because of Trypanosomiasis.

Nevertheless while large areas of Tsetse infested country remain, an opportunity exists for research into the principles and practice of game cropping which should be taken advantage of providing this does not interfere with the control of Fly. Experience to date indicates that much more experience and knowledge must be gained if game cropping is to be advocated as an alternative to cattle ranching (Ref. Section IX, 2, b).

d) Game in Tribal Areas: Generally in Tribal Areas population pressure is such that the game population, formerly large, is dwindling.

As in farming and ranching areas, agricultural development is incompatible with large populations of large game animals.

e) Game on National Land: A study of the present trends in this developing and largely agricultural country, leaves little doubt that in most categories of land the future for representative populations of large game is a bleak one. In farming and ranching areas including the Tribal Lands the trend is towards the elimination of game as development proceeds - over much of the developed area large game has already disappeared. Game will persist in Tsetse areas only until these areas are rendered habitable for cattle and the indications are that this will be brought about in the not too distant future.

We are left with National Land which in Rhodesia includes Forest Areas, Forest Reserves, Game Reserves and National Parks. In extent National Land at present totals 10,524,000 acres or slightly more than one-ninth of the area of the whole of Rhodesia. Of this total Game Reserves and National Parks together account for 7,839,087 acres. (National Parks 4,074,639 acres; Game Reserves 3,764,448 acres.)

Some of the Forest Land contains considerable game populations. At present this game is valued and preserved, but it must be remembered that in Forest Land the chief consideration is the welfare of the timber and that if game interests should conflict with Forest interests, the Forests would get preference. Only in Game Reserves and most of all in the National Parks is the interest of the game, and the preservation of their natural habitats, paramount.

Huxley (1961) points out that "National Parks are a key factor in the conservation of Wild Life ..... They give some guarantee of permanence ..... They are a source of prestige and actual or potential profit to the territories in which they lie ..... If properly managed they constitute the best means of preserving a representative sample of Africa's large wild animals for the enjoyment and interest of future generations."

In Rhodesia the permanence of the National Parks is guaranteed to some extent by the lucrative nature of the presently

large and rapidly growing tourist industry, of which they are the main attraction. It is certain however that population growth and increasing demand for land for human settlement will begin eventually to make demands on the area of the Parks.

It is vital that this tendency should be foreseen so that it can be resisted.

Perhaps the best means of ensuring effective resistance would be by beginning now to educate all people to appreciate the importance of conserving wild life in typical natural habitats, not merely because of its economic importance, but more importantly because of the obligation entailed in civilisation of providing living room for all forms of life; because of the aesthetic importance of wild life and its value for scientific and recreational purposes.

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RHODESIA

GROWTH OF INDIGENOUS HUMAN POPULATION SINCE 1901.

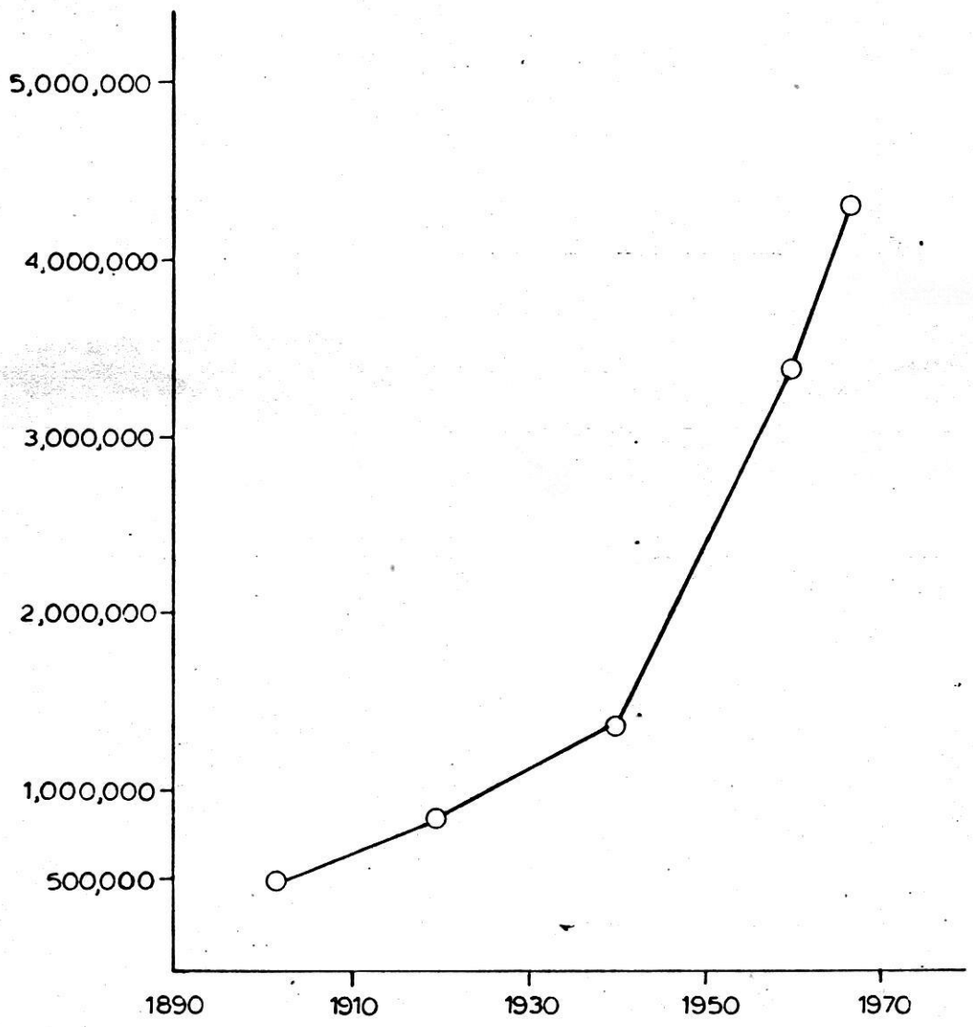

Fig. 2.

RHODESIA

GROWTH OF CATTLE POPULATION SINCE 1890

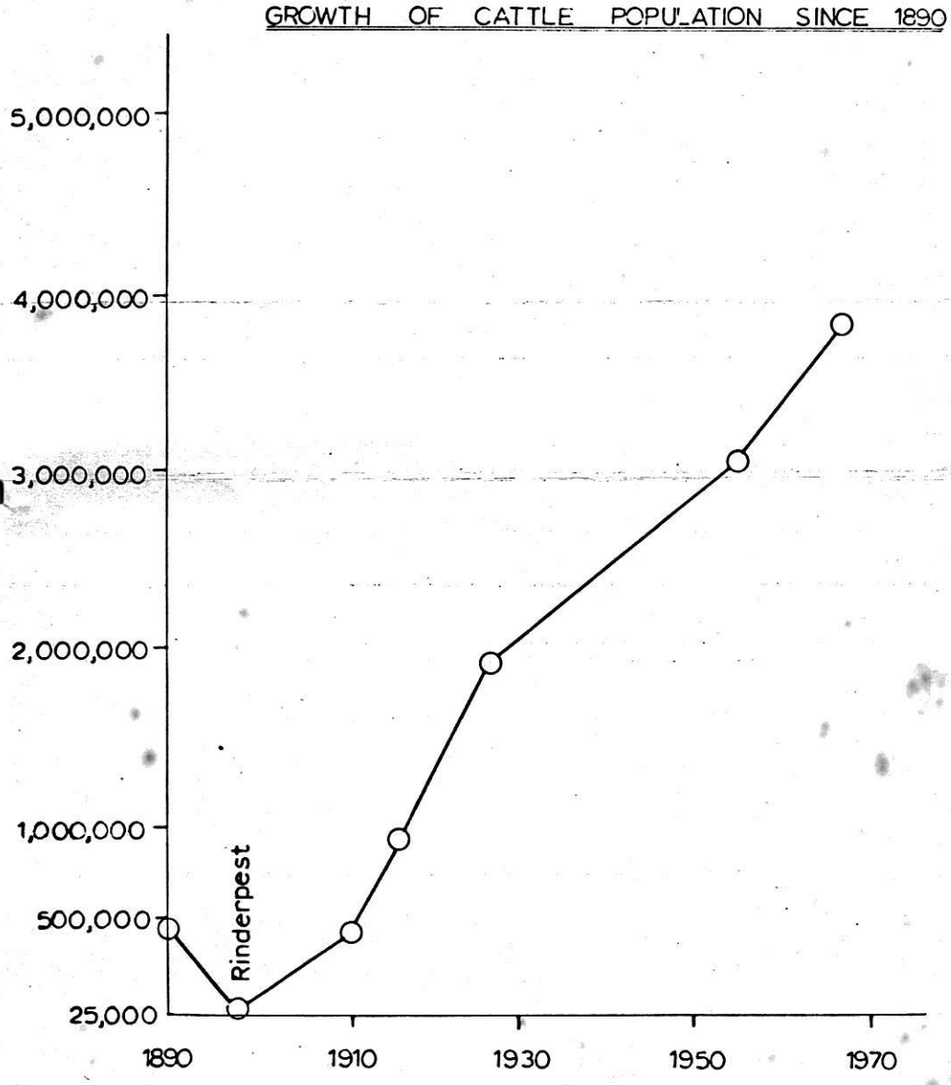

Fig. 1.