

irly effective (Hofmeyr & de Bruine, Hofmeyr et al. 1977). (Young & Bronkhorst 1971, Young Hofmeyr et al. 1973, Harthoorn 1975, 1978) have stressed the importance of many and other causes of mortalities and translocation operations. Apart from the operation and sound capture and the practical use of certain drugs in killing the alarm reaction and reducing the response to the neuroleptic, haloperidol facilitate the handling and transport of particularly the members of the Cervidae, Cephalophinae and Cervidae (Hofmeyr 1981).

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Wildlife production systems and programmes in Kenya

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Three projects have evaluated the potential of game cropping, domestication and ranching in Kenya. The UNDP/FAO Wildlife Management Project explored the potential for game cropping but difficulties in meat handling as well as public controversy redirected attention to a concessionaire system of sport hunting. The Galana Game Ranch Research Project evaluated pastoral management of habituated animals. The oryx was considered to have the greatest potential; buffalo were dangerous and the ecological adaptations of eland could not be expressed under these conditions. Game Ranching Ltd. at Athi River has evaluated fenced wild hoofed stock. Unfortunately, heavy poaching has forced nation-wide hunting and trophy bans. Nevertheless, the ranching project at Athi River has resumed under special permit.

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1. Historical perspective

As in other parts of eastern and southern Africa, wildlife populations in Kenya were massively depleted by rinderpest and overhunting in the late 1800's (Simon 1962). But, in response to legal protection and the creation of parks and reserves, populations built over a period of 70 years providing one of the world's truly great wildlife spectacles. With such large populations, recurrent droughts began to have increasingly dramatic effects. The drought of 1960—61 was particularly severe and was one a decade later which caused the deaths of an estimated 10 000 elephants in the Tsavo ecosystem alone. In the aftermath of the last drought, poaching reached unprecedented levels and stocks of rhinos and elephants were severely depleted in a tide which has only now begun to turn.

During the period of wildlife abundance, several projects on national consumptive utilization of wildlife were conceived (Field 1974, 1979). Most were conducted as reduction-cropping operations. The first major effort to manage on a sustained yield basis was the Kenya Wildlife Management Project, implemented in 1971 (UNDP/FAO 1980). Project objectives were directed towards the Government's clearly enunciated goal of optimizing returns from the wildlife resource and ensuring a fair distribution of net benefits. Initial emphasis was placed on cropping, mainly wildebeest in the Galana District within 100 km of Nairobi. This resulted in the development of a suitable technology for harvest, processing and distribution. Over 750 animals were processed although about 60 % had to be retained (frozen 14 days) because of muscle cysts. Later studies determined to be other than *Cysticercus bovis* (*Parascaris saginata*) and, therefore, no health hazard. Marketing was limited to urban fresh meat outlets which had some difficulty in absorbing the pulsed supply. The economics of the operation were

favorable when compared to pastoral beef production but not when the subsistence value of milk was included.

In spite of these modestly encouraging results, a review mission in 1974 imposed major reorientation to sport hunting and non-consumptive use. This new emphasis arose from public attitudes and came at a time of rising foreign exchange earnings from wildlife-based tourism (approx. USD 28 million in 1968 to USD 112 million in 1976).

Seemingly in anticipation of problems associated with cropping the Galana Game Ranch Research Project initiated a novel program of pastoral husbandry employing culturally-consistent systems for local people (King et al. 1977). African buffalo, eland and oryx were captured and habituated without much difficulty and it was possible to control these candidates in traditional pastoral systems of management. However, buffalo (particularly males) were dangerous to handle and offered few advantages over cattle. Eland were relatively unproductive in the arid environment of Galana under a herding system which required confinement to bomas at night. Also, their browsing habit requiring mobility and loose herd structures created herding difficulties. The greatest potential was offered by oryx, a species physiologically adapted to arid environments. Although captive herds are still held and used in several research projects, particularly concerning disease and parasites, changes in Government policy have suspended further development of a commercial enterprise.

2. Status of wildlife and current programmes

The first national rangeland census of wildlife was conducted in 1977 and repeated in 1978 (Stelfox et al. 1979). In general, populations of plains game are strong and appear to be increasing following drought in the early 1970's and protection afforded by strict controls. Conflicts with agriculture and expanding human populations have sharpened, creating an urgency for

major policy decisions and reinstatement of some form of consumptive use.

One of the most rapidly developing conflicts is in the Mara, the Kenya part of the Serengeti-Mara ecosystem. Since the early 1960's, populations of native ungulates have increased rapidly, presumably from the disappearance of rinderpest and improved moisture regimes. For eight major ungulate species, the aggregate 1979 population of 246 500 was 4.9 times that in 1961 (Stelfox et al. unpubl). During the peak of the annual migration, wildebeest alone number 800 000. Over the past 15 years, the annual rate of increase approached 40% for Thomson's gazelle, Grant's gazelle and impala. Annual rates of increase for the medium to large ungulates (kongoni, zebra, topi, wildebeest, buffalo and eland) ranged from 6–14%. If offtake approximated observed rate of increase, at least 90 000 animals could be harvested annually providing 6 000 tonnes liveweight/yr.

In spite of this considerable potential, only one enterprise is currently licenced to engage in commercial wildlife production; namely, Gamer Ranching Ltd. at Athi River, 40 km SE of Nairobi. This enterprise was established as a research project in the mid 1970's and has been operated as a full-scale commercial operation since January 1981.

The ranch comprises 8100 ha of gently undulating rangeland. The major habitats are recognizable by the occurrence and density of *Acacia drepanolobium* and *Balanites glabra*. Annual grassland productivity approaches 6700 kg/ha. The ranch is enclosed by a 2.4 m chain link fence which clarifies ownership of wildlife but restricts migratory movements.

The ranch presently supports 1800 cattle, 750 sheep/goats, and 3000 wild ungulates representing an aggregate biomass of 150 kg/ha. Thomson's and Grant's gazelles, kongoni and wildebeest are considered commercial species and number about 2500. Because of low populations or logistic constraints, giraffe, waterbuck, impala, zebra and eland are not harvested.

Cropping occurs weekly with the objective of harvesting 4 Thomson's gazelles, 3 Grant's gazelles, 2 kongoni and 1 wildebeest. This harvest regime, which provide the low continuous supply necessary to cultivate a taste for venison, corresponds to annual harvest rates of 27%, 24%, 15% and 12%, respectively. Animals are nightlighted from a Land Rover and head-shot with a .22 Hornet or .243 calibre rifle. Since an attempt is being made to build herds, only males are harvested. Stable population levels of the four economic species since January 1981 suggest that this high offtake rate has not been excessive.

Animals are bled when shot and transported to the abattoir within 1 hr where carcasses are eviscerated, skinned and cooled. Organs are retained and inspected along with the carcass the next morning by government meat inspectors. Once approved, meat is refrigerated until distribution in Nairobi 36 h later.

During 18 months of commercial operation, Gamer Ranching Ltd. has marketed 750 animals representing approximately 30 000 kg carcass weight. An average wildlife biomass of 21 kg/ha has provided a yield of 5 kg/ha. The livestock biomass of 128 kg/ha has provided an average yield of 11 kg/ha. Thus, although livestock comprise 80% of the biomass, they provide only 68% of the production.

3. Discussion

The prospect of contributing to the world food supply

has been offered as a justification for game production though the true motivation clearly has been to conserve indigenous grazing systems with their constituent large mammal faunas. Two divergent views complicate evaluation of the success of programmes in relation to the purported goal. The first is the social welfare perspective which emphasizes the importance of supplying inexpensive meat to those people who need it most and laments the fact that venison has become a high-priced specialty item. The second is the socio-economic development perspective which measures the success of game production in terms of cash returns to land owners or foreign exchange earnings for developing nations.

In Kenya, human populations are increasing at about 4% per year and the productive capacity of rangelands is rapidly being overwhelmed. Therefore, the thrust of development has been to assist pastoral people to enter the cash economy either as ranchers, crop agriculturists or members of the industrial work force. To facilitate the transition from subsistence pastoralism to commercial ranching, most of the productive trust lands have been adjudicated into group ranches.

Kenya has been eminently successful in marketing wildlife through tourism, an industry which has been the second largest earner of foreign exchange. However, there are two problems with complete dependence on tourism as an economic justification for wildlife conservation. First, it is sensitive to economic forces outside Kenya and to political instability in East Africa. Secondly, a fair distribution of benefits has been difficult to achieve. Land-owners (i.e. those who will determine the future of wildlife) bear a large proportion of the cost and realize few of the benefits.

Commercial wildlife production offers to enhance the viability of these new commercial ranches and thus the perceived value of wildlife. The selection of an appropriate technology and production system will vary with local circumstances. Sport hunting of large spectacular game is most cost-effective but abundant smaller game is best harvested for production of venison and hides. Since many pastoral peoples have not yet developed the aptitudes and skills for such an enterprise, programmes may have to be operated by concessionaires for some time to come. This approach has been tried in Kenya but failed initially because of widespread illegal dealings. With new controls in place, it is time to reinstitute and re-evaluate the programme.

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Foot and mouth disease as a li

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1. Introduction

When species of indigenous fauna are a farming system, simulating that domestic stock, it is becoming increasingly evaluate the impact of parasitism diseases, not only on these species, wit ecology, but also on the established domesticated stock, living amongst the periphery. The introduction of dom mostly of European origin into th temperate regions of the African conti past two centuries, has provided dran the existence of a great variety of infect parasites, to which the indigenous fau passage of time developed an amica relationship. Theileriosis, Trypanos wine fever, Rickettsiosis, and bo catarrh are but a few examples of th have seriously hampered the establi domesticated herds. Foot and moutl taken as a useful example to illustrate infectious diseases within the context

2. Foot and mouth disease and ga

On the basis of clinical signs or specific antibodies, at least 15 spe bovids are known to be susceptible to (1962, Macauley 1963, 1964, Condy et al. 1972, Karstad et al. 1978). A syste pathogenesis of the disease in each