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## **Mountain cattle breed for coping with climate change: needs for conserving and reintroducing the Achai in the Hindu Kush Mountains of Northern Pakistan**

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### **Introduction**

Local low input and output breeds are often a better choice for herders rearing livestock in remote mountains. With more vulnerability to diseases outbreaks and more pasture resources uncertainties as a consequence of climate change, these high resistant and well adapted breeds deserve more attention from local authorities. Local breeds also perform well on poor quality roughages, and can move on rugged terrain for grazing, whereas the exotic and crossbred heavy milk cattle breeds require quality rations, and are more vulnerable to diseases and weather extremes (KÖHLER-ROLLEFSON et al., 2009).

High output milk cattle breeds have been introduced as a breeding policy in the last 30 years in Northern Pakistan. This intervention has led to the dilution of local breeds. Despite their acknowledged qualities and adaptive capacity to extensive production, many local breeds remain undocumented, making in-situ conservation actions difficult (FAO, 2007). If local breeds are to be conserved to increase smallholders' adaptive capacity to climate change, their phenotypic and genetic characteristics needs to be documented. The yet undocumented Achai cattle, originally from the Himalayan Hindukush Mountains, can be a breed of choice for coping with future climate change scenarios. The pastoral and agro-pastoral communities in the less accessible marginal mountain valleys still have a sizable Achai population and can provide space for its conservation. This study documents the 1) phenotypic and morphometric, 2) productive and 3) reproductive characteristics of the Achai cattle breed.

### **Material and Methods**

Physical characteristics (color of coat, horns, muzzle, and switch), morphometric measurements (heart girth, body length, height at withers), and productive and reproductive performances of 108 cows in the District of Lower Dir, Northern Pakistan were investigated according to the FAO (1986) standard procedure. Body weight was estimated according to Shaffer's method (AL-AMIN et al., 2007). Standard 305-day milk yield was recorded according to the International Committee for Animal Recording A4/2 method (ICAR, 2004). Data on reproductive performance (pubertal age, postpartum anoestrus interval, first service conception rate, number of service per

conception, calving interval) was obtained from breeders through interviews. The number of observations available for reproductive performance was 97 for pubertal age, 161 for postpartum anoestrus interval, 276 each for first service conception rate and number of service per conception, and 279 for calving interval. The first service conception rate was calculated according to FETROW et al. (1990).

## Results and Discussion

### *Phenotypic and morphometric characteristics*

The majority of the Achai cows have spotted reddish brown coat color, horns of light brown color with black tips, light brown colored muzzle with black pigments and reddish brown colored tail switch (Table 1). Mean heart girth, body length and height at withers are  $134.33\pm 0.63$  cm,  $112.20\pm 0.78$  cm and  $101.79\pm 0.41$  cm respectively. The estimated body weight of the Achai cow is  $188.23\pm 2.66$  kg making it the smallest cattle breed in Pakistan (KHAN et al., 1982). The small body size could be the result of natural selection to reduce the sensitivity to fodder shortage in harsher environments (MWACHARO et al. 2006), thus its high adaptive capacity to harsher mountainous environmental conditions.

Variables	Color	(%)
Coat	Spotted reddish brown	59.26
	Solid reddish brown	40.74
Horn	Whitish grey color with black tips	28.70
	Light brown color at base with black tips	44.44
	Light brown	26.85
Muzzle	Light brown with black pigments	50.93
	Light brown	36.11
	Black	12.96
Switch	White	35.18
	Reddish brown	55.56
	Black	9.26

**Table 1: Physical characteristics of the Achai breed (n = 108).**

### *Productive performance*

The overall mean standard 305-day milk yield is  $1426.31\pm 30.23$  liters. Almost half of the studied Achai cattle population (49.07%) produces milk ranging from 1501 to 2100 liters while 41.67% produce milk ranging from 1001 to 1500 liters. Although the Achai cow produces less milk than other dairy cattle breeds of Pakistan like the Sahiwal breed, (1500-2000 liters), and the Red Sindhi breed (1200-2000 liters), its milk yield is more than some draft breeds such as the Dhanni (1000-1200 liters), or the Lohani (700-1000 liters) (KHAN et al., 2005), or local non-descript cows in the Khyber-Pukhtunkwa province 1230 liters<sup>1</sup> (SYED et al., 1994). Achai cattle are undeniably more suitable than exotic and crossbred cattle breeds in this mountainous area (MUHAMMAD AND SHAH, 1986). The output of small cattle breeds may be lower, but they require fewer inputs and provide better financial returns to farmers (AYALEW et al., 2003). Moreover, when herding for subsistence in remote areas, milk is only for homestead use, thus a low production is often sufficient.

### *Reproductive performance*

Mean pubertal age of Achai cows is  $1147.73\pm 18.26$  days. The overall mean postpartum anoestrus interval of Achai cow is  $97.33\pm 3.42$  days. More than half of the population (60%) has postpartum

<sup>1</sup> Data was provided in kilograms and converted into liters (1 kilogram = 0.9709 liter)

anoestrus interval up to 90 days which is the recommended interval for cows in tropical areas (MASAMA et al., 2003). The overall mean calving interval of the Achai is  $476.37 \pm 5.17$  days, which is within the recommended range of values for cows in tropical areas (430 days) (KANUYA, 1992). The reproductive performance can be further improved as the genetic selection and proper management of the cows can reduce pubertal age (NOGUEIRA et al., 2003), postpartum anoestrus interval (OPSOMER et al., 2004) and calving interval (MAKGAHELA et al., 2008). Noteworthy, is the excellent fertility of the Achai (first service conception rate of 71.01% and number of services per conception at  $1.48 \pm 0.05$ ).

### **Conclusions and Outlook**

The Achai cow is the smallest of all cattle breeds in Pakistan and is adapted to the environmental condition of this mountainous area including rugged terrain grazing. It is a multipurpose animal genetic resource being reared both as dairy and draft animal. Crossbred cattle and other introduced breeds cannot perform optimally in the area due to fastidious requirements coupled to their specialization (either milk production or draft). The constant threat to the Achai breed is found in its indiscriminate breeding due to the lack of breeding bulls. Traditionally, draught bulls are used for breeding, but with mechanization and the use of tractors these bulls are disappearing. As a result breeding is performed by means of other bull breeds, thus the dilution of the Achai and its adaptive characteristics. Documenting the breed and selecting Achai cows with better production and reproduction performances can help in improving the breed's traits and increase outputs. A conservation action plan of the breed has been presented to the Department of Livestock and Dairy Development of the Khyber Pukhtunkhwa. The latter initiated recently a conservation program but the capacity and scope still need to be improved.

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