Indigenous Knowledge on Animal Breeding: Is There Breeding Outside Science?

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Introduction

I am going to present one of the extremely few sets of data available on indigenous animal breeding systems and discuss it in relation to animal science.

In doing so, I shall introduce a way of understanding crucial concepts like selective mating, breeding population and production environment that, to my knowledge, substantially departs from their meaning in animal science.

I am currently at the writing up stage of a PhD programme on cattle genetic resource management in a mobile pastoral system. The programme started in 2001, a little after the publication of the FAO Global Strategy for the Management of Farm Animal Genetic Resources.

The document highlighted the irreplaceable economic role played by low-input/low-output breeds for the rural poor and recommended a paradigm shift: from the current focus on ex-situ strategies, to concentrating efforts on supporting and enhancing local breeds *within* their respective production systems.

It was soon clear that, as long as virtually nothing was known about the actual breeding systems behind the low-input/low-output breeds referred to in the Global Strategy, this much needed paradigm shift would have remained, largely, on paper only.

So, this is why as a researcher with a social science background, a keen interest in pastoralism and no established position in the field, I dutifully set off to study the subject. The British government granted me an award, with which I spent two years working amongst a famously specialised group of cattle keepers in West Africa: the WoDaaBe of Niger (a sub-group of the Peul Bororo).

A major methodological focus of my data collection, has been on herd genealogical history, looking at cattle genetic resource movement across households over several cattle generations, and looking for patterns of selective mating.

Breeding of livestock amongst the WoDaaBe (1)

My more complete set of genealogical data concerns two herds, totalling about five hundred animals. Data analysis using a combination of two commercial databases enabled detailed yearly cross-sections of each herd, including kin relationships and basic life history of all the animals, from 1979 to 2004.

The WoDaaBe name all cattle born into their herds after their dams (mothers). This system groups the animals in the herd along matrilineal lineages in the eyes of the herders, with consequences for decision making on selection, but as shown by recent studies of animal behaviour, it also corresponds to cattle social structure in the wild.

So, this is what I found…

[—> SLIDE 2]

→ Cows with no milk or who had remained 2 years without calving, were sold

→ The number of males used for reproduction amounted to never more than 2 % of the herd.

→ Cattle reproduction was strictly controlled. The short period of cows' heat and the herder's close and constant monitoring ensured that exceptions to this rule were extremely rare.

→ Considering all the births in the herd over the last 25 years, in 97 % of cases the sire (father) had been chosen, either by the herder or, when he was still a child, by his father.

→ In 92 % of cases the herders were able to:

- remember the name of the sire (in special cases, they also had information about his pedigree);
- remember the name of the owner of the sire (whether a family member, a relative or a friend);
- locate along a time-line, with more or less 1 year of approximation, the main events in the life of the animal in question, such as birth, castration, death or sale, the giving or receiving of it as a loan (haBBana.e);
- remember the context of fecundation (for example the season, the location of the camp, the surrounding neighbours).

→ In about 60 % of births, the sire had been borrowed (only for the fecundation). Most of those sires belonged to close relatives (cousins and uncles) but some 10 % belonged to strangers, met in the bush or at the well. This practice remained extremely frequent even once the herd had its own sire/s.

→ Reproduction bulls amongst my sample group had been chosen when the herd had grown to about 30 heads. These bulls were described as very good breed, mainly belonging to 'original lineages' (often both paternal and maternal), that is lineages that have been in the family herd for several human generations.

→ Despite the presence of these sires within the herd or from the extended family, other bulls, owned or borrowed, had also been used for reproduction in about 12 % of births. According to the herders, this was deliberately done to preserve variability.

Although WoDaaBe identify several transmissible traits in cattle, their selection strategies appear to be more orientated towards the preservation of 'original lineages'.

By definition, these lineages have proved capable of prospering under the conditions of WoDaaBe's herd management system over a long enough periods to include episodes of severe stress.

It is helpful, at this point, to take a step back and look at WoDaaBe's cattle breeding within the context of their production strategies.

[—> SLIDE 3]

This SLIDE summarises this section

Breeding livestock amongst the WoDaaBe (2)

In Niger, the WoDaaBe share the same ecosystem with Touareg pastoralists and from the point of view of animal science they both belong to the mobile livestock system… but the two groups follow radically different production strategies.

Whilst with the on set of the dry season, Touareg herders move their camp closer to the water point, in order to optimise family water provision, WoDaaBe move in the opposite direction, always trying to place their camp in the middle of prime fodder, investing a great deal of energy in optimising cattle nutrition.

The Touaregs in Niger, even when nomadic, are more settled and territorial than the WoDaaBe, have more political control and are relatively new to the business of keeping cattle. Their breed, the Azawak zebu, needs little care, can survive on very poor pasture, is quite small, and docile enough to be handled by anyone. Their production strategy leaves the herd alone for most of the time, freeing labour for other activities. Cattle travel alone to the pasture and graze at will, but as camps are moved closer to the water points during the dry season and nearby pasture is consumed, the herd must cover greater distances in order to feed. Progressively shorter grazing time forces the animals to feed on whatever pasture they find as near as possible to the camp.

WoDaaBe, on the other hand have very little control over the territory, where they are typically 'the last ones arrived', but they have been breeding cattle in those conditions for centuries. They have learned how to exploit resources unused by other people for lack of specialisation. An expertise, that despite their low political profile, enabled them to overcome the last major crisis, particularly the 1984 drought, with comparatively inferior losses than many of their more powerful neighbours.

Their breed, the Bororo zebu, is the largest in Niger, tall and agile, obedient and faithful to the household like a dog but shy and aggressive towards strangers, with a keen sense of direction, ideally built for long treks and isolated grazing on unbeaten tracks. WoDaaBe herders spend a great deal of time with their animals, cultivating in them demanding feeding preferences and individual and social behaviours that can help optimise feeding (for example exploring behaviours for grazing, cooperation vs competition, knowledge about nutritious and noxious plants or feeding only on the best parts of a plant). Herders aim to always present their cattle with the most appetising bites, through day and night and all year round, avoiding the conditions that could distract the animals from their focus on feeding: neighbouring herds, unpleasant smells (to the cattle), prickly vegetation or annoying insects.

Optimum herd nutrition is achieved at a high price. At the end of the dry season, the herd might have to travel up to thirty kilometres to reach the watering point. Animals' feeding techniques, motivation and capability must be such as to enable them to reap enough benefits from this particular strategy, to compensate for its costs.

Why is such a small-scale study relevant to policy making on indigenous breeds?

Whilst on the one hand, the subject remains largely under researched, offering little room for generalisation in any direction, on the other, my data do point to the fact that the available empirical evidence on the 'making' of a low-input/low-output breed within specialised pastoral settings, appears to fall largely outside the conceptual framework of animal science. As animal science provides the main theoretical model used to look at this kind of indigenous knowledge, I think that we are facing a problem worthy of attention.

[SLIDE 4: Table on The Breeding of livestock]

	Strategy	Criteria	Level of selection	Main objective
AS	Selective mating for genetic configuration	productive traits (milk/beef)	Individual	Increasing specific productivity traits (typically aimed at milk or beef)
		phenotype (horns, coat)		
		behaviour (docility)		
?	Selective mating for genetic configuration	reliability e.g. hardiness (disease & physical stress)	Individual, productive group and breeding population	Optimising response to production strategy and its specific use-environment (highly variable but typically aimed at reliable peak production)
		phenotype e.g. body structure (long legs, agility)		
		heritable behaviour more...		
		variability		
	Selective mating for behaviour	learned behaviour incl. social behaviour more...		
	Harnessing natural selection pressure	livestock's experience of the ecosystem		
	...?	...?	...?	...?

COMMENT & CONCLUSION

In this table I have tried to summarise the various dimensions of the breeding of Bororo animals within WoDaaBe's production system.

The data leave no doubt about the WoDaaBe's use of selective mating in the 'making' of their herds of Bororo.

In the meantime, these sets of data do raise important questions on the adequacy of current animal science perspective for capturing the extension and specificities of breed selection in a production system like that of the WoDaaBe, which is highly specialised and yet alien to the historical roots and economic background of the discipline.

'AS' stands for Animal Science. What the table says, is that all those aspects of WoDaaBe's cattle breeding strategy that are in the blue area, remain outside the conceptual boundaries of the discipline.

For example, selective mating practices that include complex individual and social behaviour amongst the selection criteria, are critically mishandled by a concept of selective mating focussing only on genetic manipulation.

The same inadequacy appears in other crucial concepts like 'breeding population' and 'production environment'.

In productions systems that harness for their economic goals, animals' social behaviour and patterns of cultural transmission, both the generational continuity and the social organisation and the forms of interaction within the animal population become of crucial economic interest. These populations are better understood in analogy with human societies, as historical communities of animals, largely sharing the same culture and in a dynamic network of social relationships. Animal science's concept of breeding population based on genetic configuration across a set of individuals at a given time, falls helplessly short of describing the historical and social traits that are crucial to the economic success of this kind of breeding population.

We have seen how different mobile pastoral societies may share the same ecosystem but follow production strategies that involve a radically different use of the environment. These 'use-environments' can be seen as man-made niche-resources. Diversified use of the environment is crucial to maximising resource exploitation whilst minimising competition and conflict between users.

WoDaaBe's production strategy plays an important role in the 'making' of the breed, in that it leads the animals to encounter *certain* sets of natural conditions, involving *certain* kinds of stress and advantages. In the resulting conditions, some animals prosper whilst others struggle. By manipulating the animal-habitat interaction, herders are able to harness natural selection pressure for their own breeding purposes.

A concept of production environment focussing on technological changes to the *material conditions* of the environment, is ill-equipped to catch low-profile, labour-based human interventions focussing on manipulating the animal-environment interaction.

A common and significant consequence of this conceptual inadequacy, is the mistaken perception that the WoDaaBe's livestock are bred in largely natural conditions and are therefore the result of natural adaptation, perhaps differing in degree but not in kind, from the process shaping wildlife.

It should be evident, by now, that Bororo cattle are far from being an expression of 'natural' adaptation.

With very little 'natural' about them, WoDaaBe's cattle breed embody their herders' production strategy, their ways of using the ecosystem and of course of negotiating such use within the wider network of political and economic forces on the territory.

In conclusion, the population of the Bororo breed is better understood as embodied knowledge: meaning their breeders' knowledge on animal husbandry, but also the knowledge gained and transmitted by the animals themselves over generations of survival within WoDaaBe's production strategies.

This knowledge is crucial to the WoDaaBe, as it is uniquely developed to match their specialised means of accessing resources within the range of political and economic possibilities currently available to them.

It should also be evident, that although the genetic configuration of the breed is undoubtedly an aspect of such embodiment, it is an aspect that, if alone, is for the herders of little, if any, economic importance.

Critical analysis of the collection of indigenous knowledge in scientific databases, indeed calls for great caution. The combination of utilitarian criteria, logic of classification and scientific validation, analysts have pointed out, is likely to out-select precisely the kind of diversity that databases set out to preserve; ex-situ solutions ultimately support technocracy and the mechanisms of centralisation and bureaucratisation that are said to threaten the survival of IK in the first instance; finally, efforts to translate IK in the forms of science expose it to appropriation by powerful social actors whilst offering comparatively little advantage to those who produced it, even more so if the process neglects to acknowledge its own unavoidable political dimension.

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