

# Conservation and utilisation of the Sahiwal cattle in Kenya

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## Summary

Sahiwal cattle are indigenous to Pakistan and India, and were imported to Kenya in 1930s and 1940s. The breed has been developed as a dual-purpose breed and is utilised in smallholder farming systems, beef and dairy ranching in marginal areas of Kenya which form 80% of the country. Conservation efforts include keeping of Sahiwal herds on state farms, individual ranches and the establishment of the Sahiwal semen bank at the Central Artificial Insemination Station at Kabete near Nairobi. Breeding of the Sahiwal has been promoted by the formation of the Sahiwal Breeders Society which has established breed standards for registration of Sahiwal cattle with the Kenya Stud Book.

## Resumen

La raza bovina Sahiwal es originaria de Pakistán e India y fue importada en Kenia en los años 1930 y 1940. La raza se ha desarrollado como raza mixta y viene utilizada en pequeñas explotaciones de carne y leche en zonas marginales de Kenia, que representan un 80% del país. Los esfuerzos de conservación incluyen mantener los rebaños de Sahiwal en explotaciones estatales, en ranchos privados y establecer un banco de semen de Sahiwal en la Estación Central de Inseminación Artificial de Kabete, cerca de Nairobi. La mejora de la raza Sahiwal ha sido promovida a través de la creación de la Sociedad de Mejoradores de Sahiwal, que ha establecido los estándares de raza para la

registración de la raza Sahiwal en el libro de registro de razas de Kenia.

**Key words:** *Herd management, Characteristics, Breeding plan, Performance production systems.*

## Introduction

The Kenya Sahiwal is a dual-purpose breed which has been bred in Kenya since 1939. The breed originated in Pakistan and India. The Sahiwal breeding stock, mainly bulls, were imported, maintained and used for upgrading indigenous zebu cattle at thirteen livestock improvement centres, namely Ngong, Kabianga, Baraton, Maseno, Sang'alo, Chebororwa, Machakos, Ndomba, Chemeron, Katumani, Mariakani, Naivasha and Marimba. The first three bulls were imported from Pusa in India. After 1945, 60 Sahiwal bulls and 10 Sahiwal cows were imported from Jahangirabad in Pakistan. Another importation of 15 Sahiwal bulls was from Karnal in India in 1964. In addition to the ten cows, some improved indigenous zebu cows were selected and used as foundation stock in the grading up and multiplication of the Kenya Sahiwal cattle by systematic crossing with imported purebred Sahiwal bulls. By 1962, there were 2 500 Sahiwals in the 13 livestock improvement centres. The latest importation has been of 1 000 doses of semen from six proven Sahiwal bulls from Pakistan in 1991 for use in the Sahiwal stud and other Sahiwal herds in the country.

The National Sahiwal Stud was established at the National Animal Husbandry Research Centre at Naivasha in 1963 because its ecological conditions were suitable for maintaining the Sahiwal Stud. The total area used by the Sahiwal Stud at Naivasha is 3 600 hectares (7 920 acres). The research farm is located to the east of Lake Naivasha in the Rift Valley Province of Kenya.

The climate is characterised by wet and dry seasons. The dry season months are January-March and July-September. The wet season occurs in April-June and October-December. The total annual rainfall is 620 mm and the average maximum and minimum temperatures are 26°C and 8°C, respectively. July is the coldest month. The relative humidity varies from 60 to 75%. There are strong desiccating winds in the dry season.

The natural vegetation at Naivasha consists of Kikuyu grass (*Pennisetum clandestinum*) near Lake Naivasha and star grass (*Cynodon plectostachyum*) with scattered acacia trees.

## Objectives

The main objective for the establishment of the Kenya Sahiwal Stud was to improve the breed for milk and meat production in marginal areas. The secondary objectives were to produce semen from proven bulls, to produce breeding stock for Kenya farmers and to conserve and improve the Sahiwal genetic resource.

The purpose of this paper is to present for publication a synthesis of information collected over the years on the improvement effort of the Sahiwal including various methodological approaches, formulation of breed standards, management and performance of the herd at the National Animal Husbandry Research Centre, Naivasha.

## Conservation of the Kenya Sahiwal Cattle

Conservation of Sahiwal breed has involved identification, characterisation, preservation, improvement and utilisation in smallholder mixed-farming systems, beef and dairy ranching. Methods of preservation include maintenance of purebred herds on state farms, individual ranches and establishment of a Sahiwal semen bank.

The National Sahiwal Stud at Naivasha is a member of the Sahiwal Cattle Breeders Society of Kenya and the Kenya Stud Book. Sahiwal cattle are inspected by the Inspector of the Sahiwal Cattle Breeders Society before they are registered by the Kenya Stud Book. For cattle to qualify for registration they should meet the breed standards. The Inspector requires detailed pedigree and performance records on each animal during inspection.

## Characteristics

The Sahiwals are heavily built, and the colour ranges from reddish brown to chestnut.

It has a typical head shape. In profile the brow slopes back to the poll and the line from brow to muzzle is straight and long. The hump is in the cervico-thoracic position. Ears are long and drooping and set behind and level with the eyes. Breed standards of Kenya Sahiwal Cattle are reported in table 1.

## Disqualification

Animals were disqualified for any extreme manifestation of undesirable characters or for hereditary defects that occur in cattle such as Hernia, Cryptorchidism, Malformed genitalia, excessive size of teats in cows.

Table 1. Breed standards of Kenya Sahiwal Cattle.

Item	Description
Coat colour	<b>Desirable:</b> Reddish brown to chestnut. <b>Permissible:</b> Slightly mottled white spots on underline.
Hair	Short, straight and smooth.
Skin	Pigmented.
Hide	Moderately thick, loose and pliable.
Head	<b>Bull:</b> Masculine, alert, straight and long. <b>Cow:</b> Feminine, calm but alert.
Horns	Bulls and cows should be de-horned.
Ears	Long, drooping and developed crest and clearly defined muscles. <b>Cow:</b> Lean and flat or rounded.
Hump	Well developed in cervico-thoracic position.
Shoulders	<b>Bull:</b> Neat attachment, free-moving, well-muscled. <b>Cow:</b> Neat free moving, lean but not heavily -muscled.
Brisket	Broad with skin fold clearly defined over brisket.
Heart girth	<b>Bull:</b> Not deep, broad but fairly full. <b>Cow:</b> Not deep, broad but relatively lean with feminine quarters.
Backline	Backline forward of sacrum should be both broad and level.
Loin	<b>Bull:</b> Prominent. <b>Cow:</b> Smooth not pronounced.
Ribs	Well-sprung, forming an angle with the vertebral column.
Hip bones	<b>Bull:</b> Narrow and angular. <b>Cow:</b> Narrow but free from hard lumps of fat.
Rump	Broad, slightly rounded on top, fairly long with moderate slope, front to rear.
Hind quarters and thigh	Broad, long, flat when viewed from the rear. Muscles clearly defined in bulls. Smooth in the case of cows.
Tail and tail setting	Smooth insertion well to the rear, the tail must hang down perpendicularly and must have a well developed switch.
Legs and hooves	Well-set, strong sound legs and feet, darkly pigmented hooves.
Udder and teats	Well-attached medium-sized milky udder, teats not too large or small and should be well-pigmented.
Sheaths	Normal, neatly attached, well-closed sheath opening with a good sphincter.
Testicles	Good size and held in scrotum with a clearly defined neck to scrotum.
Body conformation	<b>Bulls:</b> Bull symmetrically balanced, defined muscles. Deep in front but well-muscled in hind quarters. Good length of body, well-sprung ribs, good strong legs. <b>Cows:</b> Lean in neck and shoulders, well-developed hind quarters. Slightly drooping rump. Good length of body, well-sprung ribs and good strong legs.
Size	Large for age, fast gaining, good feed converters.
Disposition	Calm and tractable. (temperament)
Functional efficiency (fertility)	<b>Bull:</b> Masculine, virile, and high libido. <b>Cow:</b> Feminine, regular calving and calving with ease.

Table 2. Herd structure, size and % of total herd at Naivasha Research Centre (1996).

	Herd structure and size (1996)	% of total herd
i) Milk herd	230	14.5
ii) Dry cows	130	8.2
iii) Heifers (9-36 months)	398	25.1
iv) Weaners		
Males	100	6.3
Females	121	7.6
v) Calves		
Males	140	8.8
Females	150	9.4
vi) Bulls and Steers	200	12.6
Bulls	120	7.5
<b>Total</b>	<b>1 589</b>	<b>100</b>

Disqualification also applied when there was an undershot or overshot jaw, straight hind legs, coarse, woolly coat and any symptoms of sub fertility or lack of functional efficiency.

## Herd Management at Naivasha Research Centre

The Sahiwal herd was grouped as follows:

- i) Breeding cow herd consists of lactating and dry cows.
- ii) The bull herd consists of young bulls for progeny testing and older bulls awaiting progeny test results.
- iii) Young stock consists of calves and weaners.

Herd structure, size and % of total herd at Naivasha Research Centre (1996) are reported in table 2.

### Calf rearing

The breeding pattern was such that calvings occur in all months of the year, although not in equal proportions. Of the total calvings, 70

per cent occur between March-October, while 30 per cent occur in January-February and November-December. Calves were separated from their dams immediately after parturition, weighed and nipple-fed colostrum in the first week and thereafter whole milk at a rate of 10% of the body weight. Calves were weaned at 12 weeks at an average weight of 55kg.

### Weaner stock ( 55 to 125kg)

Weaners were rotationally grazed on natural pastures in paddocks which were adequately supplied with water. They were provided with mineral licks *ad libitum* when available. At 4 months of age, males from below-average yielding cows and test bulls were castrated and disposed of as fattening steers. They were then branded at 8 months of age and separated by sex.

### Heifers (9-36 months)

Heifers joined the dry cow herd and were weighed monthly up to 27 months of age. They were randomly assigned to test bulls and those that had attained 270 kg at 27 months of age were inseminated.

### Young bulls (9-24 months)

Young bulls at 9 months of age were transferred to the bull herd. Weighing was done monthly up to 24 months of age. At this age, they were selected for progeny testing on the basis of an index computed from the breeding values of the sire, dam and growth rate of the young bull. Out of 75 bulls from the elite herd, 15 bulls were selected to form a team for progeny testing and their semen was collected and stored at the Central Artificial Insemination Station(C.A.I.S.), Kabete. Bulls were further selected on semen quality and as a result of semen evaluation, 10 of them were finally selected for progeny testing.

## Bulls over 24 months

Bulls selected for progeny testing were maintained for a period of 6-7 years when progeny test results were available. From the ten bulls, the best two bulls in terms of milk production of their daughters were selected and taken to C.A.I.S., Kabete, for semen production. Semen from proven Sahiwal bulls was used locally and surplus was exported.

## Lactating cows

Cows were hand milked twice a day in the morning at 6-8 hours and 14-16 hours. As a result of selection for good temperament, Sahiwal cows at Naivasha are milked in the absence of calves and let down milk without the calf suckling. Sahiwal cows are capable of producing milk for a lactation period of 290-305 days.

## Grazing management

The Sahiwal herds were rotationally grazed in the paddocks which were adequately supplied with water from the river or borehole. Mineral licks were provided *ad libitum*. Since Sahiwals are being developed for marginal areas with limited feed resources, it was the policy of the Stud not to supplement cows with dairy meal. However, farmers keeping Sahiwals for milk production provided concentrate feed and cows responded favourably by yielding more milk.

## Health management

With acaricide solution, dipping was done once a week for the bull herd, milk herd, dry herd, maternity herd (cows 3 months to parturition), and weaner stock. Calves were sprayed with a spray race once a week. The frequency of dipping was determined by the tick load in the grazing area which was in turn influenced by seasonal distribution of rainfall. Routine vaccinations against rinderpest were done after one year of age and once in the animal's lifetime. Foot and mouth disease and anthrax vaccinations were

given twice a year. Young stock were dewormed regularly after 3 months and as was necessary depending on the helminth faecal egg count.

## Breeding

Sahiwal cows were inseminated with deep-frozen semen from proven Sahiwal bulls. Heifers and first calvers formed the test herd and were inseminated with semen from young bulls selected for progeny testing. Cows were observed for oestrus signs at grazing and milking time. Cows showing oestrus signs were inseminated 12 hours after onset of oestrus. Cows displaying irregular oestrus were examined by an on-station veterinarian and treated.

Pregnancy diagnosis was done by rectal palpation 2-3 months post-service. Cows that were not pregnant were scheduled for rebreeding or were disposed of if they had fertility problems. Pregnant heifers and cows were moved to the maternity paddocks in the last 3 months of pregnancy. Cows were then closely observed for signs of parturition. Dystocia was not common in the Sahiwal herd, perhaps because calves were small, weighing on average 20 kg. After parturition, cows were weighed immediately within 24 hours. Cows resumed oestrus activity 45 days later and were ready for breeding after 70 days when uterine involution was complete .

## Breeding Plan

Mason (1965) designed a breeding scheme which has been implemented for genetic improvement of milk yield and growth rate in the nucleus closed herd (Figure 1). The nucleus breeding scheme was found an appropriate system of organisation for testing, selection and dissemination of genetic progress in view of the poorly developed infrastructure in the marginal areas for artificial insemination and field recording.

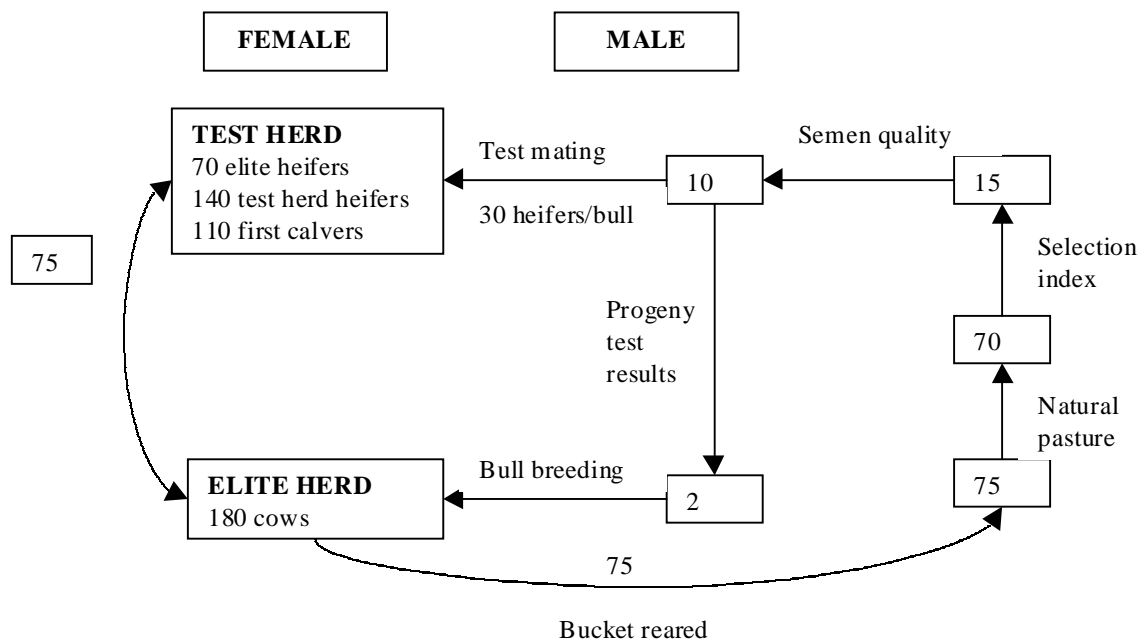


Figure 1. Breeding plan at the National Sahiwal stud.

In the nucleus herd, detailed recording of performance traits was carried out and genetically superior animals were identified and selected for breeding in the nucleus herd and in the commercial herds.

Selection and breeding procedures involved:

- i) Breeding elite cows to proven bulls to produce young bulls for progeny testing within the nucleus closed herd.
- ii) Young bulls for progeny testing being selected on the basis of pedigree information and individual growth rate.
- iii) Bull dams selected from the top 5-6% of the elite herd.
- iv) Cows selected within lactation on the basis of individual milk yield and low yielders being culled and disposed of.

## Performance of the Sahiwal Cattle

### Lactation milk yield

The mean lactation milk yield was  $1\ 574 \pm 575.8$  kg ( $M \pm SD$ ) with a coefficient of variation of 36.6% (Muhuyi, 1997). The heritability estimated by paternal half-sib analysis was  $0.127 \pm 0.04$ . The additive genetic variation was low, perhaps because the nucleus herd has been bred as a closed herd for 35 years.

### Lactation length

The mean lactation length was  $293 \pm 37.5$  days with a coefficient of variation of 12.8%. The phenotypic correlation between lactation milk yield and lactation length was 0.47, indicating that there is a significant relationship between milk yield and lactation length in the Sahiwal. This is



Figure 2. Grazing sahiwal herd.

unlike the cattle in temperate areas where there is no relationship between milk yield and lactation length.

### Age at first calving

The mean age at first calving was  $40.1 \pm 3.8$  months with a coefficient of variation of 9.5%. Analysis of variance showed that sire effects influenced age at first calving. The heritability estimate of age at first calving was  $0.20 \pm 0.097$  and this indicates that selection for growth rate can result in improvement of age at first calving. The average lifetime of the Sahiwal is 98 months and the productive life is 58 months in which it produces 4.2 calves.

### Services per conception

The mean services per conception were  $2.0 \pm 1.5$  with a coefficient of variation of 74.6%. The heritability estimate for services per conception was  $0.038 \pm 0.028$ . Although the trait is of low heritability, it was possible to evaluate sires using a large number of

daughter records. This was possible in a cooperative breeding scheme involving Sahiwal herds in other ranches.

### Days open

This is the period from calving to successful conception. The mean days open was  $151 \pm 90.6$  days with a coefficient of variation of 59.9%. The phenotypic correlation of days open and calving interval was high and positive ( $r=99$ ) indicating that the two measures of fertility refer to the same trait.

### Gestation length

This is the period from conception to normal delivery of a calf. The mean gestation length is  $287 \pm 5.1$  days with a coefficient of variation of 1.8%. Heritability estimate was  $0.10 \pm 0.03$  and repeatability was 0.18.



*Figure 3. Herding Sahiwal herd.*



*Figure 4. Milking herd.*

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Figure 5. Artificial insemination of Sahiwal cow.

### Calving interval

Calving interval is the period in days between two consecutive parturitions and is derived from the previous date of calving and the current date of calving. The mean calving interval of the Sahiwal was  $437.75 \pm 90.8$  days with a coefficient of variation of 20.7%.

### Growth characters

The mean birth weight of Sahiwal male calves was  $21.4 \pm 0.17$  (M  $\pm$  SE) and for female calves  $21.0 \pm 0.33$  (Mwandotto, 1985). Male calves are heavier than females by 0.47 kg. The mean weaning weight of Sahiwal male calves was  $56.29 \pm 0.20$  kg and for female calves  $56.25 \pm 0.20$  kg.

The pre-weaning daily gain of Sahiwal males was 300gm/day and for females 208 gm/day. Growth rate to 125 kg was  $511 \pm 4.5$  gm/day and  $470 \pm 3.8$  g/day for males and females, respectively. Weight at first service of Sahiwal heifers was 270 kg at an age of 27 months. The mature cow weight was 425 kg and mature weight for males was 500 kg.

### Survival rates

Survival rates in the Sahiwal herd vary with sex and age. Pre-weaning survival rates for males and females were  $78.1 \pm 12.5\%$  and  $78.4 \pm 10.9\%$  respectively. Post-weaning survival rates for males and females were 95.5% and 96.4% respectively. Mortality rates were relatively high in the pre-weaning stage for both sexes and these were attributed to still birth, abortions, pneumonia, diarrhoea, starvation and accidents. The major causes of losses among mature stock were tick-borne diseases, mainly east coast fever and anaplasmosis.

### Production Systems

The Sahiwal breed is utilised in smallholder mixed farming, dairy ranching and beef ranching to produce milk, meat, manure and draft power.

Smallholder mixed farming is practised in sub-humid areas in agro-ecological zone III at an altitude of 1 800-2 100 metres above sea level with annual rainfall of 750-1 000 mm. The natural vegetation consists of evergreen

and semi-evergreen bushland, combretum woodland and savannah. In this agro-ecological zone, population pressure is relatively dense where soils and topography are suitable for agriculture.

Average farm size is small varying from 1 hectare to 5 hectares. Mixed farming is practised including dairy farming, food and crop production. The average herd size is 5 head of cattle. Sahiwal and its crossbreds are managed under zero-grazing and semi-zero grazing conditions. Cattle are fed Napier grass, crop residues and grazed on natural and improved pastures. Cows are supplemented with dairy meal and mineral licks. The average milk yield of the Sahiwal on smallholder farms is  $2\ 097 \pm 687.0$  kg per lactation.

Dairy ranching is practised in highlands, sub-humid and semi-arid areas in agro-ecological zones III and IV with relatively low annual rainfall of 600-800 mm. Average farm size is between 500-1 000 hectares. Breed types used are Sahiwals and their crossbreds with exotic dairy breeds. Average herd size is 200 head of cattle. Cattle are extensively grazed on natural and improved pastures. Milking cows are supplemented with dairy meal and mineral licks. Infrastructure is well developed to facilitate marketing of milk, dairy products and surplus cattle.

Beef ranching is practised in semi-arid areas in agro-ecological zone IV with annual rainfall of 400-700 mm. Natural vegetation is mainly dry transitional combretum, acacia woodland and savannah. Average farm size is 1 000-5 000 hectares. Meat production is based on Sahiwal and Boran. The average herd size is 300 head of cattle. Cattle are extensively grazed and supplemented with concentrate and mineral licks.

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