

Killing Tigers to Save Them: Fallacies of the Farming Argument

R. CRAIG KIRKPATRICK* AND LUCY EMERTON†

*White Horse Mountain, Ltd., GPO Box 944, Central, Hong Kong, email ckirkpatrick@whitehorsemountain.org

†Environment Management Group, Colombo, Sri Lanka

Abstract: *The lucrative, illegal trade in tigers (*Panthera tigris*) remains a major conservation problem. Tiger farming has been proposed as a potential solution, with farmed tigers substituting for wild tigers. At first glance, this argument's logic seems simple: farming will increase the supply of tigers, prices will fall, and poaching will no longer be profitable. We contend, however, that this supply-side argument relies on mistaken assumptions. First, tiger markets are imperfect, meaning they are dominated by a few producers who control price. Second, consumers prefer wild tigers to farmed tigers and therefore the two are not pure substitutes. In economic terms, products from wild tigers are luxury goods, commanding a price premium. Third, there is no evidence that farmed tigers can be produced or sold more cheaply than wild tigers. In sum, it is unlikely that farming will drive down the price of wild-caught tigers or decrease profitability for tiger poachers. Rather, tiger farming is more likely to increase aggregate demand for tiger products and stimulate higher levels of poaching.*

Keywords: illegal tiger trade, poaching, supply-side conservation, wildlife farming

Matando Tigres para Salvarlos: Falacias del Argumento de la Reproducción en Cautiverio

Resumen: *El comercio ilegal y lucrativo de tigres (*Panthera tigris*) permanece como un problema de conservación mayor. La crianza de tigres se ha propuesto como una solución potencial, en la que tigres criados en cautiverio sustituirán a tigres silvestres. A primera vista, la lógica de este argumento parece simple: la crianza incrementará la oferta de tigres, los precios bajarán y la cacería furtiva ya no será rentable. Sin embargo, sostenemos que este argumento del lado de la oferta se basa en suposiciones erróneas. Primero, los mercados de tigre son imperfectos, lo que significa que están dominados por unos cuantos productores que controlan los precios. Segundo, los consumidores prefieren tigres silvestres a los tigres criados y por lo tanto los dos no son sustitutos puros. En términos económicos, los productos de tigres silvestres son bienes de lujo, lo que implica un precio adicional. Tercero, no hay evidencia de que los tigres criados pueden ser producidos o vendidos a menor precio que los tigres silvestres. En suma, es poco probable que la crianza pueda influir en la disminución del precio de tigres silvestres o en la reducción de la rentabilidad de los cazadores furtivos. Más bien, es más probable que la crianza de tigres incremente la demanda agregada de productos de tigre y estimule mayores niveles de caza furtiva.*

Palabras Clave: cacería furtiva, comercio ilegal de tigre, conservación de la oferta, crianza de vida silvestre

Demand for Tigers Exceeds Supply

Tiger (*Panthera tigris*) populations are decreasing. They occur in just 7% of their historic range (Dinerstein et al. 2006), and their habitat has become highly fragmented, reducing population viability. Currently, there are only

3400 to 5150 wild tigers, and their effective breeding population is only 1350 to 2050 (Chundawat et al. 2008). The on-going decline in tigers has led to their classification as endangered (IUCN 2009).

International trade in tigers has contributed significantly to population declines (Dinerstein et al. 2006;

Table 1. The arguments for and against the use of tiger farming as a tool for conservation of wild tigers.

<i>Supporters of tiger farming</i>	<i>Opponents of tiger farming</i>
Conventional methods do not work. The international ban in tiger trade has not kept the tiger from steep declines.	Conventional methods can work, if given adequate investment and political will. The trade ban has prevented steeper declines in tiger populations.
There will always be demand for tiger products. A nonthreatened supply must be found.	The demand for tiger products has been reduced. Residual demand still exists, however, and selling farmed tigers would inflame demand.
Flooding the market with legally supplied tiger parts undercuts the illegal supply from tiger poachers.	Legal tiger markets will not undercut poachers because poaching wild tigers is far cheaper than farming them. And, some people will always prefer products from wild tigers because they believe those products are more potent.
We have had success in farming other species, such as crocodilians and vicunas.	Tigers are very different, and much more endangered, than crocodilians and vicunas. Tigers deserve a precautionary approach.

Chundawat et al. 2008). For example, poaching for international trade is a primary cause of the loss of India's tigers, with tigers recently extirpated from India's Sariska National Park (Check 2006). The skins of at least 64 poached tigers were seized by the governments of India, Nepal, and China between 2003 and 2005 (Banks et al. 2006). The bones of at least 24 Sumatran tigers (*Panthera tigris sumatrae*) were apprehended in Taiwan in July 2005 (TRAFFIC International 2005). Because there are only 400 to 650 Sumatran tigers left (Chundawat et al. 2008), this seizure alone may represent over 5% of the subspecies.

Studies from the Russian Far East provide quantitative data on the impact of poaching. Between 1992 and 2005, the mortality of collared tigers was 28%/year (19% for adult females and 37% for adult males); three-quarters of all deaths were caused by poaching (Goodrich et al. 2008). That is, poaching accounted for an annual mortality of over 20%, and almost certainly these tigers were poached for trade purposes. This is particularly worrying because of mounting evidence that, contrary to previous thinking, tigers cannot sustain high mortality rates (Kerley et al. 2003; Chapron et al. 2008).

Can tiger farming help arrest the downward trend in tiger populations? Some argue that it can (e.g., Jiang et al. 2007; Lapointe et al. 2007). China provides an excellent case for review. Historically, China has been the world's largest market for tiger products (Mills 1997; Nowell & Xu 2007). In 1993, responding to international concern about on-going trade in tiger products, particularly tiger bone, China banned all domestic trade in the species. The continuing decline in wild tiger populations since 1993, partly caused by market demand in China, has stimulated calls for a review of the domestic ban (Dinerstein et al. 2007; Nowell & Xu 2007).

In China about 3000 tigers are held in around 10 large farms, with another 1000 held in around 200 other facilities (Nowell & Xu 2007). Expressing concern about the continued loss of tigers and rejecting the argument that

bans have kept tiger populations from even steeper declines, China's tiger farms (currently operated as tourist facilities) have proposed that they be allowed to sell tigers (Xinhua News Agency 2006; China Daily 2007; Government of China 2007; Jiang et al. 2007). This would be in keeping with China's general policy to promote farmed animals as substitutes for wild ones (Harris 2008). The proposal has supporters and opponents (e.g., Lapointe et al. 2007; Gratwicke et al. 2008a), with the conservation arguments surrounding the proposal largely about economic theory (Table 1).

Tiger Markets and Supply-Side Conservation

Most proponents of wildlife farming as a conservation tool take a simple supply-side approach (e.g., Mitra 2005). Their basic model considers the variables of supply and price and posits an inverse relationship between them. An increase in supply leads to a decrease in price, and vice versa. The hypothesis is that price decreases as farmed animals flood markets and as wildlife farms increase competition in markets originally dependent on overexploited stocks. As markets adjust to these new conditions, the profits of poachers decrease. Pressure on wild stocks of overexploited species is then reduced because poachers have less economic incentive to harvest.

The real world is not so simple, however. Factors other than supply and price influence markets. Additional factors, incorporated in more-sophisticated models of wildlife farming, include market structure, consumer preference, and the relative returns of wild-sourced versus farm-sourced wildlife products (e.g., Bulte & Damania 2005; Damania & Bulte 2007; Abbott & van Kooten 2009).

Simple supply-side conservation assumes markets are perfectly competitive. In such markets, there are numerous producers. These producers have no ability to set price, they have complete information, and they discount

the future (i.e., are unwilling to sacrifice current benefit for future gain).

Yet markets for tigers are not perfect. In such imperfect markets, a small number of producers dominate, and they set prices and control supplies (Bulte & Damania 2005; Damania & Bulte 2007). Oligopolistic, illicit organizations control illegal tiger markets through complex smuggling networks (e.g., Banks et al. 2006). If the ban were lifted, large tiger farms would control legal tiger markets. Ten large farms currently hold about 75% of China's farmed tigers. These farms were all established in anticipation of dominating markets and making profits (Nowell & Xu 2007).

In imperfect markets, pressure on overexploited wild stocks remains high even when cartels, such as wildlife farms, increase supply. Ostensibly, tiger farms would benefit by driving illegal trade out of markets. In practical terms, however, they cannot exert such control, unless acting as a single, unified entity (Abbott & van Kooten 2009). Tiger poachers will have a strong incentive to infiltrate the new, legal markets in tigers. A relevant lesson may be drawn from the trade in parrots. Illegal poaching of parrots in South America was significantly higher when trade in parrots was still legal (Wright et al. 2001). Legal trade increased poaching, it did not decrease it. This is contrary to the predictions of supply-side conservation.

Supply-side conservation also assumes that farmed stocks can substitute for wild stocks. In theory, the price of wild products decreases as the supply of farmed products increases. There should also be an attendant shift in consumer demand for farmed products. Although this occurs with some species (e.g., in crocodilians farmed stocks have replaced wild stocks and there has been a concomitant decrease in price for producers [MacGregor 2006]), it is not true for tigers (Gratwicke et al. 2008b).

Consumers often prefer wild animal products to those from farms. This is particularly the case for medicinal products because products derived from wild specimens are perceived as more potent (Lee 1998; Servheen 1999; Gratwicke et al. 2008b). This belief leads to price differentials and profit margins that may continue to spur wild collection even after the introduction of farmed supplies.

Furthermore, if farmed products are cheaper, their entry into the market will drive down producer profitability per unit. Supply-side conservation assumes sellers of wild-harvested products will withdraw from the market as their profits decline. Conventional economics suggests another rational response, however: producers may increase the volume of products being sold so as to maintain profit. In such cases, farmed products will increase aggregate supply. If they are also being sold at a lower price, aggregate demand may also rise. For example, expanding supplies of bear bile from farmed stocks has led to expanding markets for bear bile (Servheen 1999; Garshelis & Steinmetz 2008). Recent consumer surveys in China show a continuing demand for tiger products,

and legal trade will almost certainly increase that demand (Gratwicke et al. 2008b).

Supply-side conservation assumes prices of farmed stocks will be cheaper than wild stocks. The lower price of farmed products, relative to wild products, is the mechanism that allows farmed products to flood the market and replace wild products. Yet farmers make substantial investments in infrastructure and operating costs. Farmers also often must shoulder the costs of the regulatory structure that allows them to sell their products. In contrast, poachers have relatively low costs (Mockrin et al. 2005). In practice, the costs to poachers exceed the costs to farmers only if the regulatory system places high disincentives on poaching. It is rare for disincentives to be high, however. In general, rates of detection, arrest, prosecution, and conviction for wildlife crime are low (Akella & Cannon 2004).

Even if allowed to sell tigers, China's large tiger farms would likely have low profit margins due to high operating costs, which average about US\$5000/animal each year (CITES 2007; Lapointe et al. 2007). With low profitability and imperfect competition, it is unlikely that farmers will oversupply markets so that prices will decrease, particularly for products currently seen as a luxury, such as tiger bone wine (Gratwicke et al. 2008b). And, as long as some consumers prefer products from wild tigers, farmed tigers will not substitute completely for wild tigers. It is likely that the price premium for wild, illegal stocks will be maintained, as has occurred in other wildlife used in medicines in China.

Conservation policy cannot be removed from the social and political environment in which it is implemented. Farmed and wild stocks typically represent dual streams of supply that require separate regulatory structures (Fig. 1). Dual streams increase the burden on law enforcement and send a false signal that tiger products may be bought and sold indiscriminately. The farming of babirusa (*Babyrusa babyrussa*), for example, gave hunters the false impression of greater demand and lax regulation (Clayton et al. 2000), which led to an increase in illegal trade. It is possible that the same will occur with tigers.

Theory versus Practice

Tiger markets violate the central assumptions of supply-side conservation (Table 2). They operate under conditions of imperfect competition and farmed supplies are unlikely to result in lower prices. Farmed tigers and wild tigers are not pure substitutes; legal trade will likely result in increased demand. Current regulatory structures are unproven. Tiger farming presents high risks to wild tigers.

A scenario in which tiger farming could help wild tigers is conceivable. Business interests would be excluded, and

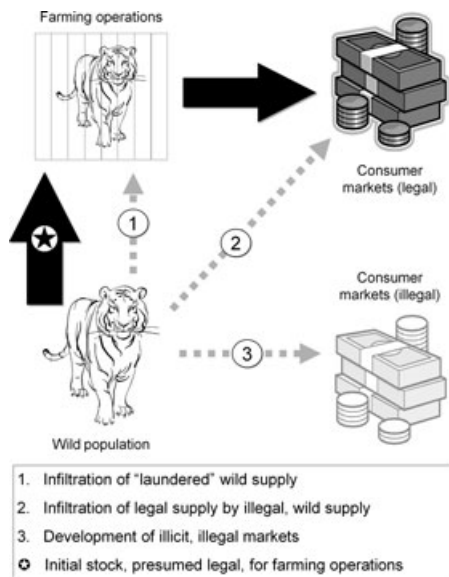


Figure 1. Wildlife farms can supply consumer markets (solid arrow) but they can also harm wild populations (dotted arrows). Wildlife farming cannot be separated from the management systems needed to prevent infiltration of legal supply chains with poached animals (1 and 2) or to prevent the development of parallel, illegal markets (3).

the government of China would exert absolute control over supply and price. There would be an iron-clad process for tagging farmed products so they could not be confused with wild products. All profits would be used for tiger conservation efforts, including antipoaching patrols in range countries, zero-tolerance enforcement in China, and awareness campaigns so consumers know that products from farmed tigers are available only to help wild tigers. This scenario is unlikely to become real-

ity, however, because the levels of financial investment and political will needed for success are simply too great.

A more-plausible scenario is that tiger farming would increase poaching. Oligopolies would control markets, prices would remain high, and demand would increase. Illegal markets would still exist, perhaps flourish, because wild stocks would receive price premiums. Economic rewards would accrue to tiger farmers and tiger poachers, while the risk of tiger extinction would still exist.

Because the level of endangerment is so high for tigers, a precautionary approach is called for, regardless of whether the tool at hand is supply-side conservation or any other approach. Although there is theoretical merit in supply-side conservation, theory often does not work in practice. Supply-side conservation should only be tried with species that allow a substantial margin for error. Such species will not be highly endangered and will be regulated under proven systems. For highly endangered species, regulatory approaches hold less downside risk than market approaches, if only because the level of control is greater.

The fundamental error of wildlife farming is in its unquestioning faith in the workings of markets. Although promising benefits to conservation, the focus is on economics. Conservation benefits are hypothesized to arise indirectly as an inevitable outcome of market forces. In the case of tigers, this faith is misplaced.

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Table 2. The validity of the assumptions of supply-side conservation compared with available evidence for tigers.

<i>Assumption</i>	<i>True for tigers</i>	<i>Evidence</i>
Supply and price inversely related	no	price of tiger products "chaotic... with no rational pricing structure" (Nowell & Xu 2007)
Markets perfectly competitive	no	tiger markets controlled by criminal cartels and, potentially, large tiger farms (Banks et al. 2006)
Farmed and wild stocks are interchangeable	no	consumers prefer wild tigers over farmed tigers; legal trade likely to increase aggregate demand (Gratwicke et al 2008b)
Farmed stocks less costly than wild stocks	no	farming of tigers expensive relative to poaching (Gratwicke et al 2008a)
Producers leave market as prices fall	unknown	not the case for bears, in which producers rather increase supply to maintain profits as prices fall (Servheen 1999; Garshelis & Steinmetz 2008)
Regulators can prevent illegal trade while allowing legal trade	no	no current, logistically feasible mechanism to distinguish between wild and farmed products; existing labeling system for legal ivory has not eliminated illegal ivory trade (Pomfret & Kirkwood 2009)

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