Deutscher Tropentag 1999 in Berlin
Session: Biodiversity and Development of Animal Genetic Resources

Unconventional animals in rural development: 1. Game animals

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Abstract

The focus is on neglected aspects of African game utilisation, namely in communal areas and on game domestication. Five reasons for this neglect are put forward and their validity examined: 1. The benefits from wildlife utilisation, which have accrued to the private landowner and Government have not reached the rural poor; but this situation is now recognised and rectified e.g. by the Communal Areas Management Programme for Indigenous Resources. 2. The "tragedy of the commons" is exacerbated by wildlife, which require separate and specialist management. However, the potential returns are higher than for livestock and not directly dependent on primary production. 3. The statement that one cannot tame big game is clearly incorrect, but some are inherently dangerous as are some domestic ungulates. The ferocity of the aurochs was not a deterrent to its domestication. 4. The hypothesis that newly domesticated game animals will be no better than those already subjugated, does not hold for oryx, which have the same specific growth rate as zebu cattle and one third the water requirements. Nor does it apply to African buffalo and eland which have superior trypanocidal mechanisms to those of cattle. 5. The cattle culture and the prejudice against wildlife remain the most convincing arguments against game utilisation. It is concluded that the livestock of conventional man are inadequate to exploit the tropical environment, and there is belated recognition that superior adaptive mechanisms exist in African wildlife. The concept is now to copy or transfer these mechanisms to conventional livestock; there is no thought of using the game animals themselves in rural development.

Key words wildlife-utilisation; game-domestication; rural-development; tropics; Africa.

1. Introduction

This session allows us to revisit an area, which was of special interest to one of the authors twenty five years ago, namely game utilisation and especially game domestication (King *et al*., 1977). In the intervening period, it is self-evident (e.g. from television and tourist brochures) that the non-consumptive utilisation of wildlife has flourished at the national and international level. It is, however, difficult to find publications on the utilisation of game at the smallholder level with the notable exception of the Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) (Martin, 1986). It is even more difficult to find recent work on game domestication, as judged from the literature review of Feuerriegel (1996). According to Hudson and Dezhkin (1989), there has been surprisingly little effort to evaluate new agricultural animals, despite considerable experimentation with new germ plasm in crop production. From approximately 200 ungulate species, only 35 have been used as domestic animals in the past, of which about a dozen persist as agricultural animals today (Clutton-Brock, 1981; Mason, 1984).

Therefore, this review will focus on those aspects of wild and domestic game utilisation which have been neglected. The main geographical focus will be on the Tropics and Subtropics of Africa, rather than that of other continents, from which it differs in the following ways:

- Africa has a wealth of wild herbivores, and the case for their utilisation was admirably put by Sir Fraser Darling in 1960: "to exchange the wide spectrum of twenty to thirty hoofed animals living in delicate adjustment to their habitat for the narrowed spectrum of three ungulates exotic to Africa, cattle, sheep and goats, was to throw away a bountiful resource". This statement needs to be modified following the discovery of genetically discrete aurochsen strains in Africa and Europe, implying a separate centre of cattle domestication in North Africa (Bradley *et al*., 1996), but the concept is still valid.
- Asia no longer has a wealth of wild herbivores, but considerable biodiversity in its indigenous domestic herbivores (Payne, 1990), which is only now being threatened e.g. by the Dutch black-and-white cow (Porter, 1991);
- Latin America has autochthonous domesticated animals, which were marginalised by the Spanish colonials, creating a different scenario which is considered in the second paper (Gerken & King, 2000).

The purpose of this review, is not to document in detail what has been done in the past few decades, as would have been the task formerly, because that can be achieved with a computer-based literature search. Instead, the modern review should be a source of ideas (Lindsay, 1996), which will be derived from an examination of the arguments listed below.

2. Arguments

The arguments why game animals cannot contribute to rural development, include:

2.1. 'Game' animals are for the wealthy.

Wild game utilisation is not for the common man, because 'game' are for the wealthy. The English word 'game', with its Nordic-Saxon roots, has been applied to wild animals and birds pursued for sport since the thirteenth century (Onions *et al.*, 1995). Within a hundred years, the verb to 'poach' or steal game, derived from medieval French, was also to be found in the English language (Partridge, 1991). Thus the practice of reserving game for the nobility was well established in Europe, long before it colonised Africa.

For the African smallholder, the status of game has changed from that of a communal resource 'bush meat', which was probably taken for granted, to that of belonging to government and being illegal to hunt. For example, the Parks and Wildlife Act of 1975 provided that all wildlife throughout Zimbabwe belonged to the State, but that private landholders were permitted to exploit wildlife on their own land for their own benefit. On communal land, the State could not identify an owner and therefore assumed responsibility, setting hunting quotas, and leasing hunting concessions to safari operators, who paid fees to government, which was supposed to return funds to the districts. The result has been a resurgence of wildlife numbers on private land and a continued decline on communal land, where local inhabitants have been divorced from most of the benefits (Jansen, 1990). The project CAMPFIRE set out to ensure that money earned from wildlife went to the local

community, and not just for approved projects such as schools, but also as cash in the pocket of the householder (Cumming, 1995).

2.2. Wildlife on common land is unmanageable.

Communal land poses well recognised management problems: the so-called "tragedy of the commons", whereby resources held in common are doomed to over-exploitation, because resource-users are individualistic (Hardin, 1968). Wild animals add to these problems. They are difficult to control and quantify and have a nuisance value for livestock, especially their conspecifics, which encourages their extermination (Wilkinson, 1972). Consequently, they often have to be managed separately, and sub-contracted to specialists. Where this is done professionally, wildlife can be more profitable than livestock production, because the non-consumptive use of wildlife generates high valued returns which are additive and not directly dependent on primary production (Cumming, 1995).

Communal management of wildlife has been done for millenia all over the world, and there is an instructive example from South America, where domestic llama and alpaca pastoralism co-existed with wild vicuña herds thousands of years before the advent of the Inca empire. The Incas improved the vicuña capture method to the extent that they could drive large numbers of them into stone corrals without injuring them. After capture, the animals were shorn, a few sacrificed in rituals and the rest released. Several hundred people, led by highly specialised individuals, participated in the exercise, the *chaku* (Hurtado de Mendoza, 1987). The Inca *chaku* is cited as a way of securing the conservation of the vicuña, because it will benefit the local community. However, given that the fibre could only be worn by local and imperial authorities and be used for certain types of clothing (which is still largely the case), and that the penalties for poaching do not bear thinking about, the *chaku* practice may not translate that easily to the modern day. Nevertheless, the acceptance of the sustainable utilisation principle by the local communities is an appropriate and imperative concept for the long term conservation of the vicuña (Torres, 1992).

2.3. Cannot tame big game.

Wild animal domestication is not a realistic option, because African game animals reared in captivity can be dangerous, especially adult buffalo and eland bulls. Nevertheless, African buffaloes have pulled carts (Condy & Hedger, 1978), and African elephants are currently taking tourists on game-viewing rides (Kiley-Worthington & Rendle, 1997). Furthermore, initial problems of herd management can be overcome, once a species has been separated from its wild conspecifics and its behavioural characteristics better understood; vis. herd bonding in oryx starts in the kindergarten groups (Feuerriegel, 1996).

The "ferocious reputation of the African buffalo (*Syncerus caffer*) is largely a product of hunter's tales" (Sinclair, 1977), and that of the oryx (*Oryx beisa*) (Taylor, 1969) a question of ignorance. Furthermore, ferocity was not the block to domestication. The "Auer Ochse" (*Bos primigenius*) retained its reputation as a ferocious quarry until it had been hunted to extinction, as the graphics of J.E. Ridinger (1698-1767) illustrate (Altmeier & Samek, 1997). The aurochs' descendants are better known for their milk and meat production, apart from the fighting bulls of Spain and Portugal which have been selected for their character from the black Iberion draught cattle (Porter, 1991). Modern dairy bulls must also be handled with caution, as must domestic Asian buffalo (*Bubalis* spp.) which "are sensitive to a foreign

environment and suspicious of strangers and unfamiliar treatment. Their reaction is sometimes violent and harmful" (Tulloh & Holmes, 1992).

2.4. Newly domesticated animals are no better than those already subjugated.

To test this hypothesis of Zeuner (1963), two Game Ranch Research Projects were set up in the early seventies at Galana Ranch (East of Tsavo East National Park) and Ol Morogi Farm in the Rift Valley, both in Kenya (King et al., 1977). Wild African buffalo, eland and oryx were caught, tamed, and subjected to standard husbandry procedures (including dehorning and castration). They were herded at free range alongside Boran cattle, Dorper sheep, Small East African goats and camels during the day, and corralled at night. The projects were managed intensively for seven years, before being wound down following failure to obtain 'pre-development' funding for the next phase. However, the Galana project continued for some years under the management of a biologist, before succumbing to the general anarchy in the area. Nine eland from Ol Morogi were transferred to Baobab Farm, Mombasa, in 1977, which purchased ten oryx from Galana a year later (Haller, R. & Baer, S., 1995). The research and domestication process has continued at Baobab Farm (e.g. Feuerriegel, 1995), where the fifth generation of calves is being born, with the latest number for eland being 244 and for oryx being 399 (S.Baer, pers.comm. Sept. 1999).

The research at Galana revealed that the oryx, retained its arid-adapted characteristics under conditions of domestication, even outperforming the camel (Table 1). Against this sort of competition, it is apparent that the zebu cow is not arid-adapted, requiring 240% more water than the oryx after adjusting for size (King, 1979). Given this higher water use by the zebu, conventional wisdom might dictate that it must be more productive than the oryx, because the extra water is used to dissipate the higher heat increment of feeding (Webster, 1980). However, there was no significant difference in the specific growth rate of zebu and oryx (at 3.3g/kg$W_{\infty}^{0.75}$/day). Thus, for every g of growth per kg$W_{\infty}^{0.75}$ per day, the water turnover (per $l^{0.82}$ body pool)was approximately 55ml for zebu and 20ml for oryx (Carles *et al.*, 1981).

Table 1. Hierarchy of species' water turnover (ml/$l^{0·82}$/day) compared with the oryx.

Species	Ratio	Significance of difference
African buffalo	2·6	
		P>0·05
Zebu cow	2·4	
		P<0·001
Eland	2·1	
		P<0·001
Small E.African Goat	1·8	
		P>0·05
Sheep	1·7	
		P<0·001
Camel	1·4	
		P<0·001
Oryx	1·0	

Adapted from King (1979)

The high heat loads on Galana increased the water requirements of eland, because they were forced to forage during the day (Table 1), and further reduced the time they could spend feeding (Lewis, 1977). Consequently, they could not select enough good feed, from the scattered vegetation associated with 250 mm annual rainfall, to be productive (Field, 1975). The species had done better in Zimbabwe, albeit with some supplementary feeding (Posselt, 1963), and subsequently at Baobab Farm where they continue browsing at night in heavily bushed enclosures (Haller & Baer, 1995).

The three domesticants on Galana retained their superiority over conventional livestock in the area of disease; livestock required constant protection against trypanosomosis and tick-borne diseases, whereas the game animals did not (King & Heath, 1975). This finding went largely unremarked during the reappraisal of the approach to vector-borne disease control that was occurring in the livestock sector e.g. to the tsetse-fly problem in Africa (Ford, 1971). The International Laboratory on Research on Animal Disease (ILRAD) set out to characterise the main vector-borne haemoparasites with a view to producing vaccines and, together with the International Livestock Centre for Africa (ILCA), started to explore the possibilities of disease resistant livestock. Earlier studies on trypanosome-resistant cattle (Roberts & Gray, 1973) were expanded into the selection of trypanotolerant cattle breeds in Africa (e.g. Trail *et al.*, 1988) and in particular the N'Dama cow (d'Ieteren *et al.*, 1998). It is now belatedly recognised that African wildlife, such as buffalo and eland which have evolved with trypanosomes, have developed disease resistant mechanisms which are "cleverer" than those in livestock. For example, buffalo and eland use an enzyme in their serum to produce hydrogen peroxide which kills trypanosomes. When the parasitaemia is under control, another enzyme, catalase, is produced which breaks down the hydrogen peroxide (ILRI, 1998). The trypanocidal serum enzyme is xanthine oxidase (Muranjan *et al.*, 1997).

2.5. Cattle culture and prejudice against game are too strong.

Despite the fact that livestock numbers in southern Africa may be declining, especially since the 1991/92 drought, "the selfish practice of using wildlife for tourism" has been viewed by members of government in Zimbabwe as "indirectly fighting Government's goal for food self-sufficiency" (Cumming, 1995). Politicians have expressed concern at the reversion of their countrymen to wildlife utilisation (hunter-gathering) from their cultural heritage as cattle owners. Thus the positive social and emotional valuation of the livestock is disproportionately higher than its income potential (Jahnke, 1982; Birner, 1999). This cost of social status against livelihood is a trade-off that the politician can afford, but maybe the rural poor cannot.

The prejudice of African and European pastoralists against game animals, extends to new domesticants. It always has done. Domestication has spread not so much by local cultures adopting the technique and applying it to their own wild fauna and flora, but by the intrusion of people bringing their crops and livestock with them. Often this alien tradition has been sufficiently viable and cohesive to establish and spread itself beyond the natural climatic and geographic habitat of the initial domesticates (Piggott, 1969). These husbandry practices are usually so deep rooted that colonists cling to them even in an unfavourable environment (Bökönyi, 1969). Thus, there have been numerous attempts to establish the Asian buffalo in sub-Saharan Africa during the past four centuries, most of which have failed because of the animal's susceptibility to trypanosomosis and tick-borne disease (Ross Cockrill, 1974). The African buffalo has never been considered as a serious alternative candidate even when, as a

by-product of the establishment of Foot and Mouth Disease-free herds (Foggin & Taylor, 1996), it has existed as a domestic herd at the Mazowe Field Station of the Zimbabwe Central Veterinary Laboratory for the past 24 years.

3. Conclusions

An examination of the five Arguments reveals that only the last one holds, namely that culture and prejudice are the main constraints to the exploitation of animal genetic resources beyond the narrow confines of the livestock boundary. The block to the exploitation, particularly domestication, of African game animals was in man and not the animals (Parker & Graham, 1971), and still exists today. We have failed to recognise that, in the process of habituating animals to man, we have become habituated ourselves to these few species. The term conventional livestock is a misnomer; it is the livestock of conventional man.
It is also salutary for cattle breeders to recognise that, although *Bos indicus* is more heat tolerant than *Bos taurus* (Frisch & Vercoe, 1977), it is not well adapted to the semi-arid tropics when compared with other African ruminants. Furthermore, the physiological trade-off between adaptation and production described for cattle (e.g Finch, 1986), may not suffice to explain the mechanisms in oryx which permit it to grow at the same rate as the zebu on about one third of the water requirements.
One may also question the value of the term 'indigenous', in the context of biodiversity. Formerly, the term, which means literally 'one born within' (Partridge, 1991), was used to explain why African game animals were more resistant to African diseases than ruminant livestock. The latter were thought to be exotic, and the first arrivals are now the most trypanotolerant (Payne, 1990). But if some of these taurines were domesticated locally, albeit in North Africa, (Bradley *et al.,* 1996; Hanotte *et al.,* 2000), then it is difficult to use the 'indigenous' explanation. It becomes apparent that one is looking for adaptive characteristics, which are not the exclusive property of indigenous livestock. For example, there are now 1.7 million Asiatic buffalo successfully exploiting the flood plains of Marajo Island and the mouth of the Amazon river (Lourenço jr. *et al.,* 1994; FAO, 1998).
There has been a belated and tacit recognition by livestock scientists that there are superior adaptive mechanisms in African wildlife compared with domestic animals (ILRI, 1998). The concept is to copy or transfer these solutions already developed in nature to livestock production. The scientists can see exciting possiblities for new chemotherapies, genetic manipulation and transgenesis. Biotechnology is seen as the fastest, most effective and, in some cases, the only route to success (Teale, 1997). There is no serious consideration of the direct use of game animals for rural development. The analogy is to take the wings off aeroplanes and put them on trains in order to get airborne.

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