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The farming of “game” species ... “horses for courses”

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ABSTRACT

Pastoral-based animal industries utilise only a handful of domesticated species. The relatively recent development of farming “game” species (i.e., species traditionally harvested by hunting) has been largely prompted by changing first-world consumer demographics. Pastoral farming of red deer in NZ is often seen as a glowing example of diversification away from traditional livestock. In tropical regions, specific species adapted to local climate, vegetation and diseases include axis deer, sambar deer and rusa deer. In the arctic regions, reindeer are the species of choice due to their cold tolerance and food selection habits. Various species (e.g., antelope, buffalo, elephants, zebra, etc) form the basis of a growing game ranching industry in the dry savannah regions of Africa, structured around sustainable, low-density, multi-species grazing of rangelands that are generally unsuited to domestic livestock due to aridity or parasites/diseases (e.g., tsetse fly). Thus, there are many examples of successfully picking “horses for courses” ... game species suited to particular environments. Conversely, there is a danger that in the enthusiasm to promulgate particular systems around the world, there are occasions when “horses are on the wrong courses”. Classic examples for this include attempts to farm (1) tropical species in temperate environments, (2) temperate species in tropical environments, and (3) species behaviourally and physiologically misaligned with pastoral environments.

Keywords: game farming; deer; antelope, venison.

INTRODUCTION

Conventional pastoral-based animal industries around the world utilise only a few (mainly) mammalian species. Cattle, sheep, goats, etc have been subjected to millennia of genetic modification by selection for improved productivity within specific grassland environments (Zeuner, 1963). The relatively recent (last 30-40 years in most cases) development of farming “game” (i.e. species traditionally harvested by hunting) seems to be largely in response to a marked change in the demography of first-world consumers brought about by urbanisation and increased per capita wealth. This has been manifest as health consciousness with respect to the over-consumption of animal fats (“game” species generally provide lean meat products), desire for novelty (i.e. new dining experiences), and awareness of environmental issues pertaining to agricultural sustainability (e.g., overgrazing by sheep and cattle in ecologically sensitive regions, persistent health problems with traditional species, etc).

Deer farming, as epitomised by leading-edge developments in New Zealand over the last 30 years, is just one example of intensive husbandry of a non-traditional species. This industry, based on the pastoral farming of European red deer and North American wapiti (*Cervus elaphus*; various subspecies) has emerged from the feral “game” recovery industry of the 1970s, initially to fulfil developing markets for velvet antler but later including new niche markets for venison (Yerex, 1979). There are presently over 2.0 million farmed deer in New Zealand, realising national export earnings in excess of \$230 million per annum (Game Industry Board statistics, 2000). New Zealand’s dominance in the world deer farming industry tends to colour our perceptions of the overall world “game” farming/ranching scene as being dominated by red deer. However, there are numerous established and emerging examples of “game” farming in the broader context. The species and environments may differ, but the production of niche “game” products is a common theme.

In this paper we reflect on some other examples of “game” farming from various regions of the world to illustrate an emerging theme ... “horses for courses” (no, we are not advocating horses as a game species). In other words, finding the right species for particular ecological (and political) environments.

1. Cervids (Deer)

The “cervids” include 43 species and 206 subspecies (Whitehead, 1993) characterised by extreme diversity in morphology, physiology, ecology and geographical distribution. The international deer farming industry is based broadly on two groups of cervids: those of cool temperate northern origin, such as European red deer (*Cervus elaphus* spp *scoticus*, *hippelaphus*), North American and Asiatic wapiti (*Cervus elaphus* spp *nelsoni*, *roosevelti*, *manotobensis*, *xanthopygus*), European fallow deer (*Dama dama*) and Asiatic sika deer (*Cervus nippon*); and those of tropical equatorial origin such as chital deer (*Axis axis*), rusa deer (*Cervus timorensis*) and sambar deer (*Cervus unicolor*). All tend to be genotypes that exhibit notable gregariousness (cf. numerous highly territorial species that live solitary lives) and are adapted to mixed browsing/grazing (cf. species that are highly selective browsers). Farmed species, typically, can adjust to exclusive grazing and open-range environments even though they probably evolved to live on the forest-pasture interface. In these respects, they represent a specific subset of the cervid genome, biased towards the larger-bodied species with a high degree of behavioural plasticity. They also represent species that have remained relatively common in the wild and have a long history of association with man as prey species (Asher *et al.*, 1999).

Temperate deer for temperate grasslands

Red deer, wapiti and fallow deer represent the main cervids farmed on temperate grasslands in New Zealand, Australia, North America, UK and Europe. Sika deer and

Asiatic wapiti are the principle species in temperate regions of China. The choice of species is largely determined by either local availability (i.e., feral sources) or legal/political considerations (e.g., fallow deer in several European countries). The general success of these few species largely reflects their adaptability to husbanding (i.e., tractability), their ability to perform well on pasture diets, and a close alignment between seasonal feed production and physiological adaptations of the deer to seasonal climates (e.g., seasonal patterns of reproduction and voluntary feed intake).

Interestingly, early concepts of deer farming in UK and NZ were based on perceptions that deer, being largely confined to "marginal" lands (i.e., low agricultural productivity), were best suited to farming on the poorer quality rangelands that were largely unprofitable under sheep and cattle production (Yerex, 1979). However, financial productivity of deer ultimately reflected the low pastoral productivity in such regions (generally due to the high costs of fencing for low animal densities). In both countries, the deer farming industries have trended towards intensification on highly productive grasslands. Contrary to early beliefs, deer have adapted well to intensification, and animal performance generally exceeds that attained by wild deer (Yerex & Spiers, 1987). There are presently some trends back towards extensification in some parts of NZ, but founded on different productive criteria such as organic farming and trophy antler production.

The production of high-value, niche-marketed products (e.g., venison, velvet antler) is a common thread of deer farming in first-world countries. However, the economics of farming deer vary enormously between countries, depending on (1) energetic and economic efficiencies of the local farming systems; (2) local product value relativity to conventional produce, often a reflection of subsidies favouring conventional livestock production (e.g., UK) and; (3) legislative restrictions governing farming practice and marketing (e.g., Europe). New Zealand's clear lead in deer farming reflects adoption of low energy/labour input pastoral systems (aided by a benign temperate climate), a level playing field with respect to artificial price supports (i.e., nil subsidisation of any pastoral based system) and relative freedom from legislative control of farming practice.

Tropical deer for tropical climates

There are three "main-contender" species for tropical regions; axis deer, rusa deer and sambar deer. Axis deer, indigenous to India and Sri Lanka, are farmed in the hotter climates of Australia (Queensland) and USA (Texas). Rusa deer, from Southeast Asia, are farmed in Australia, New Caledonia, Mauritius, Malaysia and Thailand. Sambar deer, found throughout southern Asia, are frequently encountered in small farm units in many regions of Southeast Asia (e.g., Vietnam, Indonesia, Thailand).

The most important biological consideration of deer farming in equatorial and tropical regions is to select species adapted to local conditions. Axis deer, although having a reputation for intractability, have proven amazingly resilient to seasonal fluctuations in rainfall (e.g., monsoonal climates) and can maintain biological performance during long periods of aridity. Both rusa and sambar deer are particularly well adapted to tropical humidity. Opportunist

growth and reproductive strategies enable these species to cope with unpredictable environments. Furthermore, there are strong arguments that tropical-evolved cervids are able to efficiently utilize low quality tropical forages (Howse *et al.*, 1995) and exhibit higher levels of immunity to tropical diseases and ectoparasites that commonly afflict domestic livestock.

It should be noted, however, that pastoral based agriculture in many tropical countries is relatively unsophisticated by temperate region standards. Furthermore, inadequate processing and marketing infrastructures often mitigate against high-value niche marketing of deer products. Therefore, such farming operations are often seen as alternative protein sources for local people with relatively low per capita income (Fraser Stewart, 1985). This is in marked contrast to deer farming in temperate regions of the world.

Reindeer around the Arctic Circle

The herding of reindeer (*Rangifer tarandus*) pre-dates modern deer farming by several centuries... a fact often overlooked by modern deer farmers. Up to 3 million reindeer are presently husbanded around the Arctic Circle, principally in Norway, Sweden, Finland, but also Russia, Greenland and more recently in northern Canada (Baskin, 1989; Skjenneberg, 1989). Due to the extremely low annual vegetative productivity of arctic regions, reindeer farming has been, as still is, based on semi-nomadic, very extensive and low-tech herding of animals across natural arctic rangelands. One unique feature of such herding is the reliance on lichen as a primary feed source during winter.

It almost goes without saying that the reindeer is superbly adapted to the arctic environment, particularly in relation to its legendary cold/snow tolerance and ability to utilize poor quality feeds. It is also one of the most tractable of all cervids, despite the fact that, by modern deer farming standards, reindeer handling systems (e.g. corrals and lasso capture) are primitive and quite stressful on the animals (Wiklund, 2000).

The nature of reindeer production has changed over the last few decades, moving away from nomadic herding practices and a local production/consumption base, to a more sedentary (but still very extensive) ranching and to niche marketing of reindeer venison/co-products outside the immediate community. However, certain traditional practices still persist strongly and are linked with ethnic traditions and lifestyles, particularly in Scandinavia (Skjenneberg, 1989).

2. Extensive ranching of game species in Africa

The continent of Africa has a rich megafauna, with a very long association between game species and man. While cervids are not represented, many other groups of hoof-stock and other large mammals and birds are a significant part of African biodiversity. There has been a tumultuous history to game management throughout the various countries of the African continent, including aspects of over-hunting, poaching and land-use conflicts between wildlife and agriculture. The introduction of "game ranching" (extensive game production as opposed to intensive "game farming"; Bothma, 1996) has gone some way to changing perspectives of indigenous fauna, and has

a role in the overall conservation of these species and their habitats.

Idealists promulgated the view that wild game species were disease-resistant, independent of drinking water, or otherwise adapted to local condition when compared with conventional domestic livestock. Furthermore, they argued that ranching a community of wild browsers and grazers resulted in greater biomass densities because of limited interspecific dietary competition (Skinner, 1989). Game ranching is largely focused in hot, arid environments unsuited for conventional livestock.

Despite considerable early resistance to game ranching concepts, mainly from mainstream agriculturalists and wildlife agencies, the industry has become well-established in many regions of eastern and southern Africa over the last 30-35 years. Bothma (1996) lists 40 potential game species suitable for game ranching. This includes various antelope species (e.g., impala, eland, blesbok, hartebeest, kudu, etc), buffalo, pigs (e.g., bushpig, warthog), elephant, giraffe, hippopotamus, zebra and ostrich. The one feature that separates such forms of “game ranching” from “game farming” in other countries is the integration of several non-competing species in a manner that allows long-term sustainable management of natural rangelands (Skinner, 1989). While such arid-zone systems undeniably have relatively low yields per hectare (hence the extensification), they are considered more sustainable, and ultimately more profitable, than conventional livestock systems.

3. “Horses on the wrong courses”

The well-publicised success of the growing deer farming industry in New Zealand (e.g., Anderson 1978) propagated a strong interest in deer farming in many countries. Fledgling industries were often based on perceptions of New Zealand systems, without necessarily considering the biological imperatives of matching genotype with environment. Consequently, there are some classic examples of failure through the use of species inappropriate for the region.

There have been several attempts to farm tropical cervids in cool temperate zones. Perhaps the best examples have been to relocation of rusa deer and axis deer from tropical to temperate regions of Australia (they are not native to any region of Australia but are definitely adapted to the northern climes). While this simply reflects ready availability of these non-native cervids in Australia, cold intolerance and inappropriate birth seasonality have invariably impacted severely on overall animal productivity through high adult mortality and low calf survival (van Mourik 1986; Mylrea 1992). Red deer and fallow deer now dominate the deer-farming scene in southern Australia.

Conversely, as red deer and fallow deer were often promoted as the ultimate farmed cervids, there were several ill-considered attempts to establish these species in equatorial zones, particularly in Southeast Asia. A fairly predictable series of events soon mitigated against such actions. Firstly, the translocation of species with strong photoperiodic control of reproduction into regions with little or no annual fluctuations in photoperiodicity soon led to reproductive desynchronisation and an overall reduction in birth rate. Secondly, clinical parasitism by tropical ectoparasites (e.g., ticks and screw-worm) further reduced

productivity and necessitated excessive managerial inputs to maintain acceptable levels of animal performance (G. Christie; *pers. comm.* 1994). It was known in at least one case that none of these problems occurred in the indigenous cervid (sambar) population.

In addition to examples of species translocated to inappropriate latitudes, there have been numerous examples of local species transplanted into a pastoral environment for which they are poorly adapted. White-tailed deer (*Odocoileus virginianus*), roe deer (*Capreolus capreolus*) and moose (*Alces alces*) are examples of highly territorial, selective browsers that have consistently failed as candidates for deer farming. Firstly, their territorial nature necessitates low population densities. Secondly, these species seldom thrive on pastoral diets. Most attempts to intensively farm these species have resulted in unacceptably high mortality.

SUMMARY

While the basic international concepts of “game” farming/ranching are generally similar, there is no one species that is a suitable candidate for all environments. We give here just a few examples of non-traditional agricultural species that have found favour for cool temperate, tropical, arctic or hot arid regions. However, there are numerous other options that are either presently under development or should perhaps be considered (e.g., kangaroos in Australian arid zones; capybara in swampy rangelands of tropical South America, etc). The concept of “game” farming/ranching extends well beyond the pastoralisation of red deer as we see it in New Zealand.

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