

Captive breeding of wild species – a sceptical view of the prospects

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There is interest in wildlife farming in South America, but the underlying objectives are unclear. The market for bushmeat in South America is limited and unlikely to grow rapidly. The justification in terms of satisfying a growing demand is therefore lacking. There also seems to be confusion between the aims of domestication for meat production and animal conservation. This paper will present two issues of importance: the costs of producing meat in wildlife farms, and a framework for policy makers on how to react to initiatives promoting wildlife farming for meat production. The first of these issues is largely South America-specific; the second should be directly applicable in other regions of the world.

Policy Conclusions

- Species that are currently being tested for wildlife farming do not have the complete set of biological characteristics for domestication.
- Successful wildlife farming appears to be associated with the production of high value products such as skins or live animals (primates and ornamental or songbirds), rather than meat.
- Costs of meat produced by wildlife farming are high per kilo when compared to either meat from conventional farming or bushmeat from hunting.
- Bushmeat produced by wildlife farming will not be able to replace the wild-caught bushmeat consumed by the main bushmeat consumers (people who are indigenous to the areas where the wild animals are found) because these people are poor and lack the purchasing power.
- Stimulating demand for bushmeat produced in wildlife farms could have a negative impact on animal conservation, as it might encourage increased hunting. Given the economics, regulating and policing such farms to ensure that they do not act as a conduit for wild-caught meat will be difficult, if not impossible.
- The medium to long term objective of wildlife farming for meat production is the need to reduce costs to similar levels as meat produced by conventional farms in order to maintain profit margins. Given the biological characteristics of the species being tested, it is very unlikely that farms will be able to achieve the necessary cost reductions.
- In some cases, wildlife farming for meat production is not a biologically viable activity, and in all cases reviewed not an economically viable activity. The use of conservation and development money to support such activities appears unjustified in terms of both animal conservation and the likely effects on poor people's livelihood.

Introduction

In order to have sustainable wildlife farming for meat production it is necessary that the chosen species are amenable to domestication. Domestication in this context means that breeding of the animals is under human control, a useful product is produced and the animals are tame. Breeding involves selection away from some of the characteristics of the wild type (Smythe, 1991 quoting from Mason, 1984). According to Diamond (1997), of the 148 big wild terrestrial herbivores in the world, only 14 have been successfully domesticated.

Diamond (1997) identifies the following as being key biological characteristics for the domestication of animals:

- Diet – the efficiency of turning vegetative matter into meat.
- Growth rate – the ability to grow quickly.
- Ability to breed in captivity.
- Relatively easy disposition.
- Tendency not to panic.
- Well defined dominance hierarchy with the ability to have a leader imprinted on their group.

The ability to breed in captivity and for breeding to come under human control are critical in terms of maintaining populations and improving efficiency of an animal production system. The inability to control breeding implies that it will be difficult to increase or even maintain populations, which in turn implies that wildlife farms will have to regularly capture new animals from the wild.

It can be assumed that, over the centuries, numerous attempts have already been made to domesticate most large animal species in South America. Therefore, recent attempts to domesticate species such as the paca, capybara and peccary are probably not the first, especially given that the South American sub-continent had very few large domesticated animals before the arrival of the Spaniards (the exceptions being llamas and alpacas in the Andes and dogs in other regions).

This makes it doubly important to take a sceptical view of recent attempts to domesticate hitherto undomesticated species.

Systems and costs of production for wild and domestic species in South America

There has been interest in the raising of wild animals in farms in various South American countries. The most recent data comes from Brazil where there are estimates on the costs of farm-raising capybara and peccary (Gama and Sequiera, 2004). There are additional data on the potential of capybara farming from Venezuela (Ojasti, 1991) and data from farming paca in Panama (Smythe, 1991). A summary of this work with comments on the difficulties of raising such animals is presented below.

Capybara (*Hydrochoerus hydrochaeris*)

Despite the potential of capybara for domestication, it has proved more problematic than anticipated. Infanticide amongst females has been partially resolved by ensuring that breeding females are raised from weaning as a group. However, the presence of immature capybaras is not tolerated by mature animals, and it is reported that intensification can have a negative impact on fertility rates and the condition of animals (Gama and Sequiera, 2004). These issues raise serious questions not only about the economic viability of these units but also the biological capacity to maintain a group of capybara for long periods without have to refresh the stock with wild capybaras. Box 1 presents the production parameters for capybaras in captivity.

From the available data it has been estimated that a capybara farm with 100 breeding females would have a total of between 700 to 750 animals, in terms of young animals, replacement stock and breeding males. This is equivalent to 360 adult animal equivalents. With a stocking density equivalent to half a livestock unit per hectare such an enterprise would require 60 hectares of land. With a mortality rate of 20% in animals between 0 and 1 years of age and 10% for all other age groups, plus a culling rate of 30% in adult animals, such a system and stocking rate would produce around 70 kilos of dressed meat per year per hectare, which is equivalent to the dressed weight of a third of a cow. Therefore, it would appear to produce a similar amount of meat to an extensive beef system, but would require considerably more investment in terms of fencing and day to day to management. It is also necessary to consider that the marketing costs and channels for ten capybara are higher and more difficult than one fattened steer.

Collared Peccary (*Tayassu tajacu*)

The interest in raising collared peccary appears to be for their skins rather than their meat. There is a demand for peccary skins in Europe and the USA. There are currently 21 official peccary farms in Brazil. These farms use semi-intensive systems and use land that is either of no useful agricultural purpose or in reserves, which means the land has no commercial value.

The collared peccary also suffer like the capybara from infanticide. However, unlike the capybara the adults do tolerate the presence of young, immature animals. Box 1 presents the production parameters for peccaries in captivity. Attempts to lower age at first breeding and shorten time between litters have been successful, but with a high cost in terms of viability of young.

The lower age at first parturition and the shorter inter-parturition period means that the collared peccary requires far fewer follower stock than the capybara. Therefore the fixed costs for this species in terms of replacement are lower. However, estimates of the total number of animals have not been made as the mortality rates for young animals are very uncertain for the species in wildlife farms. The advantage of their higher reproductive efficiency could be quickly be removed if, say, 50% of their young die and the culling rate of breeding animals is also high.

Paca (*Agouti = Cuniculus paca*)

Smythe (1991) was involved in a trial of meat production from Paca farms in Panama over a period of at least seven years. The farm had undertaken experiments in terms of taming paca. It should be noted that paca have to be handled before the age of 40 days if they are to be tamed. After this age they display very aggressive characteristics and panic if placed in confinement. In addition, experiments were carried out for different diets. A summary of the production parameters collected from this experimental farm are presented in Box 1.

One of disadvantages of the paca is that the animal is monogamous. The need to have one male per female obviously increases the overhead costs for meat production. Despite the optimism on the possibilities of farming paca for meat the costs from the first trials indicate that the price per kilo was extortionately high at US\$23.90 per kilo of meat. Where the animals were removed from their parents at an early age in order to make them tamer, high mortalities were incurred (three out of eight animals).

Box 1: Production parameters of Capybara, Collared Peccary, Paca, Cattle, Pigs and Poultry

Parameter	Capybara	Collared Peccary	Paca	Cattle in extensive systems*	Pigs in intensive systems*	Poultry in intensive systems*
Inter-parturition period (days)	380	215	187	730	166	2
Gestation (days)	150	145		282	114	2
Age at first parturition (days)	1,450	416	390	1095	354	240
Mean litter size	3.3	1.6	1	1	10	1
Birthweight (kg liveweight)	1.5		0.7	30	2	0.1
Slaughter weight (kg liveweight)	40	17	6	400	80	2.4
Mature weight (kg liveweight)	50	33	7	500	120	4
Growth rate (g/day)	62	50*	9.8*	343	433	55
Time to slaughter weight (months)	20.7*	10	18	36	6	1.4
Number of young/breeding female/year	3.2*	2.7*	2*	0.5	22	182.5
Number of females to one male			1	10	25	11
Costs per kg of production (US\$/kg)						
Intensive	1.85	3.46	1.65**		0.49	0.51
Semi-Intensive	1.56	2.37				
Extensive	0.68	2.33		0.65		

* Author estimates

** Based on an estimate of what might be possible rather than a system that has been tested

Domestic species

The most important domestic species in South America are cattle, poultry and pigs in terms of meat production. The majority of cattle are raised in extensive grazing systems. Poultry and pigs are raised mainly in intensive production systems and these systems have been an important component of satisfying increasing protein demands in South America over the last 15 years. South America has some of the most competitive livestock production systems in the world, but these are concentrated in the central eastern region of the continent. Table 2 presents estimates of the production parameters for cattle in extensive systems and pigs and poultry in intensive systems.

The poor reproductive efficiency of cattle in extensive systems means that a large number of follower stock needs to be maintained. However, this is offset by the fact that these systems require very low labour inputs and utilise land that has low value. It should also be remembered that cattle reproduction efficiency can be relatively easily improved through management practices. Pig and poultry systems have very high reproductive efficiency, but require high inputs in terms of buildings and feed.

Comparison with the costs of production of meat

Biological efficiency is an important aspect of animal production. However, production systems are only feasible if they are also economically efficient. Data have been brought together on the costs of production for the different species under different production systems (see Box 1). In South America, the costs of meat production from wildlife farms are far higher than the meat production systems for cattle, pigs and poultry. The only system that comes close to the conventional systems is the production of capybara meat in extensive systems. However, this system would appear to be more akin to a hunting or harvesting than a true farming system.

The production costs for meat from wildlife farms are therefore high in comparison to conventional meat production and also for the hunting of these species. The marketing and processing of these animals also adds to the costs, as they require different systems from those of conventional meat sources.

Processing animals and meat produced by wildlife farms

Of the wildlife species reviewed in the paper, all display high levels of aggressiveness when confronted with new animals, and in some cases they panic when held in confined spaces. This would imply that transporting animals to a marketing point or an abattoir is either not possible because of the high levels of risk of losing the animals or that there will be a requirement for specialised transport. The latter would be expensive, particularly when one considers the small volumes involved.

This leaves the option of slaughtering and processing animals on-farm and then selling the processed meat. The implications of such marketing and processing systems are that each farm will have to invest in slaughtering facilities for a low throughput of animals. Such facilities will have difficulties meeting the national regulations on food hygiene standards, and it is very unlikely that they would meet international regulations. Therefore, in addition to relatively high production costs, the wildlife farms will have the additional disadvantages of higher marketing and processing costs and limited access to markets due to food hygiene regulations.

Markets for meat from wildlife farms

Returning to the market for meat produced from wildlife farms, the current market for bushmeat in South America can be divided into three groups: local populations where the animals are naturally found, workers for companies in the forest areas and

urban based consumers. The main market for bushmeat is from the local people, these people are poor and would be unable to pay high prices for meat. Their preference for bushmeat is related to this being one of the cheapest forms of protein. The workers are better off than the local people, but would not be considered rich in the general society and are likely to be highly price sensitive on protein sources. The urban based consumers are richer than the other groups and there is interest in the consumption of "exotic" meat (Gama and Sequiera, forthcoming). However, there are two issues that may restrict growth of this market. Firstly, the food hygiene regulations may reduce the access of meat from wildlife farms and secondly the market for exotic meat is likely to be a small, niche market.

Experience has shown that where external markets for "exotic" meats exist and wildlife farming is practised, there is an initial boom when profits are high in order to satisfy a small, high value niche market. This either attracts more producers (for example ostrich farming) or greater hunting of wild sources (for example venison production). With an increased supply, prices fall rapidly as the market is relatively small. With lower prices, producers can only maintain profits if costs can be reduced and this requires the implementation of practices that are common to conventional farming. The critical difficulty for the species that are being tested in South America is that intensification increases costs, which in a large part are related to difficulties of controlling and manipulating breeding and also problems with handling animals in confined situations.

Objectives of domestication

What are possibilities of wildlife farms achieving objectives in terms of supplying local and external meat markets and creating economic opportunities in order to improve poor people's livelihoods? An analysis is presented in Box 2.

Box 2: Objectives of domestication

What are possibilities of wildlife farms achieving objectives in terms of supplying local and external meat markets and creating economic opportunities in order to improve poor people's livelihoods? The following is an analysis.

Objective: To supply local markets in order to reduce hunting pressure.

- Production costs are too high to produce cheap protein.
- Species that are being tested are not under threat due to hunting.
- While local protein demand is increasing specific demand for bushmeat is not convincing.

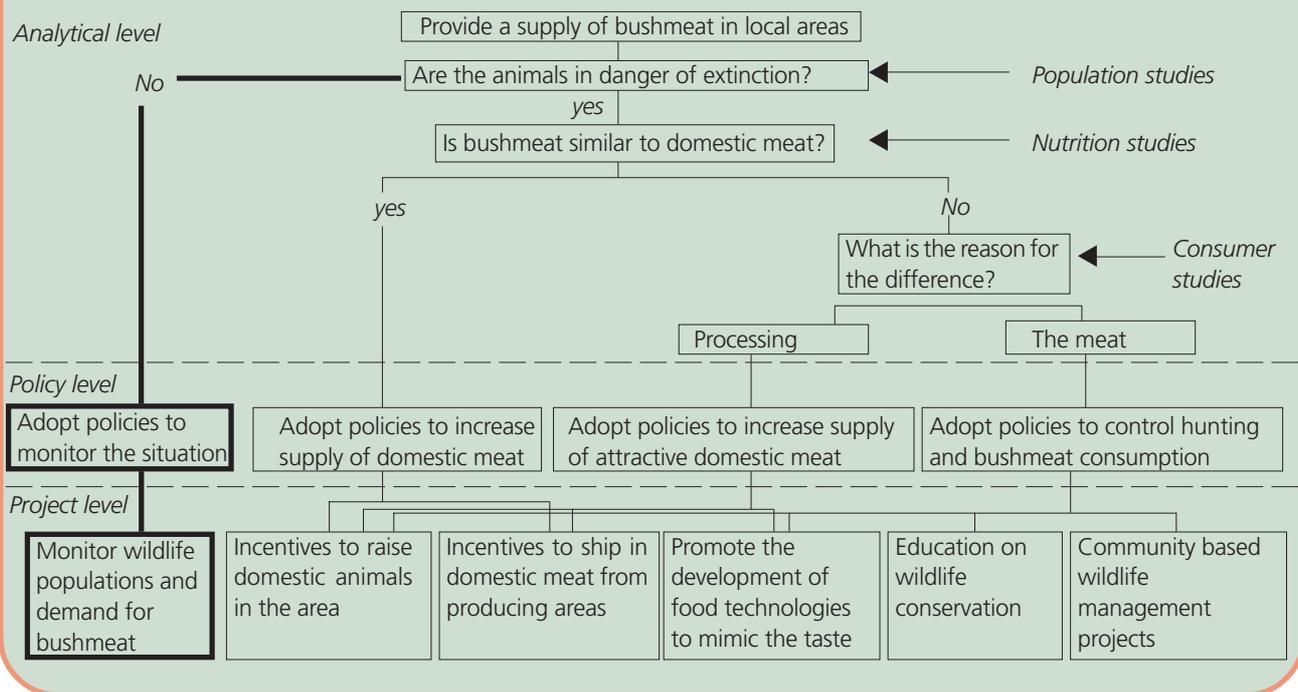
Objective: To supply external markets:

- The high production costs indicate that only a niche, gourmet market with high prices could be satisfied by wildlife farms.
- The high production costs may stimulate hunting of wild animals to reduce costs.
- Demand for bushmeat outside the forest areas is very low.

Objective: To provide economic opportunities for poor people.

- The investment costs and labour demands of wildlife farming do not match the capital and labour characteristics of most poor households.
- Access to markets willing to pay high prices is likely to be difficult, reliant on traders and with poor levels of information.

Figure 1: Role of the government where the domestication of wild animals is being promoted as an alternative to supplying bushmeat in local areas with analysis for South America (developed by the authors).



The bleak conclusions of wildlife farming for meat production raise the question of how should policy makers react to initiatives to promote such activities.

Policy Analysis Structure for Wildlife Farming

In order to assist policy makers a series of flowcharts were developed in order to determine appropriate policies and associated actions (see Figure 1, for an example). The charts have a series of questions with yes/no answers that need to be based on analysis of animal populations, nutrition and consumer studies. For the objective of wildlife farms supplying meat to local populations the questions are as follows:

- Are the animals being farmed in danger of becoming extinct?
- If the animal is in danger, is bushmeat similar to domestic forms of meat?
- If bushmeat is different, what is the reason for the difference?

Figure 1 presents the application of a flowchart to the South American wildlife farming examples presented above. In all cases the species are not in danger of extinction and policy could be limited to monitoring the situation.

A similar flowchart was developed for the objective of supplying bushmeat for an external market such as for tourists, consumers in larger towns and cities. Again applying the analysis to the South American wildlife farming data, the identified role for government would be to monitor the situation.

Conclusions

Data and information available from experimental wildlife farms for meat production indicate strongly that such animal production systems are not economically viable. The economic efficiency of these systems is unlikely to change in the future due to the biological characteristics of the species. In addition, marketing and processing costs for wildlife farms will be higher than for conventional meats. Again this is related to the biology of the species, which confines slaughter and processing to farm-level locations. The only market available for the expensive meat produced by wildlife farms will be the "exotic" meat market in urban centres. However, the processing facilities for the meat could well encounter problems in meeting national food hygiene

regulations and will almost certainly not meet international regulations. Analysis of the objectives for the promotion of wildlife farming for meat production indicate that such promotion cannot be justified. Further analysis of the policies would suggest that government and non-governmental action should largely be restricted to monitoring the few people who continue to see a future in domesticating wild animals for meat production.

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