

A close-up photograph of two cows. The cow on the right is in sharp focus, showing its eye and the texture of its brown fur. The cow on the left is out of focus, with its large, rounded ear being a prominent feature. The background is a soft, warm, golden-brown color, suggesting a natural outdoor setting.

The story of cattle in Africa

Why diversity matters











Cattle are central to culture and to life in Africa.

This book explains why and how cattle have evolved in Africa over centuries and the role they play today. The African cattle breeds that exist today comprise a critical long-term asset. They also provide short-term income and the daily food and nutrition for some 800 million livestock keepers across Africa. The diversity of African cattle ranges from breeds adapted to the edges of the Sahara Desert in North Africa, to those able to survive in wet tropical lowlands, to breeds that thrive in the vast savannahs of southern Africa.

Where you find people, you find cattle.



The story of cattle in Africa

Why diversity matters

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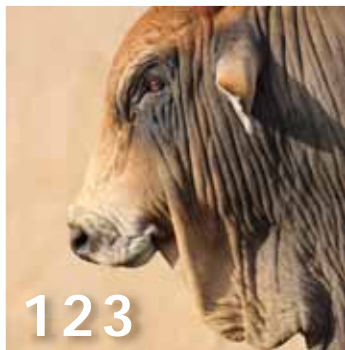
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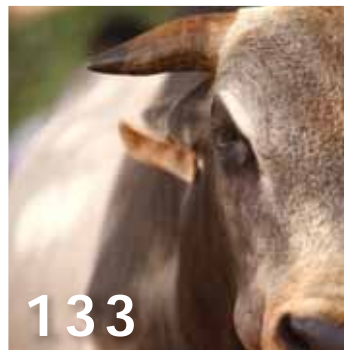
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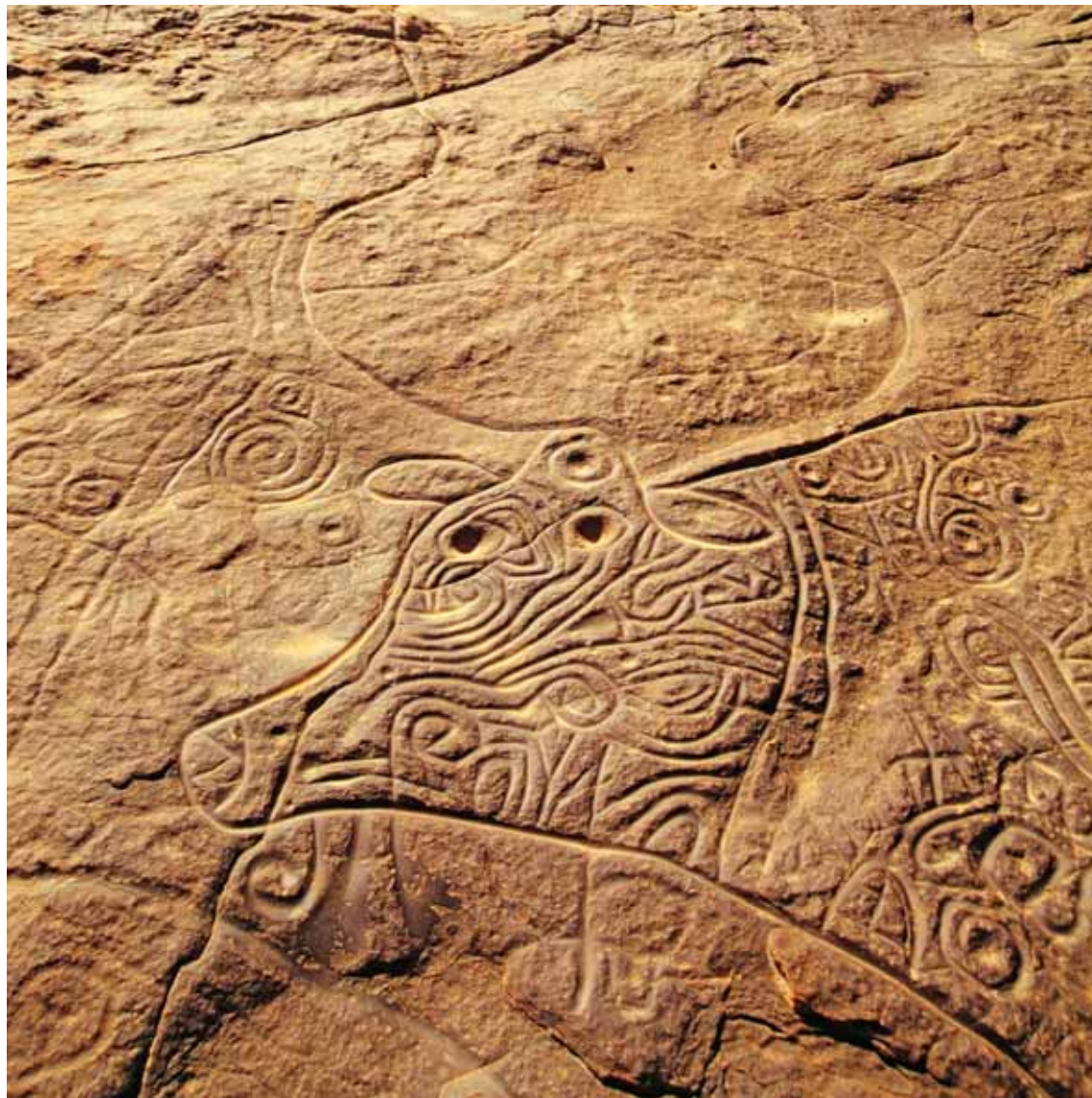
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Preface

Cattle are central to the lives and diverse cultures of Africa's people. This book highlights how cattle have evolved in Africa over centuries and illustrates the varied and vital roles they have played in the past and continue to play today. Robust, genetically diverse African cattle are treasured assets for estimated 800 million livestock keepers across the continent. Cattle are a critically important daily source of food and nutrition, of much needed income, and of nitrogen-rich manure for replenishing soils and other uses. They also fulfil a wide variety of socio-cultural roles. Thanks to their rich genetic diversity, different breeds of African cattle are well adapted to a remarkably wide range of environments—from the harsh fringes of the Sahara Desert in North Africa, to the drier areas of the Horn of Africa, to the wet tropical lowlands found along the Congo River, and on to the vast savannahs of Southern Africa.

"The story of cattle in Africa: Why diversity matters" showcases a few of the continent's indigenous cattle breeds, highlighting their social, cultural, economic, genetic and environmental importance. Through stories told by farmers, one learns about the contribution these animals make to the livelihoods of their keepers as well as those who participate in the extended range of economic activity that surrounds each animal. In addition, cattle are a critical daily source of nutritionally rich animal source foods (ASFs), providing protein, vitamins, minerals, and essential fatty acids that help meet the dietary needs of millions of African people, especially children and reproductively active women.

The content of this book has been jointly contributed by the International Livestock Research Institute (ILRI), the Rural Development Administration (RDA) of the Republic of Korea, and the African Union-InterAfrican Bureau for Animal Resources (AU-IBAR). Its development and release marks the culmination of the United Nations General Assembly Declaration 2011-2020 [the UN Decade on Biodiversity (Resolution 65/161)]. Designating 2011-

2020 as the Decade on Biodiversity has served to support and promote the objectives of the strategic plan for biodiversity and the Aichi Biodiversity Targets. The goal of this book is to reinforce recognition of the importance of animal biodiversity and while illustrating how to both utilise and conserve the genetic diversity of indigenous African livestock through improved management.

Changes in population, climate, technology, lifestyles, consumer demands, markets and other factors are driving rapid change in Africa's indigenous livestock populations and breed compositions. These drivers are influencing the way that animal genetic resources are being used to sustain and improve the livelihoods of people; they also influence, and sometimes threaten, livestock diversity at the herd, national and regional levels.

The future of African cattle and the millions of people who depend on them as a source for food, income and improved livelihoods is at a crossroads. The tension between the need to improve productivity under more intensive systems and the need to halt the precipitous loss of irreplaceable, diverse and adapted breeds is growing rapidly and must be acknowledged. We cannot expect African farmers to halt the crossbreeding, selection and changes in management practices that are dramatically improving the livestock business, but we also cannot ignore the loss of diversity. We believe that the international community must take positive actions and we hope that this book contributes to an increased understanding of the critical and enduring values of the many extraordinary African cattle breeds that have been bred and nurtured by African people over the millennia. To let this extraordinary resource disappear would be a tragic and dangerous loss to mankind.

Tadelle Dessie and Okeyo Mwai
Livestock Genetics Program, ILRI

Acknowledgments

“The Story of Cattle in Africa: Why diversity matters” is the result of many contributions, particularly Africa’s farmers and herders who are the long-standing stewards of this continent’s priceless bovine diversity. We thank the many owners and experts who generously shared their knowledge of and passion for these unique animals. Many people worked hard to enable us to visit various locations, consult with experts, and photograph the marvellous animals featured in this book. We thank all those who facilitated discussions with livestock keepers, the crew that captured the original stories and photographs, and the members of the editorial teams that pieced together the information to create this book.

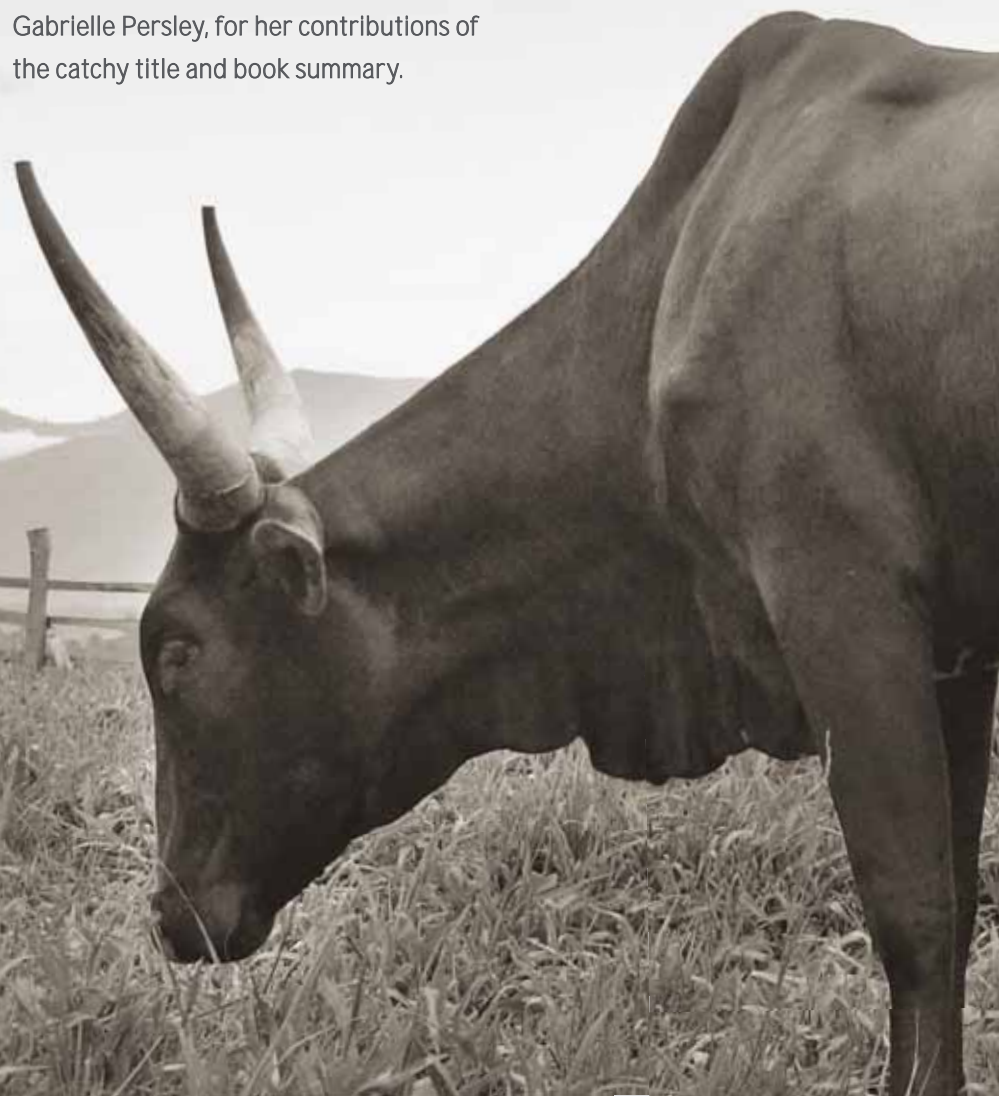
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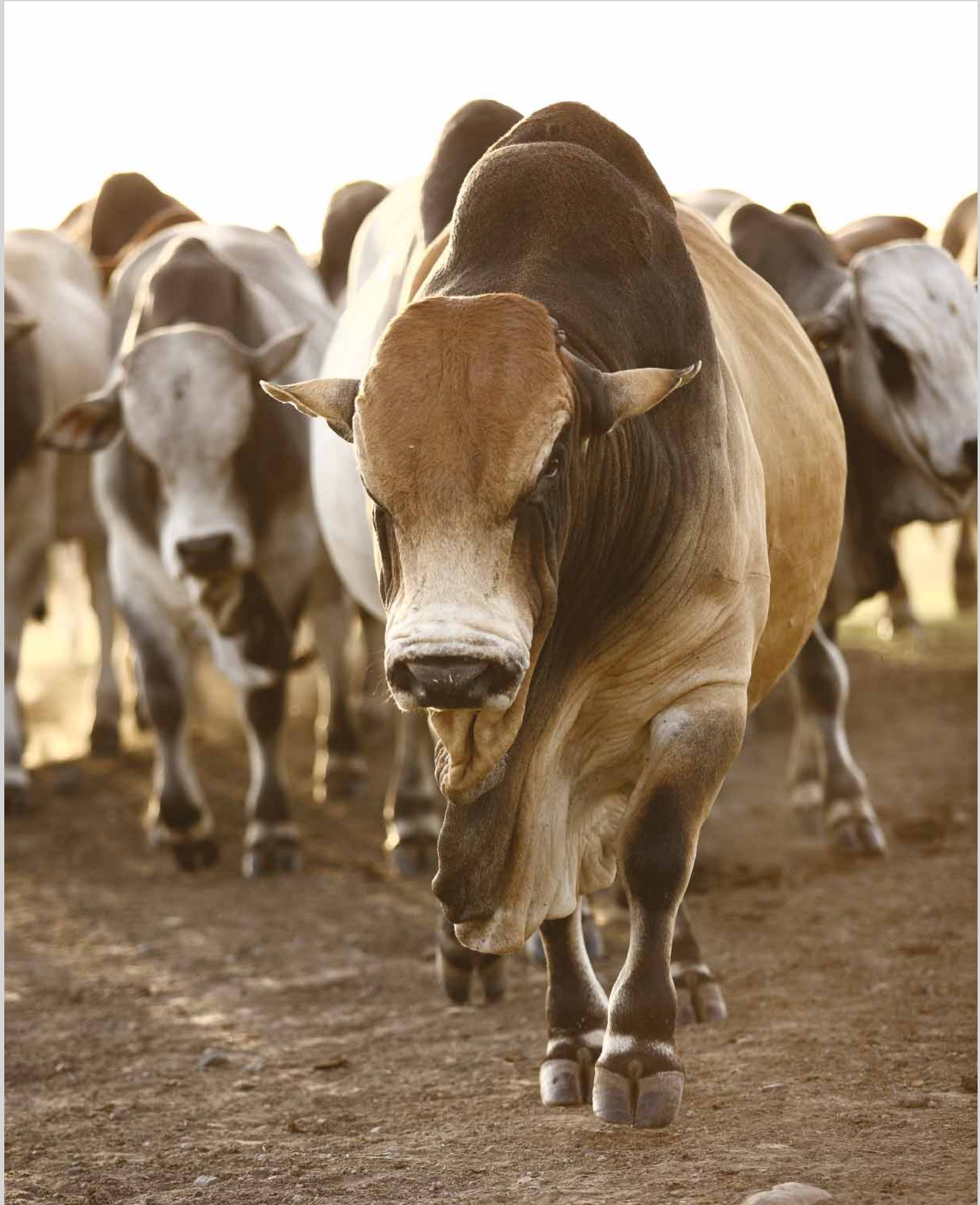
Photographs were taken by Stevie Mann and Eric Ouma and the selection of those included in the book was undertaken by Stevie Mann, John Dawson and Eric Ouma. The creative design concepts of this book were developed by Eric Ouma.

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Tadelle Dessie and Okeyo Mwai
Livestock Genetics Program, ILRI





Foreword by AU-IBAR

Ancient genes offer hope for the future

Africa rears about a fifth of the world's cattle (some 300 million head), which comprise a unique combination of two major cattle species—*Bos indicus*, which is widely recognized for the signature hump on its back, and *Bos taurus*, which is of European descent and has no hump. The African herd contains numerous robust crossbreeds that combine the best traits of these two species.

African cattle are a critically important source of food and nutrition, nitrogen-rich manure, and labour-saving draught power. They are a major household asset, a significant source of income, and are used for transporting goods to market. Beyond these roles, cattle are often used to fulfil many sociocultural obligations. They are central to the livelihoods of a third of the continent's population, contributing significantly to household incomes. Cattle and other livestock generate anywhere from 20% to more than 80% of the agricultural value produced by most African countries. The demand for meat, milk and other animal products that is fuelled by rapidly growing urban and middle-class populations and changing consumer tastes and preferences will further increase the contribution of livestock to incomes and economies.

In Africa, cattle are an indispensable means for achieving savings and provide a traditional social safety net that helps to spread and manage risk and, in so doing, building household resilience to economic shocks. Cattle are often central to social exchanges that create social capital and redistribute wealth. Their safety net role is particularly critical among rural populations in the marginal arid and semi-arid environments found across the African continent. All these products and sociocultural services are primarily derived from a continental cattle herd that is not only predominantly indigenous, but also largely in the hands of smallholder farmers, pastoralists and agro-pastoralists.

Many current public sector policies, breeding programs and financial investments in the livestock sector do not match the needs of most cattle owners in Africa. Breeding programs have generally focused on a limited number of high-output breeds best suited for intensification purposes under specialized large-scale operations. This has marginalized African breeds that are not considered competitive in meeting production targets, despite evidence of being efficient producers under marginal conditions and their high levels of disease resistance. Fortunately, this situation is changing. In 2015, African heads

of state and government endorsed the first ever twenty-year Livestock Development Strategy for Africa (LiDeSA). In line with the aspirations of the Agenda 2063 of the African Union, this strategy is formulated under the Comprehensive Africa Agriculture Development Programme (CAADP), which promotes an agricultural sector transformation agenda. LiDeSA underscores the importance of harnessing Africa's entire richly diverse animal genetic resources in order to address some of the continent's most pressing challenges concerning food and nutritional security. LiDeSA, and CAADP more broadly, provide a blueprint for future investments in livestock development.

This publication showcases some of Africa's unique cattle breeds, providing invaluable insights into the continent's diverse and extraordinarily valuable animal genetic resources. It profiles selected breeds of cattle found in Africa and is meant to highlight the importance of indigenous breeds to the continent. It provides information on the important attributes of different breeds, including their special adaptive traits and roles. Breeds like the Ankole cattle of southwestern Uganda, with their enormous horns, are globally renowned. Others, like the Kuri cattle of Central Africa, with their bulbous horns and timid disposition, are hidden treasures whose genetic and economic value are little known, even on the African continent. All the cattle featured here are indigenous breeds that have come from centuries of both natural and deliberate genetic selection. Their unique and sometimes curious features belie a hardiness bestowed by adaptation to a multiplicity of stresses and shocks, such as endemic diseases and pests, scarcity of forage and feeds, and extreme climatic variations.

This publication begins a new narrative on the value of Africa's animal genetic resources, one that embraces new approaches and innovations in business, marketing and governance that will transform how Africa's animal genetic resources are viewed, accessed, managed, utilised and conserved.

It is our hope that this publication will inspire much needed action and investments by national governments, regional communities, and all those working to strengthen Africa's vibrant livestock sector.

Prof Ahmed ElSawalhy
Director, AU-IBAR



서문

아프리카 소 품종의 다양성 고대 유전자, 미래 희망을 주다

아프리카 대륙은 백여 가지 이상의 소 고유 품종이 서식하고 있는 유전자원의 보고이다. 본 책자에서 소개되는 소 품종을 보면, 크기가 아주 작은 ‘로비’ 종에서 큰 ‘에티오피아 보란’ 종, 형태학적으로 등에 혹이 없는 ‘엔다마’ 종에서 혹이 있는 ‘레드 풀라니’ 종, 모색이 흰색인 ‘캄바’ 종에서 짙은 빨간색인 ‘앙콜’ 종까지 그 종류가 다양하다.

왜 이렇게 다양할까? 그 답은 아프리카가 가지는 많은 민족과 다양한 자연환경에 기인한다. 각각의 독특한 품종은 황량한 반사막지대, 가시가 돋힌 나무들로 뒤덮인 사바나 지역 혹은, 다른 생태환경에 적응한 것이며, 또한 다양한 민족의 필요에 따라 우유, 고기, 농사용으로 사용하거나, 미적 선호도에 의해 뿔의 모양이 변화된 것이다. 이처럼 야기된 다양성은 동물 질병 파동, 온난 기후, 시장 변화에 대응하는 현대적 방법으로 그 중요성이 더해짐에 따라 유전 형질의 살아있는 보고로 대표된다. 이렇게 형성된 다양성은, 가축 질병, 기후 온난화, 시장변화 등을 해결하기 위한 현대적 방법으로써, 매우 중요한 유전물질의 살아있는 보고로 여겨진다.

하지만 이 놀라운 생물학적 자산은 위협 받고 있다. 매달 가축의 한 품종이 사라질 정도로, 세계 가축 유전자원은 빠른 속도로 사라지고 있다. 많은 아프리카 소의 고유 품종들도 같은 위기 상황에 놓여있다. 시장은 더 많은 고기와 우유를 생산하는 수입가축을 선호하게 하였다. 하지만 이는 아프리카의 생산환경에 적응하기 위해 요구되는 풍부한 유전자 조성을 빈약하게 만들었다.

고유 품종들의 멸종은 잦아진 가뭄과 해충 등에 대비하는 미래 도전과제에 대응하는 중요한 형질들을 돌이킬 수 없이 잃어버리는 것이라고

할 수 있다. 또한 아프리카의 소규모 가축 사육자들은 팽창하는 시장으로의 진입과 생계를 변화시킬 기회를 놓치는 것이다.

그러나 희망은 있다. 최신의 유전체학은 아프리카 소 품종의 유전적 조성을 밝히는 해결사가 될 것이다. 그래서 현지 여건에 가장 적합한 형질을 식별하고 해당 품종을 사육하여 더 많은 우유나 고기를 생산하도록 할 것이다. 국제축산연구소 (ILRI)와 농촌진흥청 (RDA), 아프리카 연합 산하 국제축산자원국 (AU-IBAR) 등 협력기관들은 급증하는 지식을 실질적으로 사용하기 위한 노력을 선도하고 있다. 국제축산연구소의 국내가축유전자원 정보시스템 (ILRI DAGRIS)은 향상된 품질의 동물을 소규모 축산업자에게 제공하기 위해 공공, 민간, 과학 분야의 협력 파트너들을 연계하는 LiveGene 프로그램과 에딘버러 대학교의 로슬린 연구소 (The Roslin Institute, University of Edinburgh)와 공동으로 열대 가축 유전학 및 보건 센터 (Center for Tropical Livestock Genetics and Health)를 운영하고 있다. 이와 같은 이니셔티브들은 농민과 목축업자들에게 과학의 혜택을 제공한다.

본 출판물은 국제축산연구소가 국내외 협력 파트너들과 이니셔티브를 강화하는 차원에서, KAFACI(한-아프리카 농식품기술협력협의체) 축산 프로그램의 지원 하에 아프리카 소의 고유 품종과 사육자 생계 간 지속적인 연계에 관련한 소중한 유산을 기념하기 위해 제작했다. 이와 같은 축산 연구와 자원은 더 나은 미래를 위한 국제 R&D 어젠다 향상에 기여할 것이다.

Kim Kyeongkyu, Administrator
Rural Development Administration, The Republic of Korea

This foreword was written by Jimmy Smith, director general of the International Livestock Research Institute, and translated into Korean for the Rural Developmental Administration of the Republic of Korea.



Foreword by ILRI

African cattle diversity

A precious heritage

The African continent is home to an extraordinary array of indigenous cattle—well over a hundred distinct breeds. As the small sample featured in this book demonstrates, they come in every shape, size and colour, from the miniature Lobi to the large-bodied Ethiopian Boran, the humpless N'Dama to the humped Red Fulani, the favoured white of the Kamba to the deep, dark red of the Ankole.

Why this diversity? The answer lies in the very diversity of the peoples and landscapes of Africa itself. Each unique breed is adapted to a particular environment, be it harsh semi-desert, acacia-dotted savannah or some other ecosystem; or to the requirements of the cattle keepers, whether for milk, meat, traction or even for some aesthetic attribute, such as the shape of the horns. The resulting diversity represents a living storehouse of precious genetic material that is becoming ever more important as modern methods of fighting animal diseases falter, the climate warms and markets change.

But this remarkable biological capital is under threat. The world's livestock genetic resources are disappearing at an alarming rate—every month, one breed of domestic livestock become extinct. Many of Africa's indigenous cattle breeds are at risk of suffering the same fate as market forces increasingly favour imported animals that promise greater yields of milk or meat but bring a narrow gene pool ill-suited to African production environments.

Each disappearance of an indigenous breed represents an irreversible loss of unique traits that may serve as vital insurance against future challenges, such as increasingly

frequent drought or new pests and diseases. It is also a missed opportunity for small-scale African livestock keepers to tap into expanding markets and transform their livelihoods.

Still, there is hope. The exciting new science of genomics is enabling us to unravel the genetic make-up of African cattle breeds and to identify, and breed for, those traits that are best suited to local conditions while also offering greater milk or meat production. ILRI and its partners, including the Rural Development Administration (RDA) of the Republic of Korea and the African Union's InterAfrican Bureau for Animal Resources (AU-IBAR), are in the vanguard of efforts to put this burgeoning store of knowledge to practical use. ILRI's Domestic Animal Genetic Resource Information System (DAGRIS), its LiveGene Program linking public, private and scientific partners to deliver improved animals to small-scale livestock keepers, and its new joint Centre for Tropical Livestock Genetics and Health with The Roslin Institute (University of Edinburgh) are a few examples of initiatives that can bring the benefits of science to farmers and pastoralists.

ILRI is working with its international and national partners to intensify its initiatives, and this publication is a testimonial to the precious heritage of indigenous African cattle. It highlights their enduring connection to the lives and livelihoods of their keepers, and the way livestock research and resources will help us to advance the global research and development agenda for a better future.

Jimmy Smith
Director General, ILRI

This foreword was written by Jimmy Smith, director general of the International Livestock Research Institute, and translated into Korean for the Rural Developmental Administration of the Republic of Korea.

The sturdy Red Fulani can produce milk, meat and manure for their keepers with only limited amounts of feed and water



Why diversity matters

An African mosaic of unique genetic resources

Tadelle Dessie and **Okeyo Mwai**, Livestock Genetics Program, ILRI

Genetic diversity is a critically important resource that provides the raw material for farmers and pastoralists to improve their livestock breeds and strengthen the adaptation of livestock populations to changing environments, as well as to shifting market demands. In short, genetic diversity provides an essential buffer to a changing world—and an unpredictable future.

For more than 10,000 years, human and natural selection have combined to produce thousands of genetically diverse breeds of domestic livestock, such as cattle, sheep, goats, chickens, camels, and buffaloes. Around the world, and in very diverse environments, people depend on these and other animals for food and a wide range of other products or activities that are central to their lives, including fuel, clothing, transportation, ploughing, decorative items, and ceremonial objects. In the developing world, livestock are often a mainstay of household livelihoods, particularly in areas where growing crops is limited or simply not possible.

In Africa, indigenous cattle breeds have had thousands of years to adapt to local conditions and stresses. They are hardy and resilient, with such features as thick skin to resist insect bites, short hairs that make it less habitable to parasites, strong

For more than 10,000 years, human and natural selection have combined to produce thousands of genetically diverse breeds of domestic livestock, such as cattle, sheep, goats, chickens, camels, and buffaloes.

legs and hooves that enable them to walk long distances to water and seasonal pastures, and a complex symbiosis with other organisms that makes African cattle more tolerant to diseases. Some are good swimmers, while others have developed a tolerance for insect pests, drought or debilitating diseases. Each in its own way, different breeds of indigenous African cattle produce milk and meat using relatively little in the way of inputs, and are thus able to more readily survive on limited and poor quality feed and water than their exotic counterparts.

The breeds of cattle featured in this book illustrate the extraordinary diversity of African cattle and the benefits that diversity bestows. The huge white horns of the Ankole dissipate heat and act as a cooling mechanism in hot climates. The hardy Ethiopian and Kenyan Boran, with its tough hooves, strong legs and light frame, can walk long distances and is well attuned to the migratory lifestyle of the Borana herders who keep them. The docile temperament and rich milk of the Kamba breed makes it an ideal part of the crop-livestock mixed farming economy of smallholders living in eastern Kenya. The Lobi, N'Dama and Sheko of West Africa, Central Africa, and Ethiopia, respectively, possess a hugely important trait—tolerance to a severe parasitic disease

(typanosomosis), a major threat to cattle production in the warm and humid parts of sub-Saharan Africa. And the sturdy Red and the White Fulani can produce milk, meat and manure under marginal conditions with long periods of limited feed and water.

Unfortunately, the future of these and other indigenous African cattle breeds is at risk. Populations of several remarkable breeds, including the iconic Ankole, are declining so rapidly that they could disappear entirely within a few decades unless urgently needed steps are taken to mitigate this downward trend.

The threats to indigenous cattle come from multiple sources. One of these is the shrinking or outright destruction of their natural habitat, caused by frequent droughts, human conflicts and competition for land resources.

The threats to indigenous cattle come from multiple sources. One of these is the shrinking or outright destruction of their natural habitat, caused by frequent droughts, human conflicts and competition for land resources. However, equally important is the risk that comes from the intensification and industrialisation of crop and livestock production. There is increasing demand for animals with particular traits, such as high milk or meat yields, to meet increasing demands for foods sourced from animals, as well as respond to shifting consumer tastes and preferences. The result of these



changes in demand are an increased desire for, and large-scale breeding of, a narrow selection of genetically improved yet less diverse exotic cattle breeds.

The Holstein-Friesian cow, originally from Germany and the Netherlands, is a prime example of an over emphasis on and use of limited diversity. While the breed dominates the global dairy industry because of its high milk yields, there is currently only a very small number of intensely selected breeding bulls which are being used around the world in artificial insemination programs. This is strongly

influencing the global dairy industry by heavily favouring production per cow over genetic diversity and resilience. Lured by their impressive yields—Holstein-Friesian cows produce 5-10 times the amount of milk per day compared to indigenous breeds—farmers in Africa are importing this and other exotic breeds without a full understanding of the implications. These newcomers are not well adapted to the local environments and cannot survive without special care. In fact, they often produce much less under local conditions. They are more fragile and expensive to raise than their indigenous counterparts,

The Holstein-Friesian cow, originally from Germany and the Netherlands, is a prime example of an over emphasis on and use of limited diversity.

Diversity is on the brink, and not just for African cattle. Their cousins and companions in pastures and barnyards around the world are also at risk.



requiring higher quality and a greater quantity of feed and water, more medical and preventive care, and improved housing to reduce the effects of extreme weather.

Indigenous cattle breeds are being pushed towards extinction as foreign breeds continue to be imported or crossed with local breeds in an effort to increase their resilience. The loss of indigenous breeds of course means the loss of their valuable and unique genetic traits. This is all the more alarming given that local climates, customs and consumer demands continue to evolve, and it is impossible to know with any certainty which traits may be needed in the future, including some that may be overlooked today—and soon lost forever.

Diversity is on the brink, and not just for indigenous African cattle. Their

Indigenous cattle breeds are being pushed towards extinction as foreign breeds continue to be imported or crossed with local ones in an effort to increase their resilience.

cousins and companions in pastures and barnyards around the world are also at risk, some even more severely. Every month, one rare breed of domestic livestock becomes extinct, as farmers import exotic high-yielding animals to replace their local ones. Overall, one in five indigenous livestock breeds is at risk of disappearing permanently, according to the Food and Agriculture Organization of the United Nations (FAO, 2007; 2015). The repercussions could be grave, and scientists warn that unless we act, we could be on the verge of one of the greatest extinction episodes of our planet's history.

With climate change, the genetic diversity contained in indigenous African cattle is more important than ever. Countries worldwide are experiencing increased rates





of drought, greater weather extremes, and threats from new pests and diseases. The overreliance on a few selected commercial breeds that are not well suited to such conditions is a potential recipe for disaster. Though they often give lower yields of livestock products, the hardy indigenous cattle of Africa provide something far more valuable—the underlying genetic architecture that is responsible for the traits and unique characteristics that have enabled them to survive this far, and to continue supporting all those people whose lives and livelihoods are intricately linked with what these animals provide.

All is not yet lost. The emerging genomic, reproductive and information technologies, if smartly harnessed, would

Though they often give lower yields of livestock products, the hardy indigenous cattle of Africa provide something far more valuable—they survive in harsh environments.

breathe new life into not only better understanding these unique genetic resources, but also the development of feasible management options for their improvement and conservation through better and more informed utilisation.

The search for new management options is being driven by a growing interest on the part of livestock keepers, researchers, development practitioners and policy makers in harnessing cattle biodiversity to improve production and food security, as well as environmental health. These noble goals, however, can only be achieved through continental and regional cooperation, specifically by formulating and implementing supportive policies, the details of which are described on page 18.

Why cattle matter

An enduring and essential bond

Olivier Hanotte, Livestock Genetics Program, ILRI, and the University of Nottingham (UK)

On a cattle ranch in the savannah grasslands of southern Uganda, an extraordinary spectacle unfolds. A hundred or more handsome Ankole cattle, dark red in colour and magnificently bedecked with great curving white horns, are gathered in a corral. A dozen muscular young men, stripped to the waist, are catching the cattle one by one by the horns, pitting their strength against that of the animals, subduing them into submission before releasing them one by one from the enclosure. But this is not a rodeo; they use the horns to lever back each cow's head, raising the mouth to accept a dose of deworming solution. It is an age-old ritual, a trial of strength, recreated in a present-day veterinary guise.

In a very different setting—the bushlands around Kitui, Kenya—Rael tends to her few small but hardy Kamba Zebu cattle. She is a widowed grandmother but derives strength from her membership in a community farmers' group, and from the cattle that provide for her everyday nutritional needs in the form of milk, as well as for her longer-term needs when the sale of a calf brings money for school fees or other expenditures. She is sorry to sell her cattle: 'They are very valuable to us, but now they give us something even more valuable—education for our children.'

The same strands weave through both diverse stories—the ancient bond between cattle and people in the continent of

Africa; the continuing social, cultural and economic importance of different breeds of cattle, within their own environmental settings; and the ongoing adaptation of the relationship between people and cattle to current circumstances, essential to the survival and development of unique breeds.

'Cattle did not arrive in Africa alone,' says Olivier Hanotte, livestock geneticist at the University of Nottingham (UK) and at the International Livestock Research Institute (ILRI Addis Ababa, Ethiopia). 'The introduction and expansion of cattle across Africa has been solely in the company of people, and it has mirrored their history and continued development.'

The details of that history have now become clearer with improved techniques of genetic analysis and the accumulation of a substantial body of data about the DNA of different cattle breeds. The most recent molecular evidence indicates that cattle were first domesticated in the Middle East around 10,000 years ago, and early pastoralists brought domesticated cattle with them to Africa some 2,000 years later as they migrated westward and southward. These were 'taurine' or humpless cattle (*Bos taurus taurus*). As they spread across Africa with the migratory movements of herders, they may have interbred with the now extinct wild African cattle called aurochs. Such interbreeding, combined with the effects of genetic drift and selection, has led to a unique African

A warrior with head plumes and spear, depicted with three decorated cattle, Kozen, eastern Tibesti, Chad. c 5000/6000 years old

'Cattle did not arrive in Africa alone. The introduction and expansion of cattle across Africa has been solely in the company of people, and it has mirrored their history and continued development.'

Olivier Hanotte, *livestock geneticist, Livestock Genetics Program, ILRI, and the University of Nottingham (UK)*





cattle taurine species, which is different from its European cousins. For several thousand years, African taurine were the masters of the African cattle pastoralism landscape. But today, the only remaining descendants of these unique indigenous African taurine cattle are the West African breeds (for example the N'Dama, Lobi/Baoulé and Lagune species), the Kuri of Lake Chad, and the Sheko of Ethiopia.

Newcomers proved to be more adapted to the already changing climatic conditions of the continent. Amongst the new breeds were the humped zebu or 'indicine' cattle (*Bos taurus indicus*), which came from the north of the Indian subcontinent, in particular the Indus valley. The first wave arrived in the second millennium BCE, and they were initially more of a morphological curiosity than anything

else, impressive for their larger size, their humps and their dewlaps. Then, a major wave of zebu arrived about the 7th century CE, thanks to migration of people of Arab descent along the East Coast of Africa. These Zebu crossed with local taurine cattle and that led to the origin of the unique African 'Sanga' cattle, exemplified by the Ankole breed from Uganda and the Southern Africa indigenous Nguni cattle, which display an extraordinary diversity of coat colours and patterns. Today there are no pure-blooded zebu on the African continent; all contain a proportion of African taurine, with increasing evidence that this mix may have been at least partly the result of natural selection under African environmental conditions.

Like the African taurine, African zebu are unique to the continent. The southward

movement of cattle pastoralism followed the migration of Bantu-speaking people, coupled with cattle trading and cultural exchanges between different ethnic groups; as attested to by the cattle of the Southern Africa Khoikhoi communities. The inland westward dispersal of the zebu may have been favoured by their adaptation to hot dry climates. This movement followed the migration of pastoralists, such as the Fulani along the Sahelian belt.

The African cattle landscape was again remodelled following the rinderpest virus epidemics of the 19th and early 20th centuries, which led to the disappearance of nearly all East African taurine, with the exception of the Ethiopian Sheko. However, the Sheko is experiencing heavy crossbreeding with local zebu, putting it at risk of extinction. If that



happens, East Africa will lose its unique remaining trypanotolerant taurine breed.

Last but not least, across the continent—and with mixed success—African cattle are being crossbred with modern exotic breeds, in particular with dairy cattle such as the Holstein-Friesian and Jersey breeds.

The story of African cattle is a continuing one, and we must ensure they remain a vital part of the African landscape. They constitute a unique part of human history on the African continent. Ancient rock paintings and carvings illustrate the close, age-old relationship between humans and cattle in Africa. Rock art images in the Tadrart Acacus of the Libyan Sahara date between 5,000 and 8,000 years ago and depict early pastoral life with tall elegant people and beautifully

Two people walking with cows, Tassili n'Ajjer, Algeria, 6000 years ago.

The enduring connection between humans and cattle has allowed both to survive in areas where agricultural resources are scarce or absent, including the vast arid and semi-arid regions of the continent.

drawn cattle, including scenes of milking and cows with full udders. The artistic excellence of the images also attests to the respect and affection in which the animals were held. The 7,500-year-old 'crying cow' images at Tassili-n'Ajjer, Algeria, are stunning in their sophistication, the emotion they express and the way the cows seem to emerge horns first from the rock face. In ancient Egyptian tombs, cattle are depicted both in their everyday activities and venerated as gods.

The enduring connection between humans and cattle has allowed both to survive in areas where agricultural resources are scarce or absent, including the vast arid and semi-arid regions of the continent. For many African cattle farmers and pastoralists, most of that which matters is associated with their cattle. The milk,

meat and blood provide food and a source of income. Hides, horns and hoofs are used for multiple purposes, including clothing and mats, tools and instruments, and accessories and ceremonial objects. The manure serves as fertilizer, fuel and a building material. And cattle are often the only source of traction, other than people, for pulling ploughs or other heavy loads.

Beyond their practical benefits, cattle also play an essential role in the culture and connections among their herders. They are central to many ceremonies and ways of marking major life events among cattle-keeping communities across the continent. Cattle are exchanged as a bride price, given in celebration of births, and are often a key element in events marking the coming of age into adulthood. In many cases, a wedding or funeral is

not considered complete until one or several cattle have been slaughtered.

There are songs, myths and dances about cattle. Competitions and feats of daring involve catching, jumping on, or grabbing cattle literally by the horns. Major festivals celebrate cattle river crossings, and cattle raiding is an ageless practice for building wealth and asserting power. In pastoralist cultures such as the Dinka, Maasai, Hamar, Geleb and Fulani, cattle also represent an important link to the spiritual world, and creation myths include images of cattle emerging from water or the heavens as a divine gift.

Cattle are often the most valuable asset a family owns, and they are referred to as standing wealth. They serve as both a type of currency and a measure of

Decorated cattle in camp with finely dressed woman and artefacts. 6500 yrs old

Major festivals celebrate cattle river crossings, and cattle raiding is an ageless practice for building wealth and asserting power.

Cattle herd, a big bull and a herder, Tibesti region, northern Chad, 5000/6000 yrs ago





social prestige. The animals represent a form of long-term insurance, providing an asset to be sold, traded or borrowed against in times of necessity. Cattle are exchanged to bind families or to compensate for crimes and losses.

Beyond their importance to their owners, cattle also represent a key economic asset in terms of national export revenues and domestic trade. In Kenya, cow's milk alone has a gross annual value nearing USD 3 billion. In Niger, the livestock sector, including cattle, is second only to uranium as a source of export revenue. In Chad, pastoral livestock account for 18% of gross domestic product and 30% of export revenues. In arid and semi-arid lands, cattle herding is a primary source of employment and earnings.

There is an African proverb that says: 'If the herds die, then the people will die, too.' The point has been driven home during recent periods of extreme drought in the Horn of Africa, which have decimated cattle numbers and cost hundreds of thousands of human lives. In the face of current trends—shifting weather patterns, the need to produce more food on less land, and the search for balancing development with climate-smart strategies—cattle will continue to play their part. They are an important source of dietary protein and natural fertilizer. Their traction is a renewable energy source, as is the fuel generated from their manure. Cattle also contribute to more efficient use of environmental resources through controlled grazing, which promotes grass growth and soil fertility. In many

dryland areas, pastoral cattle herding will continue simply because other viable land use alternatives do not exist.

And what of the future? As the anecdotes at the start of this chapter show, it is important to retain the ancient link in Africa between cattle, people and their environment while adapting it to modern circumstances. The close interdependence of people and cattle has benefited both species for millennia. Efforts to boost cattle yields, safeguard their diversity, and adapt production systems to shifting demands should take account not only of the economic benefits to communities and countries, but also the sociocultural and environmental benefits generated by maintaining healthy and diverse cattle stock.

Why science matters

African cattle in the genomic century

Steve Kemp, Livestock Genetics Program, ILRI

It is clear that the rich diversity of Africa's indigenous cattle must be protected, but what exactly do we mean by diversity, and how do we safeguard it? After all, every animal is unique, so how can a rational strategy be developed that efficiently, effectively and usefully minimises the loss of irreplaceable livestock resources? Improving the genetic background of cattle almost inevitably implies a narrowing of the genetic base and a loss of diversity. This is most dramatically seen when genetically diverse and well-adapted African breeds are diluted by crossing them with homogenous 'exotic' breeds that may dramatically improve productivity under the right circumstances; the crossbreeds might be more productive, but they are often poorly adapted to Africa's harsher environments. Even selective breeding for improved performance within the existing African cattle gene pool results in changes to the genetic base that some scientists consider undesirable.

So, we have a dilemma. African farmers are working to improve their productivity and profitability and should have the option of using more productive livestock breeds, even if they have a less diverse genetic background. But who then will be the custodians of diversity? We believe that Africa must take responsibility for understanding and safeguarding the diversity of her unique indigenous livestock, but at the same time we must support the right of African farmers to

African farmers are working to improve their productivity and profitability and should have the option of using more productive livestock breeds, even if they have a less diverse genetic background. But who then will be the custodians of diversity?

be as productive and profitable as they can. We at ILRI see a role for genomic science in achieving both these ends. From our perspective, the community of African scientists and policy-makers is well equipped to balance these apparently conflicting needs in ways that support African farmers while maintaining globally important livestock diversity.

The way to resolve the tension between conservation and development is to use each to support the goals of the other. But what is the goal of conservation? Most would agree that it is more than simply maintaining overall total diversity and would expect that particular useful combinations of traits be conserved in breeds or populations ('ecotypes'). The indigenous cattle that survive in very specific niches on the continent have evolved unique combinations of attributes in response to a mix of human and environmental pressures. Their characteristics depend on complex combinations of adaptations, each of which may carry with it the key to understanding the biology of a particular phenomenon.

Faced with a complex combination of extreme differences in genetic backgrounds, a wide range of selective pressures at work, and the reality of genetic erosion (loss of diversity), African scientists must act quickly to save as much as possible of the existing livestock diversity. At the same time, we must



On the acacia-dotted high grassy plains of Laikipia County in Kenya, an Improved Boran bull grazes alongside zebra and other herbivores

Our task is to bring to bear the latest tools that we have today and to ensure that as much data as possible, as well as genetic material (in living animals or preserved in various ways), is available for future use.



document the practical advantages that particular combinations of traits confer. This will enable future scientists to continue mining the rich genetic diversity of African cattle to achieve additional gains in productivity. Our task is to bring to bear the latest tools that we have today and to ensure that as much data as possible, as well as genetic material (in living animals or preserved in various ways), is available for future use. This requires systematically recording a breed's performance under a range of conditions together with preservation of genetic information;

which might be through preservation of live animals, or cryo-preserved gametes, or even as pure data in a computer.

Advances in science are allowing us to explore variations in gene sequences (the order in which specific genes are arranged) and to begin to understand their role in complex networks of gene interactions. Morris Agaba and his colleagues pioneered this approach during his time at ILRI when they compared the genome sequences of the giraffe with that of its closest relative, the okapi (also known as a forest

giraffe or a zebra giraffe). They did this in order to understand the origins of the giraffe's impressive stature and how its cardiovascular system was able to evolve such that it could meet the animal's needs. Subsequent studies building on this approach have identified groups of genetic variations in African cattle that are associated with their adaptation to tropical environments. An exponential increase in the speed and power of such methods is expected as we build informatics systems and data resources that are capable of identifying and comparing gene networks.





In parallel with steady improvements in our ability to understand genomes, advances in reproductive technology are being made that offer better ways of preserving and distributing individual animals of interest. For example, genome editing is becoming a routine laboratory tool and when we reach the stage of being able to make hundreds or even thousands of edits in a single cell, the idea of recreating indigenous breeds by modifying a 'base' breed using only information stored in a computer will become a reality. Equally important, of course, is that such approaches hold the

Nguni Cattle. An ancient race of indigenous African cattle much admired for their uniquely patterned hides and hardy physical attributes

Ironically, the information that is still the hardest to obtain for any given animal remains its phenotype.

promise of producing 'designer' breeds with unique combinations of genetic variations that we understand because we have seen them functioning in animals with desirable traits. Reproductive technologies also provide means of speeding-up the distribution of desirable genetics using a variety of methodologies, including the engineered surrogate male and female parents that host foreign sperm or ova. Such methods have already been demonstrated in poultry and pigs.

Ironically, the information that is still the hardest to obtain for any given



animal remains its phenotype. Even the word phenotype is difficult to define. To a geneticist it implies everything about an animal that is not genetically determined and of course that involves interactions between the physical and biological environment, which are in turn influenced by economic, management and social factors. If we are to understand the subtle effects of a particular genetic variation, we must be very careful to fairly compare the phenotypes produced by different variations of a particular genetic sequence. This is easy to do for crop scientists who can plant hundreds

of genetically identical seedlings side-by-side and watch what they grow into, but it's very difficult to do in livestock research. A promising alternative to doing traditional experimental comparisons is to accumulate large bodies of data, and use them to predict such characteristics as tolerance to extreme temperatures, disease susceptibility, market demand and many others. Such 'big data' approaches are now common in other fields, and as these tools improve, we can expect to see richer and more subtle measures of phenotype becoming available to characterize different breeds.

Thus, the combination of genome sequencing, reproductive technologies, genome editing, genome network analysis, and phenomics (the systematic study of phenotypes) come together to provide a toolbox of methods for characterising, using and conserving livestock diversity. Importantly, these methods are readily available to and easily used by modest research facilities, which allows multiple small-scale and highly distributed national conservation centres to own, manage and make the best use of their livestock genetic resources.

Why policy and institutions matter for AnGR in Africa

N'Guetta Bosso, Animal Genetic Resources Project, AU-IBAR

and

Simplice Nouala, Head of Agriculture and Food Security Division of the Department
of Rural Economy and Agriculture of the African Union Commission (AUC)

Farm animal genetic diversity is declining across Africa as foreign exotic breeds, valued for their high productivity, are imported by livestock keepers. This is a major concern to policy-makers and government institutions, and rightly so given the importance of livestock to African economies and cultures, and by extension, to its political stability.

African countries clearly recognize the challenges they face in conserving and effectively managing animal genetic resources. Most African nations have signed on to important, multiparty legal frameworks governing the conservation and use of animal genetic resources. These include the FAO Global Plan of Action for Animal Genetic Resources (2007), and the UN Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (2010). These two frameworks serve many African countries as their primary strategy and protocol for ensuring the conservation and equitable and sustainable utilisation of the continent's rich reservoir of animal genetic diversity.

Africa's farm animal genetic resources are an integral part of the continent's broader agricultural sector. Their management is therefore also guided by the vision and aspirations of the

African countries clearly recognize the challenges they face in conserving and effectively managing animal genetic resources. Most African nations have signed on to important, multiparty legal frameworks governing the conservation and use of animal genetic resources.

accelerated African agricultural growth and transformation agenda laid out in the 2014 Malabo Declaration. This historic declaration set forth a new set of agreed goals that entail a more targeted and collaborative approach to achieving shared prosperity and improved livelihoods.

The management of animal genetic resources is also guided by the results framework of the African Union's Comprehensive Africa Agriculture Development Programme (CAADP), which strives to help individual countries and Regional Economic Communities (RECs) as they formulate agricultural investment priorities. Additional guidance is drawn from the AU's Agenda 2063, a 50-year strategy for the African continent in all spheres of social and economic development, including the conservation and use of animal genetic resources. And of course, policies affecting animal genetic resources are also very much aligned with the AU-IBAR Livestock Development Strategy for Africa 2015-2035, which provides an opportunity to build consensus, mobilize stakeholders and establish strong partnerships to drive the sector in Africa.

In Africa, most of the policies affecting animal genetic resources are embedded within and under the purview of agriculture



or livestock ministries. This tends to obscure the importance of these resources to effective livestock production and, because this 'nesting' limits cross-ministry coordination and policy harmonisation, it is a key impediment to the development and conservation of genetic diversity.

Policy-makers recognise the importance of local animal genetic resources to scaling up farm production and incomes, as well as to ensuring resilience to climate and disease risks. But policy and legislative reforms are needed that both address the dynamics shaping the livestock sector and deal with an increasingly complex set of emerging issues. An effective animal genetic resources policy is one that promotes the active participation of the rural population, and promotes greater awareness and understanding of the inherent value of

conserving animal genetic resources. An effective policy will also embrace the complementary roles of exotic and indigenous animal genetic resources, mainstream them, support knowledge exchange and relevant research on them, and promote awareness of new scientific developments that impact diversity.

African countries have inventoried and analysed policies and strategies related to animal genetic resources, and have identified key issues relating to crossbreeding, livestock movement across national borders, and selection and breeding programs that help with formulating policies and legislative frameworks. They have also examined the implementation of the Nagoya Protocol, specifically the access and benefit-sharing measures for animal genetic resources, within and across countries in Africa.

Ensuring the sustainable conservation and use of genetic resources requires long-term and potentially fundamental transformations. This is why institutions and public investment are central to animal genetic resources development. The challenge in Africa is that many institutions that fulfil key functions of managing such resources are weak, mainly because of the long-term nature of the public investments required to build sustainable diversity. Many African countries lack these institutions altogether. The development of strong institutions that will plan and implement strategic approaches to the use, development and conservation of animal genetic resources is critical, as is the need to explore potential partnerships with private sector entities, both small and large, that encourage coordination in priority setting and incentives for public/private investments in the livestock sector.



The lack of trained personnel, both in terms of numbers and in skills, needed to address animal genetic resources management is also a major impediment to the development and implementation of appropriate policies, strategies, programs and projects. Research in all aspects of managing genetic resources needs to be strengthened. A key institutional requirement is to build and maintain networks for linking stakeholders and supporting institutional development and capacity building.

African countries have established five regional gene banks to acquire, evaluate, preserve, and provide national collections of animal genetic resources in order to secure the biological diversity that underpins a sustainable African agricultural economy. These banks are located at the Department of Agricultural

Research in Botswana; the National Genebank of Tunisia; University of Dschang, Cameroon; CIRDES in Burkina Faso; and the National Animal Genetic Resource Centre and Databank (NAGRC & DB), in Entebbe, Uganda. The African Union has provided support to selected countries to establish and implement their National Action Plans for animal genetic resources and to strengthen their national breeding and conservation strategies.

As a part of the AU-IBAR Livestock Development Strategy, five Sub-Regional Focal Points for the management of animal genetic resources were established. Each focal point is housed by its corresponding sub-regional organization in West, Central, East, North, and Southern Africa. The focal points aim to build capacity, generate synergies, build partnerships and strengthen

communication platforms for the management of animal genetic resources.

A unique and deeply diverse pool of animal genetic resources exists in Africa, and efforts are under way to conserve it and abide by international frameworks and agreements. At the same time, policies and strategies should explicitly recognize that in some settings and production systems, imported exotic livestock may have an important role to play. Still, gaps remain in existing policies and strategies, as well as our knowledge about the extent and depth of the African cattle gene pool. Most of the institutions needed to fill those gaps have been created, and they must now support and build on existing initiatives for the conservation, management, and sustainable utilisation of Africa's incredibly valuable animal genetic resources.



Why information matters

The status of information on Africa's animal genetic resources

Mary Mbole-Kariuki, Animal Genetic Resources Project, AU-IBAR

The African continent is endowed with a rich and diverse animal genetic resource base. However, poor articulation of the unique value of these resources and a lack of reliable information about them have resulted in the loss of important animal genes, genetic erosion, and dilution of breeds indigenous to the African continent. Millions of resource-poor farmers, pastoralists and agro-pastoralists—the custodians of much of the continent's livestock wealth—lack the information and skills needed to harness Africa's diverse animal genetic resources for livestock development, increased food security and higher incomes.

Poor documentation of the primary threats to Africa's animal genetic resources, such as rampant and indiscriminate crossbreeding, has resulted in considerable erosion of the genetic base across the continent. Breeds such as the Muturu (West Africa), Sheko (East Africa) and Nguni cattle (Southern Africa) among others remain threatened.

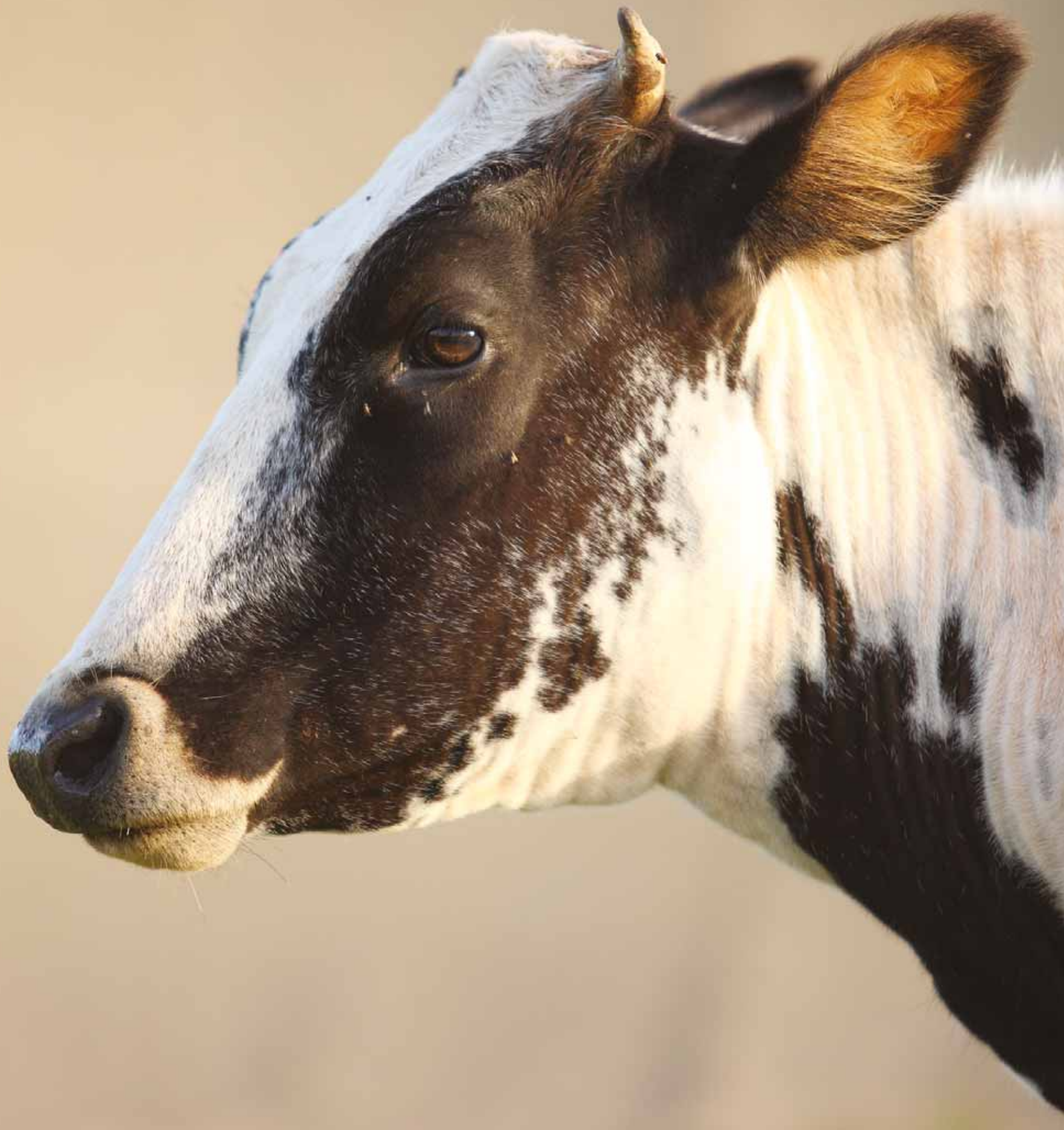
Access to vital information provides the necessary catalyst to formulate appropriate policies, strategies and legislation that will ensure the wellbeing of Africa's animal genetic resources and ensure adequate and well-coordinated allocation of public and private investments. Useful information in the hands of many is indeed a game changer.

Access to vital information provides the necessary catalyst to formulate appropriate policies, strategies and legislation that will ensure the wellbeing of Africa's animal genetic resources and ensure adequate and well-coordinated allocation of public and private investments.

A breath of fresh air

In order to comprehensively capture information on indigenous African livestock and increase access to such information, the African Union Inter-African Bureau for Animal Resources (AU-IBAR) working with experts from the African Union member countries developed a harmonized Animal Resources Genetic Characterization, Inventory and Monitoring (AnGR-CIM) tool for Africa—<http://www.au-ibar.org/training-manuals-and-tools>. The tool is a comprehensive paperless data capture type and a first of its kind in Africa. A key characteristic of the AnGR-CIM tool is its ability to provide information about non-conventional animal genetic resources, such as the cane grasscutter and the guinea pig, a first for Africa. These are economically important resources in some regions of Africa.

The tool also captures the associated indigenous knowledge about these livestock and their related production systems. The robust tool records vast amounts of data on farmers' (especially women) socio-economic status, breed production and productivity, animal husbandry practices and environmental parameters. In addition, the AnGR-CIM tool allows in-depth phenotypic and morphometric characterization of thirteen (13) animal species (including fish species) and is supported by well-illustrated pictorial field manual guides. This tool





When the music changes, so does the dance. *African Proverb*

provides a much-needed platform for succinct and harmonized descriptions of Africa's animal genetic resource diversity.

The other critical sets of information that are needed are on individual and herd performance for the economically important traits such as milk yield, milk composition, growth rate, carcass quality and feed conversion efficiency. This information should be continuously captured through herd performance recording and is used for genetic evaluation and consequently ranking of selected individual animals to pass on the

desire genes to future generations. The lack of comprehensive herd recording has adversely affected commercial competitiveness and popularity of African AnGR except for a few cattle breeds such as the Kenya Boran, the Nguni and Tuli of Southern Africa.

It is evident that the lack of critical information has affected efficient implementation of long-term selection programs in Africa. Herd recording is a long-term activity and African governments need to increase support for farmers and breed societies to undertake herd recording of key indigenous breeds; otherwise these breeds will remain uncompetitive and increasingly threatened by exotic breeds.

A conscious push towards availing operational data capture and collection hubs will ultimately provide vital information to guide the management, conservation and utilization of Africa's precious animal genetic resources.

African Animal Genetic Resources Information System, the information hub

AU-IBAR, with the overall objective to enhance the information and knowledge management capacity of Member States and Regional Economic Communities, has established the Animal Resources Information System (ARIS). This system provides information on animal health, trade and marketing and animal production issues across the continent. In accordance with its mandate and desire to bridge



gaps in information and data on Africa's animal genetic resources between key stakeholders, policymakers, Member States and worldwide audiences, AU-IBAR also developed the African Animal Genetic Resources Information System (AAGRIS) <http://aagris.au-aris.org/> as a module within ARIS.

This information hub functions as a 'one-stop shop' where end users can obtain relevant information aimed at increasing their knowledge on animal genetics resources as well as providing a robust evidence resource for policy makers and other decision makers. It will offer a platform to raise awareness and promote best practices in the conservation, utilization and management of AnGR and propagate a strong technical network for African animal production experts.

"if you talk to a man in a language he understands, that goes to his head, but if you talk to him in his language, that goes to his heart".

Nelson Mandela, *Africa's greatest statesman*

AAGRIS will further complement other well-established information systems such as Domestic Animal Diversity Information System (DAD-IS) and Domestic Animal Genetic Resources Information System (DAGRIS). These information systems also offer a rich resource of information on animal genetic resources in Africa and the world such as breed diversity, population status, origin and geographical distribution of breeds, amongst others. The amalgamation of these existing information systems will catapult Africa to greater heights in terms of promoting communication and cross-pollination of ideas, formulation of strategies and frameworks related to sustainable utilization, conservation and management of animal genetic resources in Africa and beyond.

As the world evolves technologically, Africa must continue with its quest to bridge the digital divide and adopt a vibrant virtual approach for information collection, collation and dissemination. This will ultimately provide a robust information and knowledge base and will help ensure that relevant information is shared as widely and as fast as possible. To improve information dissemination, a deliberate move must be made towards producing information in more 'palatable' forms so as to reach a wider audience. As Africa's great statesman, Nelson Mandela, said "if you talk to a man in a language he understands, that goes to his head, but if you talk to him in his language, that goes to his heart". This is key to the successful dissemination and effective use of information about Africa's animal genetic resources.



*The daily trek to find pasture
is taking the herders and cattle
further into the distant hills*





Ankole

Burundi, Rwanda, Tanzania, Uganda
and the Democratic Republic of the Congo

Ankole

Few breeds of cattle take your breath away as the Ankole do, with their majestic, sweeping horns and attractive dark colours. To the Bahima people of southwestern Uganda, they are a source of pride and affection as much as a source of livelihood. But despite their iconic status, the breed is threatened with extinction as commercial pressures impinge on traditional lifestyles and farming patterns.

The cattle themselves are truly striking. It is the huge horns, sloping outwards and upwards in a graceful curve, that first catch the eye—gleaming white is favoured by the herders, not just for their attractiveness but for their ability to deflect light and act as cooling towers during the heat of the day. The horns are not as heavy as

they look, as they have an internal lattice structure that assists blood circulation and enhances their function as a natural thermostat. The cattle themselves are generally dark in colour, with deep, dark red being particularly prized.

Myth and reality are intertwined in the history of the Bahima and their cattle. According to legend, the progenitor of the Banyankole—the people of the ancient Ankole kingdom—was Ruhanga, the 'creator', who had three sons. The descendants of those sons became the three main branches of Banyankole

society—cattle keepers, agriculturalists, and the rulers of the land. The pastoralist son, Kahima, was the forefather of the Bahima people. The distinctive Ankole breed, so the story goes, was the offspring of the native cow and a small, red, short-horned bull brought from the east by the Bahaya people.

The true history of the Ankole breed is almost as obscure as the myth. The original cattle were brought to southwestern Uganda by Hamitic tribes migrating from northeastern Africa and the Sahel centuries ago. One theory states that the original Ankole cattle evolved in and around the Ethiopian Highlands, while another theory argues that they evolved in present-day Uganda.





The classic Ankole cow—dark red in colour, impressive white horns, small hump and medium dewlap

The distinctive Ankole breed, so the story goes, was the offspring of the native cow and a small, red, short-horned bull brought from the east by the Bahaya people.

BREED: ANKOLE

Location: Two main areas, separated by tsetse-infested territory: The northeastern parts of the Democratic Republic of the Congo and southwestern Uganda; and southern Uganda, Burundi, Rwanda and the northern parts of the United Republic of Tanzania.

Origin: The Ankole breeds originated in northeastern Africa. It is part of the Sanga group of cattle that evolved from interbreeding of longhorn, shorthorn and zebu-type cattle.

Description: Large to medium in body size, and with immense horns. The Ankole has a small hump and a moderately developed dewlap. Coat colour is mainly dark red and light brown; some are black, grey, dun white and pied (pigmented spots on a white background).





*The distinctive white horns of
the Ankole easily signal their
presence in the rolling, bushed
landscape below Rwakobo Rock
on the edge of Lake Mbuoro
National Park, Uganda*



A threatened species

Traditional cattle keeping versus the new 'milkeconomics'

Visible for miles around, the new milk plant at Akaget, in Kiruhura District, Uganda, is a tangible symbol of the new marketing forces that are threatening the survival of the indigenous cattle breeds like the Ankole. The plant will process two million litres of milk per year, and cattle farmers throughout the area are modifying their systems to meet the demand—crossing the native Ankole with exotic breeds, especially Friesians, for a higher-yielding cow, and replacing bushland grazing with improved pastures. In addition, population growth is reducing available pastures, further encouraging a move towards smaller, more productive herds that require less grazing land.

But the new farming economy has its potential pitfalls. While the cross-breeds, especially

crosses with high levels of exotic genetics, are more productive and generate more income, they are not as well attuned to the environment here as are the indigenous Ankole. They require more drugs to counteract disease, they become stressed on very warm days, they tire easily when walking any distance, and they are susceptible to blinding from sharp thorns. In short, they cost more to maintain. The sturdy Ankole, on the other hand, are renowned for their hardiness—they can graze on poor vegetation and use their large horns to negotiate safe passage through the threatening patches of thorny bushes. The Ankole can endure droughts and walk miles to get to water and grazing pastures.

The Ankole, over centuries, have been an essential part of the economic, cultural and social fabric of the Bahima people. That special relationship, and indeed the very existence of the breed, is under severe threat as farmers bow to market forces that favour the cross-breeds.

Eric Kanyoga individually doses hundreds of cows with a deworming solution

CATTLE DRENCHING, COWBOY STYLE A THOROUGHLY MODERN RITUAL

Now that the rainy season is drawing to a close, Eric Kanyoga's 400 Ankole cattle are ready to be 'drenched' with albendazole, a deworming medicine. The process is simple—gather the cattle into a fenced enclosure or 'crush', channel them one by one through a narrow funnel, propel the dose down their throats using a large syringe, and release them. But that is far too easy for Eric's team, who strip to the waist and catch every single animal individually over the course of several hours, using the horns to lever their heads back in readiness for Eric's dose before allowing the animal out to re-join its treated companions. This modern rite of passage is exhilarating, exhausting, challenging and competitive as the 'cowhands' vie with each other for bragging rights in this true test of their manhood. Any cattle that escape back to the herd before being dosed are pursued pell-mell and herded back to the crush. Identifying them among the milling herd of 400 is not a problem—the herders, using a combination of colour, hide pattern, and horn and body shape, recognize every single one by name.





A battle of strength and wills—muscles rippling, a herder attempts to subdue an unwilling cow in the crush



In an intimate moment, a herder levers back a cow's head in readiness for the squirt of medicine down its throat

The key to preservation Environment or culture?

The Ankole group of cattle breeds is being driven to the brink of extinction by cross-breeding with imported 'exotic' breeds as a consequence of inexorable commercial forces. What can save the Ankole?

The Cow Protection Conservancy Uganda (CPCU) sees the environment as the key. Nasasira Livingstone, director of CPCU and an impassioned advocate of the Ankole, warns that the removal of the bush habitat to make room for cross-breeds will cause irreversible ecological devastation and loss of biodiversity. Raised in a herding family, he does not eat meat: 'I drink cow's milk, why should I want to eat the cow? I took my mother's milk; as a baby and had no desire to eat my mother!' Strolling through the Ankole grazing lands, he points to traditional plants and fruits that are gradually

'I drink cow's milk; why should I want to eat the cow? I took my mother's milk as a baby and had no desire to eat my mother!'

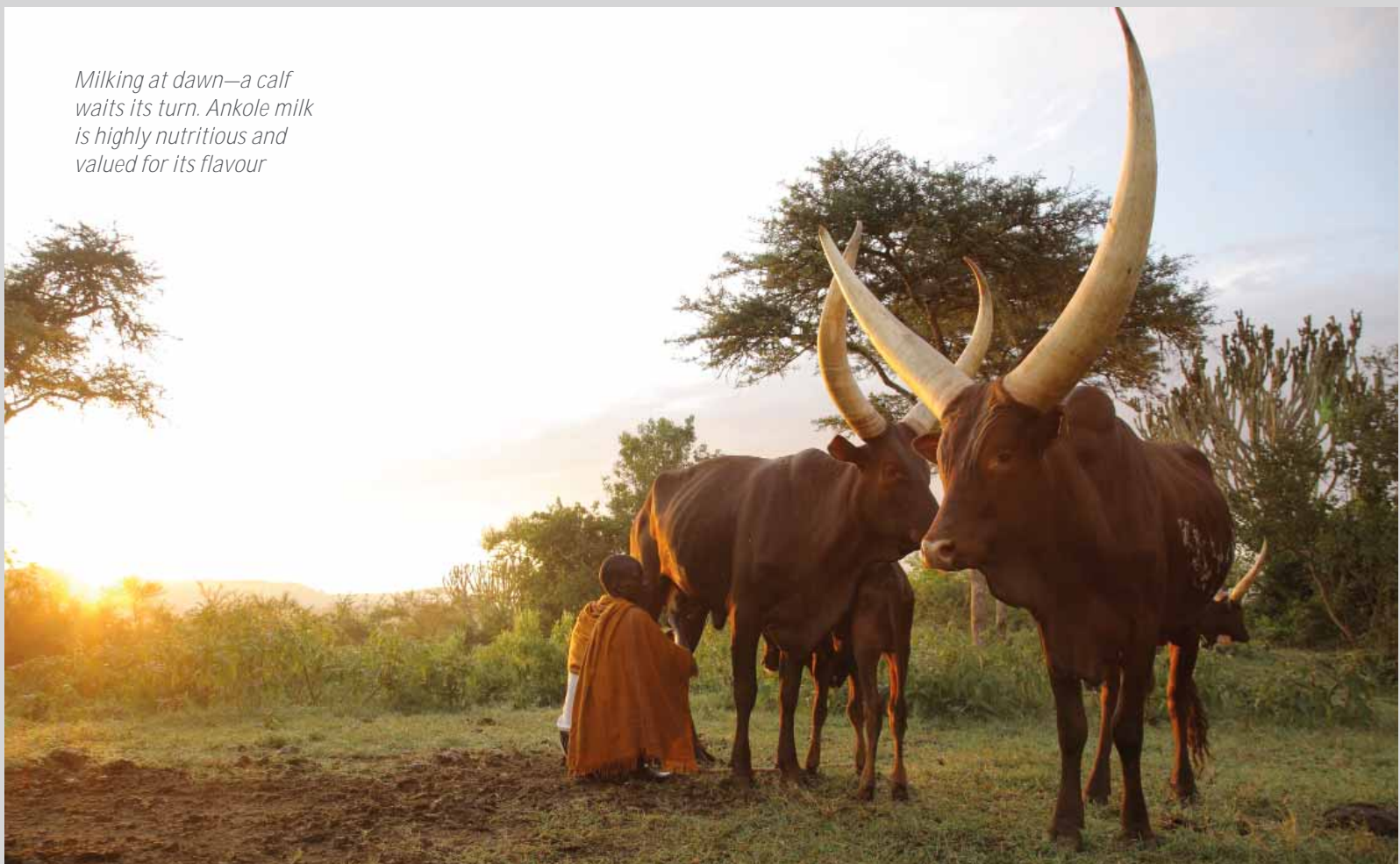
Nasasira Livingstone,
*director, the Cow Protection
Conservancy Uganda*

vanishing as varied and rich bush is replaced by monotonous grasslands. Indigenous knowledge, along with the cultural traditions associated with cattle keeping, is irrevocably being lost.

The Ankole Cow Conservation Association adopts a more cultural approach. Traditional-style houses are being constructed at the association's centre on the fringe of Lake Mburo National Park, where an impressive herd of 40 pure-bred Ankole are based, and an ecotourism lodge is planned for the site. The cattle share the lush, acacia-dotted grassland with zebra, eland, impala and other herbivores. Here, the Ankole have their rightful, traditional place as an integral part of the cultural and ecological landscape.

The approaches are not mutually exclusive but form part of a wider advocacy process whereby lobbyists for the Ankole highlight the sociocultural and economic value of the breed and its important role in environmental conservation.

Milking at dawn—a calf waits its turn. Ankole milk is highly nutritious and valued for its flavour



Horns gleaming, a line of Ankole cows head homeward after a day grazing in the bush





Kamba

Kenya

Kamba

The docile temperament and graceful demeanour of the Kamba cattle belie their strength, hardiness and ability to cope with semi-arid conditions. These cattle are a mainstay of the mixed crop-livestock dryland farming economy in southeastern Kenya, where the Kamba people, after whom the breed is named, farm a patchwork of tidy plots on the dusty plains and hills of the Ukambani region. The Kamba farmers tend small numbers of cattle alongside goats and chickens and grow maize, beans and other crops in a landscape of dry red soils and gaunt baobab trees.

Kamba cattle are much beloved in the farming community for their even-tempered yet robust character. They provide the muscle power to plough the fields and produce creamy, flavourful milk that is a mainstay of the Kamba diet, including the yoghurt-like fermented milk that the children like so much.

‘Our Kamba cattle are an integral part of the farm landscape, offering not only food, income, and labour, but also beauty. A Kamba farm without its Kamba cow is a sad place indeed.’

Benjamin Kwinga, *farmer and community leader*

A well-tended Kamba cow produces about two litres of milk per day—enough to meet a family’s daily needs and provide some surplus that can be sold for extra income.

‘Our Kamba cattle are an integral part of the farm landscape, offering not only food, income, and labour, but also beauty,’ says farmer and community leader Benjamin Kwinga. ‘A Kamba farm without its Kamba cow is a sad place indeed.’



BREED: KAMBA

Also known as Akamba.

Location: Kept by the Kamba people in southeastern Kenya.

Origin: Descended from the *Bos indicus* (humped) cattle that were introduced along the eastern coast of Africa by Indian and Arab merchants some 2,000 years ago. Kamba cattle are part of the small-statured cattle stock that spread widely across east Africa following the rinderpest cattle plague of the early 20th century, which wiped out the then dominant Sanga populations.

Description: Small to medium build, short horned with a large, pyramid-shaped hump; the coat colour is often plain white or black, sometimes with a patchy pattern. Kamba cattle are gentle in nature and are used for milk, meat and traction.





Kamba cattle play an essential role in the culture, livelihoods, and farming system of the Kamba people

A primary part of the Kamba diet is the creamy nutritious milk from Kamba cows





*As men have moved to town
in search of work, women
like Rael have taken over
managing the farms*

THE FEMALE FACE OF AGRICULTURE

Rael is a lively grandmother, with a quick smile and a sparkle in her eye. Widowed since 2009, she takes care of her small subsistence farm while the men of the family earn a livelihood in town. She lives with her married daughters, several grandchildren, and an adopted teenage son who helps care for the livestock.

Though farming households headed by women are usually poorer than those headed by men, Rael is better off now than she was when her husband was alive. 'This one has given me a calf every year,' she says, proudly pointing to the Kamba cow she purchased several years ago. Along with the income from her surplus

milk, honey and produce, the sale of her calves has allowed Rael to pay the school fees for her adopted son and grandchildren. Still, she is sorry to see the young cattle go. 'They are very valuable to us, but now they give us something even more valuable—education for our children.'

The Kamba community

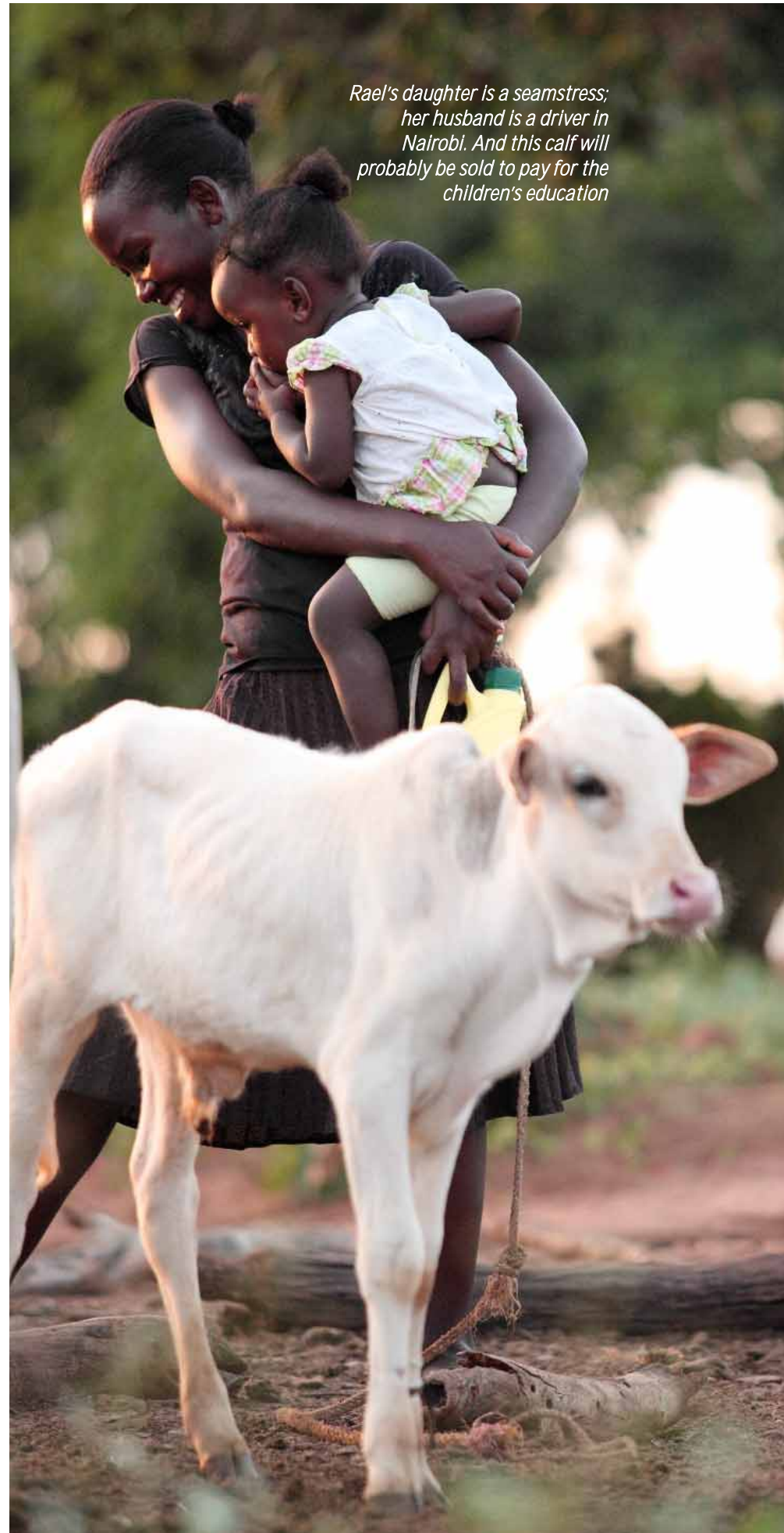
Strength through cooperation

True to its name, the Kikunga ('multi-task') Farmers' Group undertakes a range of cooperative activities, reflecting the collectivism and sense of community that are central to the Kamba culture. *Buffel* grass and *Maasai Love* grass are grown on a communal plot to be used as supplemental cattle feed during dry periods. Members also participate in revolving loans, group trainings and joint programs to support small-scale livestock development. Food is prepared communally, and children are reared by a network of neighbours and family members. Resources are shared with those in need—the loan of a cow for ploughing, for example. The strong emphasis on cooperation and mutual support is expressed in the Kamba saying: 'A small axe cannot chop down a large tree.'

Most of the members of the Kikunga Farmers' Group are women. Many of the menfolk have left the farms to find higher paying jobs in the nearby towns of Kitui and Machakos, and further afield in Nairobi and Mombasa. The women then assume responsibility for managing the farms and livestock and adopt leadership roles within the farmers' group. Rising education levels are also prompting adjustments in gender roles and expectations. 'Life is changing at a fast pace,' says Kwinga, one of the few male members of the group. 'Children are learning and taking up both male and female roles. More of them are going to school and wanting a life in town.'

Climate change presents a further challenge. Rains have become less frequent and more unpredictable. Maize crops are increasingly failing to reach maturity and are being replaced with drought-resistant sorghum. Some food security comes from the variety of crops grown—cowpeas, pigeon peas, green grams (lentils), cassava, sweet potatoes and pumpkins, as well as tree crops such as bananas and mangoes. Boreholes provide metered water for the homesteads and livestock.

The Kamba system of integrating crops and livestock, along with the tradition of mutual support, has served them well in surviving the dry climate and arduous physical environment in which they live. The resilience, fertility and drought tolerance of Kamba cattle are especially well suited to meeting the changing needs of Kamba farmers, as well as the challenge of climate change. Clearly, the Kamba cattle will be a critical part of the survival equation for ensuring the long-term future of their keepers.



Rael's daughter is a seamstress; her husband is a driver in Nairobi. And this calf will probably be sold to pay for the children's education



Balancing quantity and quality Tipping the scales in favour of the Kamba

While the Kamba breed makes an invaluable contribution to the mixed farming system used by small-scale subsistence farmers, it can frustrate the ambitions of larger-scale dairy producers. Twenty years ago, Daniel Ntheeu had over 100 Kamba cattle on his 200-acre farm; now, most of his cattle are Friesian crossed with Sahiwal, a more productive but only slightly drought-resistant Pakistani breed. They produce five to ten litres of milk per cow per day, which is two to five times the amount obtained from Kamba cows.

But the exotic cows require expensive inputs—supplemental feeds during the dry season, installation of boreholes to meet their water needs, and additional medical care as the cross-breeds struggle to cope with the environmental challenges to which local breeds are well adapted. Ntheeu is reluctant to itemize the costs versus the benefits of keeping the cross-bred cattle: 'If I calculate it out, I might not make it!'

Ntheeu loves the Kamba cattle and admits that the quality and flavour of their milk surpasses that of his high-producing cross-breeds. He still keeps a few Kamba cows as a safety net in times of drought, but challenges scientists to develop a local breed that can be more productive without losing its resilience. Indeed, increasing the productivity of sturdy indigenous cattle is crucial for livestock development and improving the livelihoods of cattle keepers throughout the developing world.

Ntheeu loves the Kamba cattle and admits that the quality and flavour of their milk surpasses that of his high-producing cross-breeds.

Cattle are brought to drink at a water tank maintained by the Kitul county government. Farmers pay a small monthly fee for the service

Daniel Ntheeu still keeps some sturdy, resilient Kamba among his mixed herd





Ethiopian Boran

Ethiopia

Ethiopian Boran

Ethiopia has more cattle than any other country in Africa, and the Boran is the breed of choice in the vast cattle-herding southern region of the country. The breed's endurance, fertility, meat quality, and strong herding and mothering instincts have led to its success, not only in Ethiopia but also among Kenyan and Somali herders—and breeders all over the world.

The Borana herders of southern Ethiopia have developed economic, social and cultural systems that are attuned to the semi-arid rangelands they and their cattle inhabit. The dire landscape of savannah grasslands, thorn bush and scattered acacias is not well suited for growing crops, and mobility in search of the fresh pastures that spring up in response to patchy rainfall is the key to survival.

During the region's two rainy seasons—March to May, and September to November—the cattle and their keepers are relatively sedentary. As the rains draw to an end, however, villages send out scouting missions to search for areas where pasture and water are available, and their reports guide the subsequent movement of livestock and people.

The Ethiopian Boran cow: sturdy build, with a prominent hump and dewlap

Essential tools for the migrating herder: spear, herding stick, hand axe, forked and hooked stick for manipulating thorny branches, pans for cooking, giraffe skin milk container, leather thong, leather mats for sleeping



BREED: ETHIOPIAN BORAN, or BORANA

Location: Southern rangelands of Ethiopia, around the Liben, Mega and Arero plains, and bordering areas of northern Kenya.

Origin: The Ethiopian Boran is descended from the first introduction of zebu cattle (*Bos indicus*) from western Asia into Africa, where it became established in the semi-arid and arid Borana plateau of southern Ethiopia. Migrations into neighbouring territories have resulted in the evolution of the Orma Boran, Somali Boran and Kenyan Boran breeds.

Description: Large-bodied animals, suitable for beef, with a characteristic hump and pendulous dewlap. They are well adapted to a migratory lifestyle, with their hard hooves, light bones, and ability to regulate their body temperature and survive on limited water.



Though young, Dalu Buru is the leader of his village and cares for a relatively large number of livestock—100 Boran cattle, 20 camels and 80 sheep and goats. His father was the Aba'Olla or founder of this village. He prizes the Boran for their resistance to drought and the quality of their milk, but his appreciation is also aesthetic, as he pays tribute to a particular animal with a pleasing body conformation or an attractive white and dark brown coloration. He will sell some cattle following the rainy season, when they are in good condition and prices are high, in order to raise money for school fees and other needs.

Borana women manage the milking and dairy-related activities of the household, along with much of the agricultural production. The cows are milked next to the family home. A calabash gourd for storing milk is first smoked with smouldering twigs of the soap berry tree, which fumigates the gourd and gives the milk a unique flavour. Yoghurt is produced by shaking the gourd

Young Boran calves are allowed to freely move in and out of the family home

The breed's endurance, fertility, meat quality, and strong herding and mothering instincts have led to its success, not only in Ethiopia, but also among Kenyan and Somali herders—and breeders all over the world.



*Preparing nutritious
yoghurt in a calabash gourd
decorated with cowrie shells*





Silhouettes at dusk

On their migration the herders will visit the ancient, hand-dug wells, or *tula*, that are found throughout the *dirre* ecosystem. The wells are deep—often 30 metres—and some have been in use for hundreds of years

MIGRATION: A KEY SURVIVAL MECHANISM

While the rains are adequate, the Borana will remain in their semi-permanent settlements, grazing the surrounding pastures (the wara land) with their livestock. As the rains come to an end, or when they fail, the population of the village thins out as the adult men and older boys take most of the cattle—male and female—and calves in search of fresh, rain-induced pastures (the fora rangelands), often travelling dozens of kilometres each day. They leave behind the elders, women and children, along with the lactating cows and very young calves. The sheep and goats will also stay, as their varied diet and browsing habits will enable them to survive harsher conditions than the cattle. In times of severe drought, the whole community migrates, using donkeys to carry small children, frail adults and essential belongings.

On their migration the herders will visit the ancient, hand-dug wells, or *tula*, that are found throughout the difficult ecosystem. The wells are

deep—often 30 meters—and some have been in use for hundreds of years. The back-breaking work of drawing water from the *tula* is carried out by the young men, who form a human chain to fill buckets and pass them from the well to watering troughs. These are the ‘singing wells’, as the men sustain the rhythm of their work with songs about their cattle and the herding life, praising the strength and respectability of those who have many cattle.

The migrating herder will travel lightly, with a few essentials—a dish for cooking, a spear for protection, an axe to cut wood for fire and fencing, a wooden tool for manipulating thorny branches while hacking them, water and milk containers, a leather sleeping mat, and basic food items such as maize flour, beans, tea and sugar. A milk container of giraffe skin is particularly treasured and can be handed down for generations.

until the milk thickens. Surplus milk and yoghurt may be sold at the local market. Women also work the leather from cattle hides to produce sleeping mats, harnesses, and other practical, decorative or ceremonial items.

At night, the Borana keep their livestock in small corrals constructed of interwoven sticks. The family compound may also include a few small plots of maize or cowpeas, though the dry

conditions in the lowlands severely limit crop yields. Most of the Borana's crop production is concentrated in the nearby hills, where water is more abundant and the land more fertile. There they raise such crops as wheat, barley, maize, beans and native grains.

Inevitably, life is changing for the Borana. Political, economic and social forces encourage a more sedentary lifestyle—for example, it is easier to provide health

and education services to a settled community. The effects can be seen in the solid, square, wattle and daub houses that are replacing the traditional cylindrical dwellings of sticks and thatch, and in the trend towards a more diversified agropastoral system combining small-scale subsistence farming with livestock herding. In addition, with population growth and the extension of commercial agriculture, the Borana's traditional grazing lands are slowly being eaten away.

At dawn, cattle leave the village in search of grazing





Milking in the morning: the cow's hind legs are tethered to make the task easier

Two young herders, moving with their cattle in search of pasture and water, take tea in the morning





Lobi

Burkina Faso and Côte d'Ivoire

Lobi

The pint-sized Lobi is a rare cattle breed, found only in remote corners of southwestern Burkina Faso and northeastern Côte d'Ivoire. Lobi cattle are excellent work animals and provide quality meat and milk with minimal need for food, water and medical care. Their diminutive size—about 25% smaller than the common Zebu breeds—is deceptive; these cattle are remarkably strong and resilient, and their compact efficiency could be useful in other regions with similarly challenging climate conditions and pressures on land use. But because of their small stature, Lobi cattle are widely undervalued, and

intensive cross-breeding with larger Zebu cattle is placing the Lobi at high risk of disappearing as a pure breed.

The Lobi come from an ancient stock of humpless cattle (*Bos taurus*) introduced into Africa some 10,000 years ago. Docile and well proportioned, they resemble a miniature version of many of the breeds found today in more temperate climates. Along with their unique physical appearance, the cattle possess another characteristic of particular importance—tolerance of a devastating parasitic disease (trypanosomiasis, also known as

'sleeping sickness') which is spread by the tsetse flies that plague the warm wet zones of western and central Africa.

While Zebu cattle are very susceptible to sleeping sickness, which is thought to affect 80% or more of the cattle living in tsetse fly-infested areas, the Lobi have developed a natural immunity and experience lower infection rates; they also have a greater tolerance of the effects of the disease. 'They rarely get sick or require medical attention,' says Amadou Traouré, an animal geneticist with Burkina Faso's National Centre for Scientific Research and Technology. 'In contrast, the Zebus have to undergo expensive treatment two to three times per year, with limited success due to the tenacity of the disease and its ability to become resistant to trypanocidal drugs.'

Though small in stature, Lobi cattle are deceptively strong, and are used by the Lobi people for ploughing their croplands



A small breed with large payoffs

Many breeders and farmers prefer Zebus to Lobi cattle because of their greater meat production. But when the costs and benefits of raising the animals are calculated, it is the smaller Lobi cattle that provide the bigger return on investment. Compared to larger breeds, the Lobi require fewer inputs and are also more tolerant of dry conditions and easier to manage. These attributes, along with the breed's milk production and high-quality meat, make the Lobi an especially valuable livestock asset in areas where competition for land and natural resources has reduced the portion allocated to cattle rearing.

BREED: LOBI

Called Lobi in Burkina Faso and Baoulé in Côte d'Ivoire.

Location: Found in the Bouna Department, northeastern Côte d'Ivoire, and the Gaoua region of southern Burkina Faso.

Origin: The Lobi are descended from the humpless *Bos taurus* cattle, which may have appeared in Africa as early as 8000 bc.

Description: A dwarf breed, with short horns and no hump. Colours range from white or grey to tan, brown and black, with light or dark markings. The breed is important for its tolerance of trypanosomiasis (sleeping sickness) and its ability to produce milk and meat with minimal inputs. It is also used for traction.



The Fulani herders have an affectionate relationship with the Lobi cattle under their care



Banking on Lobi cattle

The Lobi people, after whom the cattle are named, migrated from Ghana to Burkina Faso in the late 1700s. They are predominately subsistence farmers, raising cereals such as sorghum, millet and maize, and other crops such as yams, squash, beans, tomatoes and onions. Most of their income derives from the sale of surplus food crops. They also sell a sweet and delicate beer brewed from sorghum, and cosmetic butter made from the nuts of the shea tree.

The Lobi farmers keep small numbers of chickens, domesticated guinea fowl, and dwarf varieties of sheep and goats. They generally own no more than a dozen cattle per household, which are used as draft animals to plough the fields. However, the Lobi farmers primarily rely on their cattle as a form of savings, 'banking' them (along with those of neighbours and family members) to be tended by local Fulani herders. The Lobi tap their cattle accounts only when the need arises—for a bride price or ceremonial purposes, for example.

The Lobi people mostly use their cattle as a form of savings, 'banked' with larger herds that are tended by Fulani pastoralists



Lobi cattle are among the few remaining pure taurine (humpless) breeds in Africa



LOBI OWNERS, FULANI HERDERS: SYMBIOTIC MANAGEMENT OF LOBI CATTLE

The symbiotic relationship between the Lobi and Fulani peoples is a fascinating aspect of Lobi cattle stewardship. The Fulani are Islamic pastoralists whose range extends from western and central Africa through Sudan to southern Egypt. They are a minority group in Burkina Faso and Côte d'Ivoire, representing less than 10% of the population. Though cattle ownership is seen as a measure of wealth and a source of cultural identity among the Fulani, changes in land tenure and land use have restricted their nomadic ranges. Many have adopted a more sedentary lifestyle, and some, having lost their own herds, tend cattle as caretakers for other cattle owners.

In the verdant Gaoua region of Burkina Faso, the local Fulani tend cattle for the Lobi farmers in exchange for food, payment, and use of the cows' milk as a key staple and source of income. The herding is conducted by the adolescent and adult males, who guard the cattle day and night, even sleeping by the animals to protect them from marauders. Living in relative isolation and remaining on the fringes of modern life, the Fulani maintain the deeply rooted values of their pastoral heritage, even if they do not own cattle of their own. And despite their more settled existence, they continue to live in traditional nomadic homes—lightweight, dome-shaped structures of reed mats woven onto a framework of wooden poles.

A Fulani woman gathers milk from Lobi cattle as partial payment for taking care of the animals

In the verdant Gaoua region of Burkina Faso, the local Fulani tend cattle for the Lobi farmers in exchange for food, payment, and use of the cows' milk as a key staple and source of income.



An untapped potential

The arrangement between the Fulani herders and the Lobi farmers meets the mutual needs of both groups. But as neither side has much incentive to improve the animals' nutrition or breeding, it does not promote the further development or preservation of this unique cattle breed. The challenge of shining more light on the genetic value and importance of the discounted Lobi cattle remains to be met, not only among local tribes but also in the broader scientific community.

Fulani women make butter, which they sell along with surplus milk to generate extra income for food, clothing and other household purchases

'Lobi cattle really hold enormous advantages, if only researchers could tap into them better,' says Traouré. 'They need to be preserved and fully appreciated among all of those who could help ensure their future, from the local herders and farmers to the wider field of scientists and decision-makers.' A new breeding research program that Traouré is part of and that aims to sustainably improve the Lobi breed is now under way in Burkina Faso.

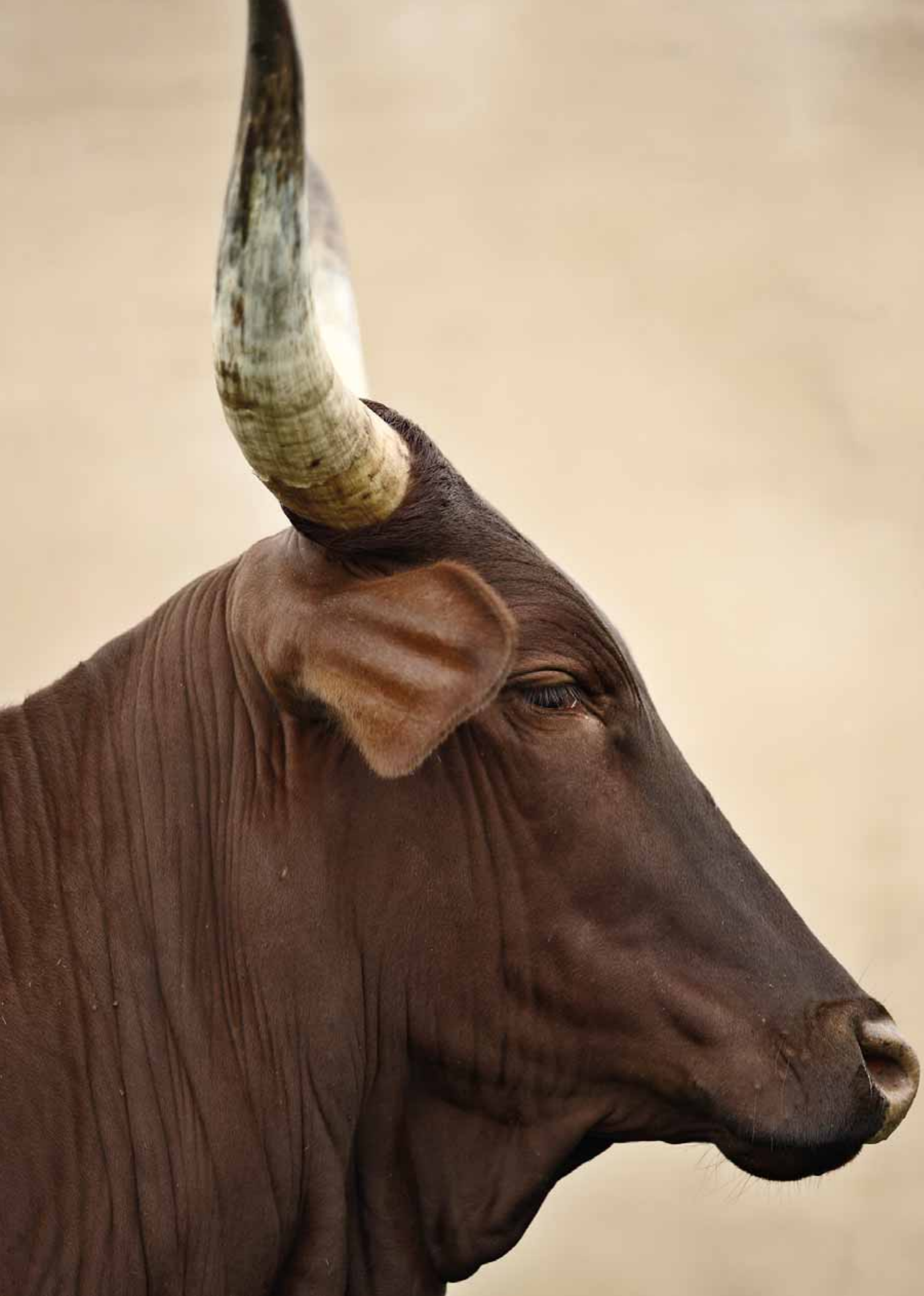




The Fulani of Burkina Faso retain the traditional values and lifestyle of their pastoral heritage, including their domed reed homes



Lobi cattle grazing under the care of a Fulani herder



Red Fulani

central and western Africa

Red Fulani

The Red Fulani cattle are a favoured animal among the herders of central Africa, where they cut an impressive figure with their deep burgundy-coloured coats and long, lyre-shaped horns. The breed's wide range traverses much of the centre of the African continent, stretching from Mali and Nigeria to the western parts of Sudan and Ethiopia. The origins of the Red Fulani breed are uncertain and disputed, but their mixed descent has given the animals a large frame—a classic zebu profile—and the genetic makeup to contend with marginal lands and meagre resources.

Red Fulani cattle are a favourite among the herders of central Africa. The breed does well in marginal environments and is found in a wide swath that stretches from Mali and Nigeria in the west to parts of Sudan and Ethiopia in the east.

The Mbororo herd has become more mixed, with White Fulani and Gudali standing alongside the Red Fulani

BREED: RED FULANI

Red Fulani are known locally by a variety of names, including Abori, Bodadi, Brahaza, Fellata, Mbororo, Red Bororo and Wodabe.

Location: Widely distributed across the centre of Africa, including Mali, Niger, Nigeria, Chad, Cameroon, Central African Republic, Sudan and Ethiopia.

Origin: A type of west African zebu, with unclear origins. One theory contends that the breed descended from long-horned zebras brought from the east coast of Africa by Arab invaders during the 7th century; another argues that it is the result of much earlier interbreeding between short-horned zebu and ancient Hamitic (ancient Egyptian) longhorn cattle (*Bos taurus longifrons*), possibly mixing also with some humpless shorthorns (*Bos taurus brachyceros*).

Description: Notable for their dark-red coat, large size, pyramid-shaped hump, elegant dewlap and long horns (reaching up to 140 cm), Red Fulani cattle are used for milk, meat and manure. They tolerate heat, ticks and insect bites, and can survive on limited feed and water.





The dark burgundy hides and long horns of the Red Fulani are in sharp contrast to their green surroundings



Cattle versus crops: Conflicts and solutions

In the steep fertile hills of the Bamenda Highlands of northwestern Cameroon, the grazing Red Fulani herds are easy to spot as their bold white horns and large red bodies stand out amid the green landscape of crops, woodland, pasture and villages. The integration of the Fulani herds with the local agricultural production system has not, however, been as tranquil as the peaceful pastoral scene might suggest.

The Red Fulani cattle are kept by the Mbororo—the name adopted by Fulani pastoralists in Cameroon to distinguish themselves from the sedentary, town-dwelling Fulani. As is the case in most regions where herders compete with local farmers for water and grazing land, the two groups have had a history of skirmishes over land use and access rights. Greater population pressure, fragmentation of rangelands, encroachment of crop farmers onto marginal lands, coupled with frequent droughts, often

As is the case in most regions where herders compete with local farmers for water and grazing land, the two groups have had a history of skirmishes over land use and access rights.

The Mbororo herders, who have found ways to coexist peacefully with local farmers, sing and dance for visitors

forces pastoralists to move in search of pasture, which puts them into direct competition, and conflict, with the sedentary farming communities. Local population pressures and increased urbanisation have further limited the availability of grazing lands, and conflicts have been sparked by episodes of cattle straying onto farmland and destroying farmers' crops.

With mediation from agricultural service agents, the herders and farmers in the Bamenda region have found a workable solution for peaceful cohabitation. By mutual agreement, the Mbororo herders keep their cattle fenced in at night and away from farmers' crops during the growing season. During the fallow period, however, the animals are encouraged to graze on the crop residues, as their manure—combined with the gentle trampling of their hooves—helps to restore the soil's fertility.





The pastoralist's challenge

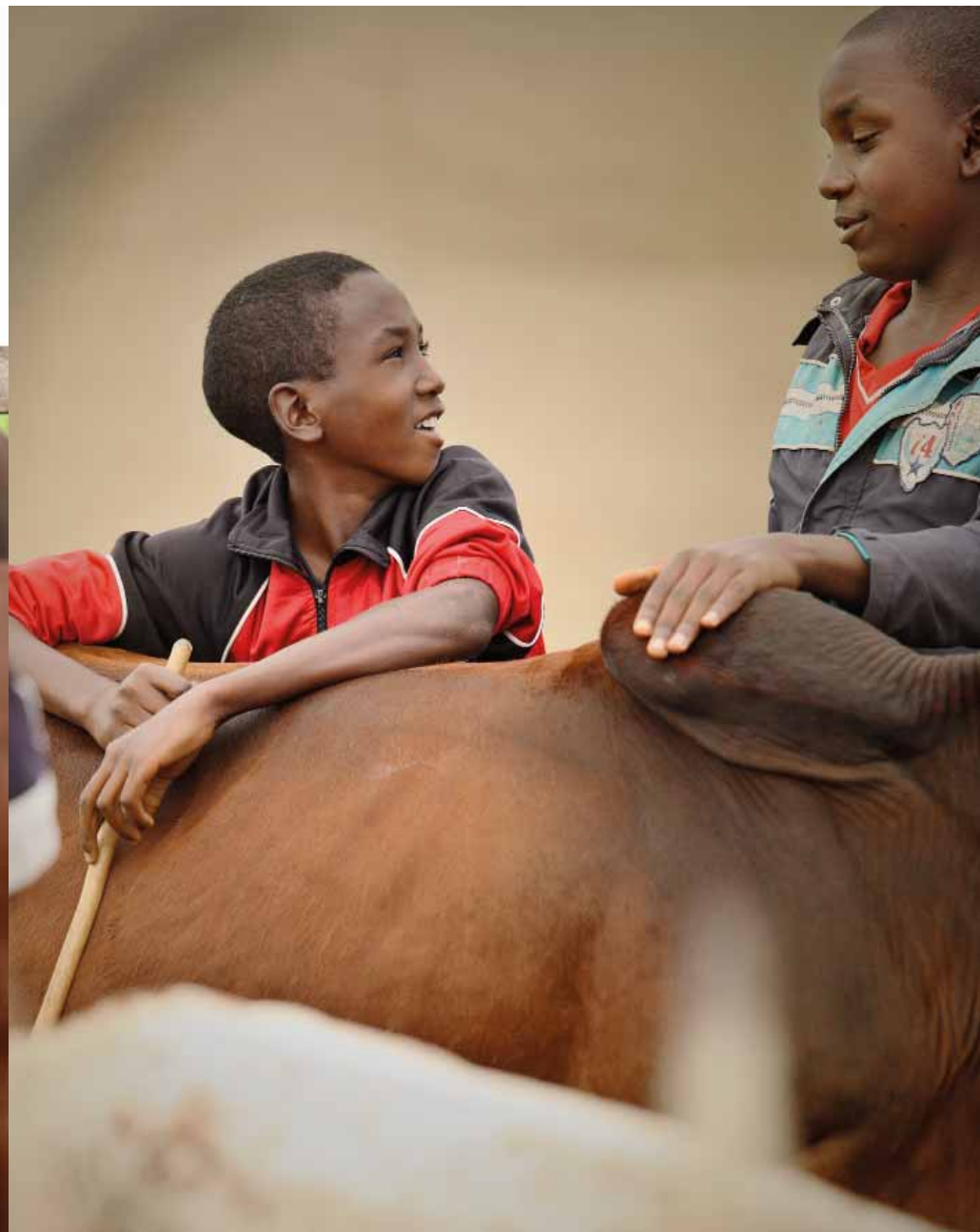
Strengthening the herd while preserving diversity

'My grandfather had over 100 head of cattle, all of them Red Fulani,' says Ardo Saidou, an elegant man who displays the stoic reserve and deep intelligence befitting his role as village chief. 'He refused to own any White Fulani cattle because they were smaller and produced less milk. Even if someone had given him a White Fulani cow, he would have sold it immediately.'

But times have changed for the Mbororo herders. With less land available for grazing and higher expenses due to changing lifestyles, Mbororo pastoralists of the present generation keep far fewer cattle than their predecessors. Chief Saidou, who is considered to be a man of wealth and importance, has a herd of about 40 animals. Moreover, he has diversified his herd to cope with greater uncertainties and changing market demands and now keeps White Fulani and Gudali cattle as well as the Red Fulani. The cream-coloured White

Chief Ardo Saidou has diversified his Red Fulani herd by adding White Fulani and Gudali cattle. White Fulani do not measure up to the stature and meat quantity of the other two breeds, but they do bring a more docile temperament, greater disease and drought resistance, and a smaller appetite.

The old and the new: the Mbororo expect that their future will still depend on their cattle, but life for the next generation will be filled with new ideas and herding methods



Fulani do not measure up to the stature and meat quantity of the other two breeds, but they do bring a more docile temperament, greater disease and drought resistance, and a smaller appetite. The beautifully mottled Gudali are nearly as big as the Red Fulani and are regarded as an especially valuable breed. Their tender meat is very much in demand and is considered to be of particularly high quality.

Saidou lets his cattle breed naturally, producing an assortment of mixed offspring that he hopes will strengthen his herd and mitigate risks from disease or other unpredictable challenges. This breeding strategy, however, leaves genetic improvement to chance, and will erode the store of desirable genetic traits particular to each indigenous cattle breed. More targeted breeding could help ensure both the preservation and improvement of such herds, through a two-pronged approach—one focused on improving the production capacity of pure breeds through the careful selection of higher-performing sires, and a second aimed at generating hybrid animals with a mixture of desirable traits derived from different cattle breeds.

Making such a system viable and appealing to the pastoralists who care for and depend on indigenous cattle herds is quite a challenge and requires the cooperation of forward-looking local champions. Perhaps Ardo Saidou, who envisions a life for the next generation filled with new ideas and herding methods, is of that mould: 'I expect that in the future, we will see significant changes and new ideas coming from our children's advanced training and education. I do not think that they will abandon cattle herding and rearing. But I imagine they will move from our traditional pastoral system to one much more influenced by modern ranching methods.'

Targeted breeding efforts, rather than natural selection, could help ensure both the preservation and improvement of the Mbororo herd (and others like them).

For daily cash, Mbororo women make dairy products that they carry to market in bowls made from large calabash gourds





N'Dama

central and western Africa

N'Dama

N'Dama cattle are integral to the resilience and productivity of the Fulani agropastoralist system

The lineage of the graceful and sturdy N'Dama cattle is one of the oldest on the African continent. The breed is descended from the Humpless Hamitic Longhorns (*Bos taurus*) brought by ancient pastoralists around 8000 BC via the land route from Asia to present-day Egypt. Over millennia, the N'Dama have evolved adapted traits that allow them to flourish in warm and humid regions uninhabitable to other cattle breeds due to the heat stress and infestation of tsetse fly. With their long arcing horns and hardy constitution, the N'Dama are truly emblematic of the valuable genetic heritage of

Over millennia, the N'Dama have passed on genetic traits that allow them to flourish in warm and humid regions that other breeds find uninhabitable.

An N'Dama cow displays its characteristic docility while being milked

indigenous African cattle that is in danger of disappearing due to neglect and interbreeding.

N'Dama cattle are the favoured breed in the low-input crop-livestock farming systems of the warm and humid, tsetse fly-infested zones that stretch from Senegal to the Central African Republic and the Democratic Republic of the Congo. They display a docile temperament that is well suited for work as draught animals, and they are tolerant of trypanosomiasis ('nagana', the cattle equivalent of human sleeping sickness), tick-borne diseases, and skin ailments that seriously affect zebu cattle and other large working animals such as horses and donkeys.



BREED: N'DAMA

Also known as Boenca or Boyenca, Fouta or Futa, Mallinke and Mandingo.

Location: Found in a broad belt through coastal western and central Africa, from Senegal and the Gambia down to the Democratic Republic of the Congo, including its original homeland on the Fouta Djallon plateau in Guinea.

Origin: Believed to be a pure descendant of the original Humpless Hamitic Longhorn (*Bos taurus*) of northeastern Africa.

Description: Medium-sized, with no hump, a minimal dewlap, a large head, and long lyre-shaped horns averaging 60 cm in length. The coat is made of short, fine hair, often fawn coloured, though varying from sandy to black. N'Dama cattle are trypanotolerant, resist tick-borne infections, and are well adapted to warm and humid and hot and dry climates. They are used for milk, meat, manure and traction.





While the cattle drink, small boys take the opportunity to enjoy a cool bucket shower from the well



Adding resilience to an integrated system under stress

In the wooded savannah ecosystem of southern Senegal's Casamance region, the N'Dama lend considerable resilience to the integrated crop-livestock production system practiced by Fulani herders. Farming is an unusual practice for the Fulani people, who are pastoralists by tradition and are more often found traversing the semi-arid rangelands of the Sahel with their large herds. The Fulani in Casamance joke that their forefathers adopted farming 'by accident', learning from the agriculturalist Mandike people and taking advantage of the region's long wet season, which lasts from June to October and delivers up to 1650 mm of rain.

The Fulani agropastoralists grow a wide assortment of rain-fed subsistence and cash crops, including millet, maize, sorghum and rice, along with onions, beans, cassava, tomatoes, mangoes and groundnuts. However, more frequent drought and the increasing

unpredictability of rainfall patterns are having a negative effect on crop production, particularly of such staples as rice and maize, which need a regular water supply to mature properly.

The N'Dama cattle are far more resilient in the face of a shifting climate. Co-owned in large herds (averaging 50-60 animals) through complicated kinship networks, they graze on crop residues and *Brachiaria* grass, providing milk, traction and a steady supply of new calves to their Fulani keepers. The cattle benefit from a plentiful source of water, which is drawn by hand from the numerous wells that dot the landscape and poured from the buckets into concrete troughs for the cattle to drink.

Water is drawn from concrete wells and sloshed into troughs for the cattle to drink



'MADE IN SENEGAL' PROMOTING LOCAL MILK PRODUCTS AND LIVELIHOODS

Seido Balde is part of a growing trend among entrepreneurial herders to transform milk production from a daily ritual for subsistence into a thriving business—and point of pride. In 2004, Balde sold cattle and invested the money in a small-scale dairy. He received training and financial support from a project called Pro-Lait, which is dedicated to developing a greater appreciation for locally produced milk in Senegal and a stronger value chain for delivering it to consumers. The goal is to improve milk quality and nutrition, reduce milk imports, add value to the milk through processing, and increase returns for milk producers. Added benefits also include greater incentives to improve cattle health and milk yields.

Balde's dairy processes about 80 litres of milk each day. He enjoys wide support from local farmers and herders who bring their milk to him, 1 or 2 litres at a time, either for sale or in exchange for processed products. Balde employs one person to help in the dairy and three vendors to deliver the products via motorbike to various markets throughout the region. Customers also come directly to the dairy, including many from neighbouring Guinea-Bissau. The dairy produces and sells pasteurized milk, fermented milk, liquid butter and a sweetened or unsweetened yoghurt called 'Kossam'.

Seido Balde is among a growing number of entrepreneurial herders working to transform milk production from a daily ritual for subsistence into a thriving business—and a point of pride.

Each day, Seido Balde's dairy produces 230–240 bags of kossam, a liquid yogurt that is sold for about USD .40 per one-quarter litre



Partnering to promote on-site conservation and development


Beyond the gate and magnificent tree-bordered driveway that mark the entrance to the research station of the Senegal National Institute for Agricultural Research at Kolda, an innovative program has been developed to stimulate on-site improvement of N'Dama cattle. Since 2009, the institute has been partnering with local herders to develop indigenous cattle that can produce more meat and milk, without reverting to crosses with other breeds or losing the traits that make the cattle so well suited to the local environment.

The project brings together the station's improved N'Dama bulls, selected for their size and other preferred traits (for

example, a long tail, long horns and light colour), with about 180 N'Dama cows lent by local herders through a formal agreement with their community cooperatives. The cows are benefiting from the station's feed, safety and livestock management practices, which are resulting in improved calving rates. The calves are measured monthly, with weight being used as the main proxy for success.

According to the current agreement, 90% of the profits from the sale of the calves will go to the herders. Issues of inputs, levels of commitment and how rewards are shared are under discussion as the initiative continues to mature from a program to a true partnership—and a potential model for other public-private efforts to promote the improvement of indigenous African cattle stock.

Senegal's National Institute for Agricultural Research is partnering with local herders to develop more productive indigenous cattle without crossing with exotic breeds.



Cattle taking part in the N'Dama breeding improvement program wander past the tree-lined entrance of the government breeding station in Kolda

An innovative public-private partnership with Senegalese herders is breeding improved N'Dama cattle that produce more meat and milk





Gudali

Benin, Cameroon, Ghana, Mali, Nigeria
and Central African Republic

Gudali

Gudali means 'short-horned and short-legged animals' in the language of the Hausa people, who, along with the Fulani people, herd this breed and dominate cattle keeping across the Sahel from Senegal to Sudan. But stature is not what distinguishes the Gudali from the other indigenous zebu cattle of western and central Africa. Rather, it is the succulent meat of the Gudali that sets them apart and has earned them a rank as one of the most promising beef breeds in the region.

To the untrained observer, the most noticeable thing about Gudali cattle is the stunning pattern and colouring of their coats, which display intricate combinations of brown speckles and splotches set against a white background. But to the experienced eye of the cattle buyer or breeder, it is what lies beneath the surface of the animals' coats that really matters and makes these animals special.

The Gudali are distinguished by their intricately mottled coats, as well as by their delicate and tender beef



BREED: GUDALI

With two major subgroups—Sokoto and Adamawa. The latter includes the Banyo, Yola (or Tattabareji) and Ngaundere breed strains.

Location: Gudali cattle are found principally in Nigeria, Cameroon and the Central African Republic, though the Sokoto subgroup also appears in northern Benin, Ghana and Mali. They are owned and managed by the Hausa and Fulani people.

Origin: Included among the short-horned zebu of western and central Africa, they are believed to have descended from the Indo-Pakistani zebu, which arrived in the Horn of Africa with seafaring Arab and Indian traders and made their way westwards with invaders and migrating tribes.

Description: The Gudali are large and broad, with short horns and a dome-shaped hump that slumps to one side. Their coats are white, with spectacular arrays of brown spots and speckles. Considered docile and rather sluggish, the Gudali are used for traction (including ploughing) and milk production, but they are most highly valued for their tender and flavourful meat.



'Gudali meat is highly prized for its flavour and tenderness,' explains Félix Meutchieye, an animal breeding and production systems specialist from the University of Dschang in Cameroon. 'A full-grown Gudali steer can sell for as much as 1.1 million Central African Francs (USD 2,000), easily twice the price offered for other cattle. Even the calves are more expensive, selling for about 160,000 francs (USD 300), compared to a price closer to 100,000 francs (USD 200) for other breeds.'

The succulent meat of the Gudali (right) is what sets it apart from other local breeds, such as the Red Fulani seen in the background



Needing a sharp eye for profits

At the twice-weekly cattle market in Koutaba, Cameroon, buyers and sellers come from as far as neighbouring Equatorial Guinea, Nigeria and Chad. Potential purchasers check the physical appearance of each animal, from its

general shape and demeanour to the way the muscles ripple and hang as each one moves. 'You have to be careful with older cows that have given birth multiple times,' warns one buyer, a butcher who will typically purchase three to five animals

each week. 'Repeat pregnancies can stretch out their ribs, making them appear larger and meatier than they really are.'

Savvy buyers can make a profit of 20% or more, but because there are no





WHAT'S THE BEEF?

AT THIS BUTCHER'S SHOP IT'S ALL GUDALI

With demand for quality meat rising, the Beef House butcher's shop in Bamenda, Cameroon, is maintaining a steady business. The shop specialises in Gudali meat, sourced from cattle raised on its own farm. This arrangement allows for greater control over both quality and supply, which makes for higher profit margins.

A woman buys a slice of liver at the Beef House butcher's shop, which specializes in Gudali meat and generally sells out by mid-morning



One or two animals are slaughtered each day to supply the Beef House, and by 10 a.m. nearly everything has been sold. 'You have to come very early for choice cuts,' notes a customer buying a large slice of liver, which is considered a delicacy. Even the hump is highly popular, as the fatty, highly flavoured meat is especially well suited for grilling. The Beef House features an outdoor barbecue that sells small plates of Gudali hump slices. The meat is juicy and subtly flavoured with a marinade of herbs and spices. But though the food is available for takeaway sales, the recipe is not—its secrets are known only to the chef.

Gudali hump meat, seasoned with a secret mix of herbs and spices, is grilled and sold on the spot at the butchery



scales in the market, the actual return on investment depends on the buyers' ability to estimate an animal's real weight and value using visual cues, along with what they can learn about the animal's age, breed and origins. Prices and purchasing decisions are also based on information gleaned from personal contacts among the cattle traders regarding current market prices, as well as the stock and reputation of different sellers.



The range of cattle presented for sale at the Koutaba market includes Gudali, Red Fulani, White Fulani and various mixed breeds. Several hundred head are rounded up each week, with 100 to 150 changing hands, and others remaining to be fattened on the grassy hills that surround the market stockades for later sale. Final prices may vary considerably according to prevailing trends and demand, but one thing is certain—the most prized and expensive will most probably be the Gudali.

The range of cattle presented for sale at the Koutaba market includes Gudali, Red Fulani, White Fulani and mixed breeds.

At the cattle market, final prices vary considerably according to prevailing trends and demand, but one thing is certain—the most prized and expensive will most probably be the Gudali





Mursi

Ethiopia



*Head adornments
are bestowed on
favoured cattle*

Mursi

The scenery is breath taking in this remote corner of southwestern Ethiopia, where acacia-bedecked hills and mountains tower above the broad floodplains of the Omo River, which flows southwards into Lake Turkana. Here, the Mursi people still maintain their agro-pastoralist lifestyle, though they are facing some difficult choices as the world changes rapidly around them.

Mursi cattle share their name with the Mursi people who keep them. Mursi cattle are moderately sized zebus and have the distinctive hump and dewlap typical of their type. The herd is a patchwork of colour, as the owners appreciate unusual, well-defined patterns in black and white, brown and white, and other shades. The horns, too, are distinctive, tied with rope and moulded from an early age until they achieve an elegant inward curve that is both aesthetically pleasing and prevents these naturally aggressive beasts from harming each other.

The Mursi people themselves are striking in appearance and are known for their elaborate body decorations. Body scarification is considered a beauty enhancement, as are the wooden or clay plates worn in the lower lips and earlobes of the women. The first incision of the lip is made when a girl is between 15 and 18, and increasingly large discs are inserted as the lip stretches over time. The men are tall and muscular, and some carry rifles and machine guns, evidence of occasional skirmishes with other tribes, usually over livestock.

A young woman is decorated with arm rings and a large wooden disk in her stretched earlobe



The Mursi people themselves are striking in appearance, and are known for their elaborate body decorations.

BREED: MURSI

Location: South Omo zone, southern Ethiopia, where the breed is maintained by the Mursi and neighbouring pastoral tribes.

Origin: The breed is a representative of the small East Africa zebu type. It is believed to have descended from recent introductions of zebu cattle into Africa from Asia in the last 1300 years. The breeds or strains of the Ethiopian short horned zebu group probably represent cultural and ecological variations of closely related populations.

Description: Body size is relatively large compared to others of the Abyssinian short-horned Zebu subgroup. The hump is prominent and well developed, and coat colour is highly variable. The horns are trained to curve inwards.



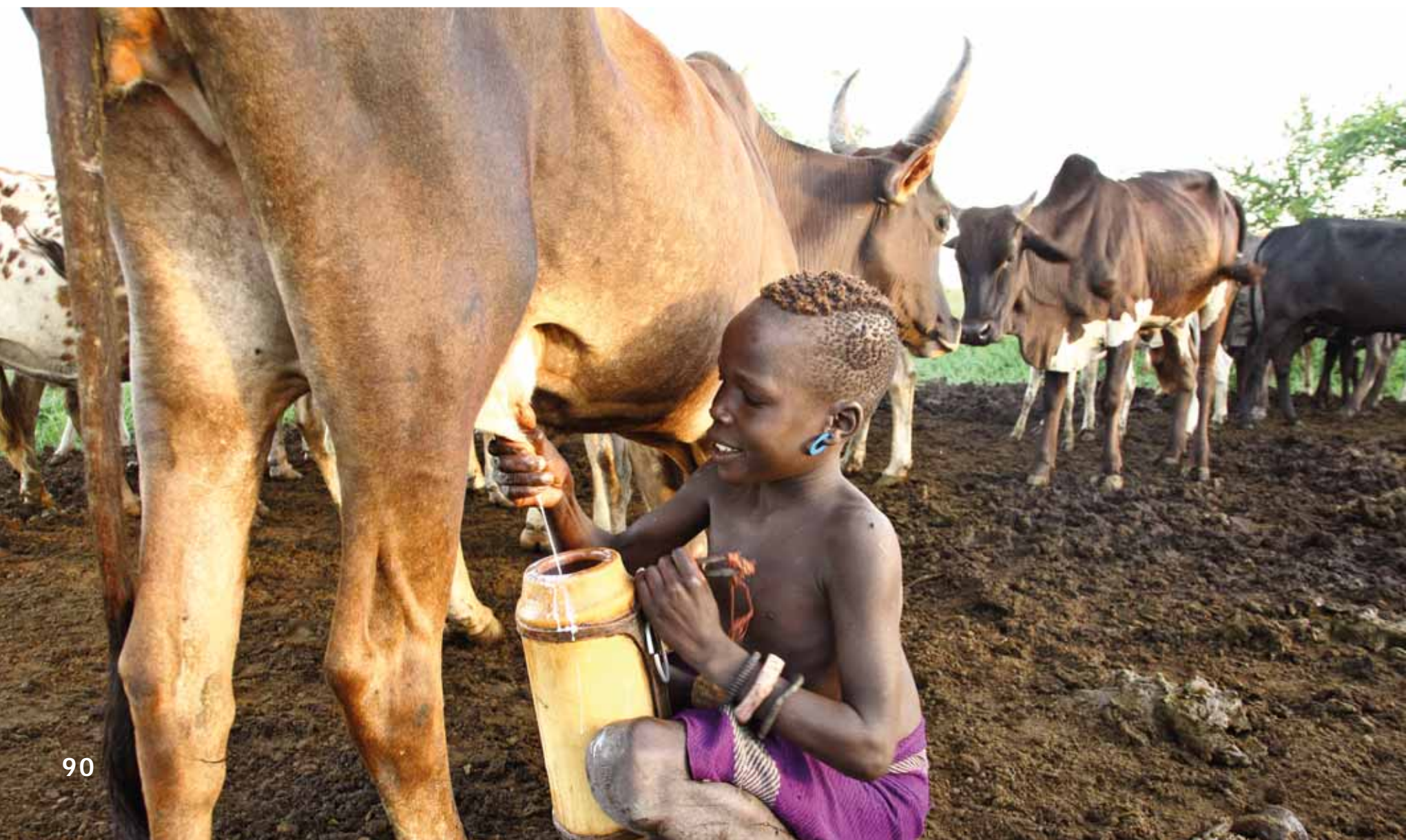
Change in the village

As with many traditional societies, powerful external forces are compelling the Mursi to make cultural, social and economic changes to their way of life. Their belief in a primal force (*Tumwi*) and in the power of women healers is waning as they are increasingly baptized into the Orthodox Christian faith, supported by donations and pilgrimages from Orthodox communities in Addis Ababa. And as roads are built and tourists flood in, the lip plates and traditional dress of the women are retained more for the camera than for cultural reasons.

Hailu's village exemplifies other changes. There is a strong veterinary presence, and the national government provides assistance to combat a range of diseases afflicting cattle, including anthrax, contagious bovine pleuropneumonia (CBPP), and foot and mouth disease. Ticks and tsetse flies are abundant throughout the area. In addition to veterinarians, teachers and health-care workers are introducing the benefits of the outside world to the Mursi.

The Mursi people's belief in a primal force (*Tumwi*) and in the power of women healers is waning as they are increasingly baptized into the Orthodox Christian faith, a trend supported by donations and pilgrimages from Orthodox communities in Addis Ababa.

Women and young boys are responsible for milking the cows



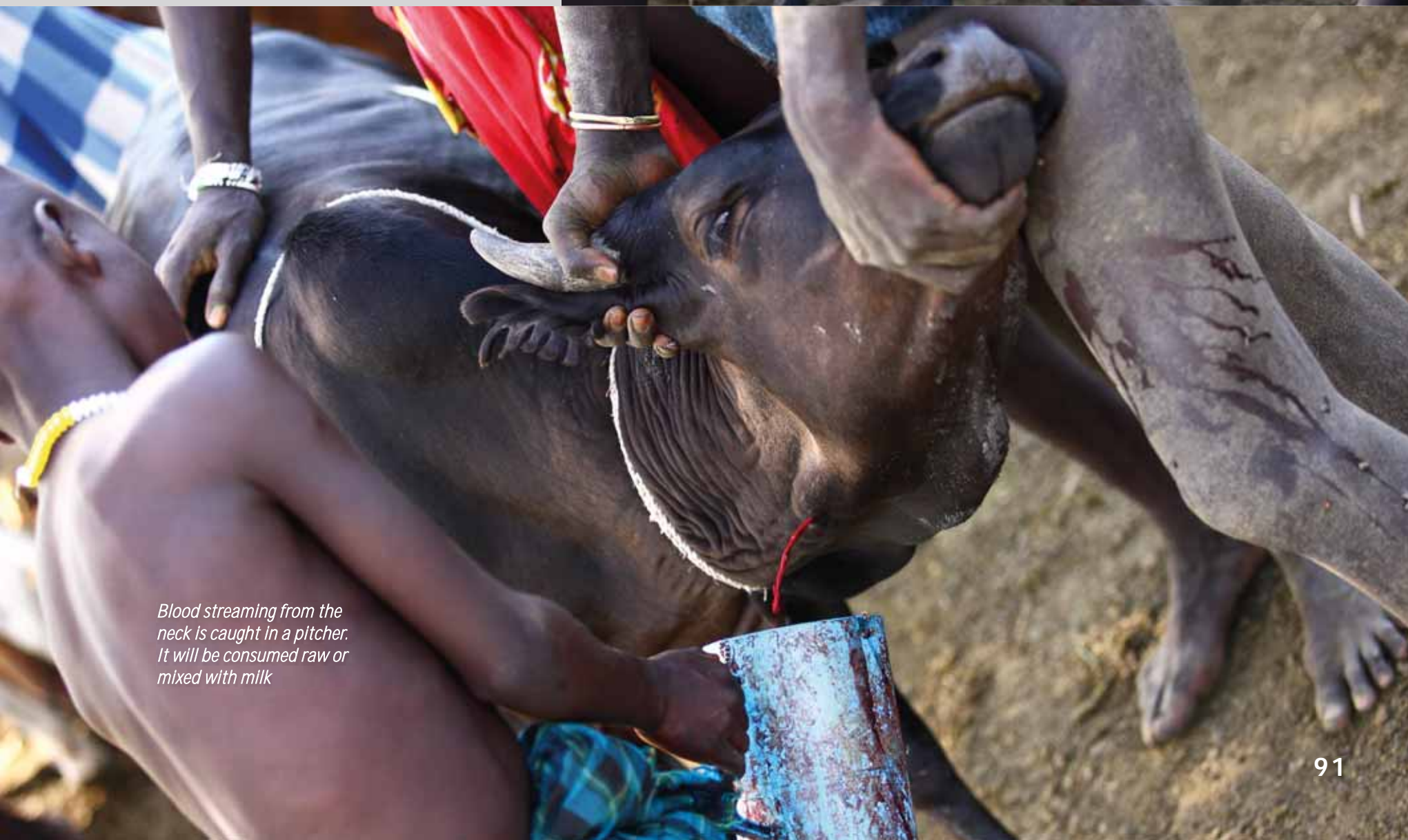
CULTURAL SIGNIFICANCE OF MURSI CATTLE

The Mursi attribute great cultural importance to their cattle. The value of cattle is enhanced significantly by their appearance—the colour patterns and the curvature of the horns. The Mursi also practise 'haruspicy', in which the entrails of a slaughtered beast are inspected in order to ascertain the meaning of a particular event and to decide on future action. Disease or hunger in the village, or a shortage of rain, or a domestic conflict are all occasions on which a cow may be slaughtered for this purpose. The slaughtered animal is then eaten, and its hide is pegged out in the sun for three or four days to dry.

On special occasions—a wedding, for example—the men drink fresh blood, shooting an arrow directly into the cow's jugular vein from close distance and catching the red stream in a pitcher. The flow from the wound is staunched with a plug of clay when sufficient blood has been drawn. The blood is drunk raw or mixed with milk and is considered to bestow strength on the drinker.



Preparing to shoot an arrow into the cow's jugular to draw blood



Blood streaming from the neck is caught in a pitcher. It will be consumed raw or mixed with milk

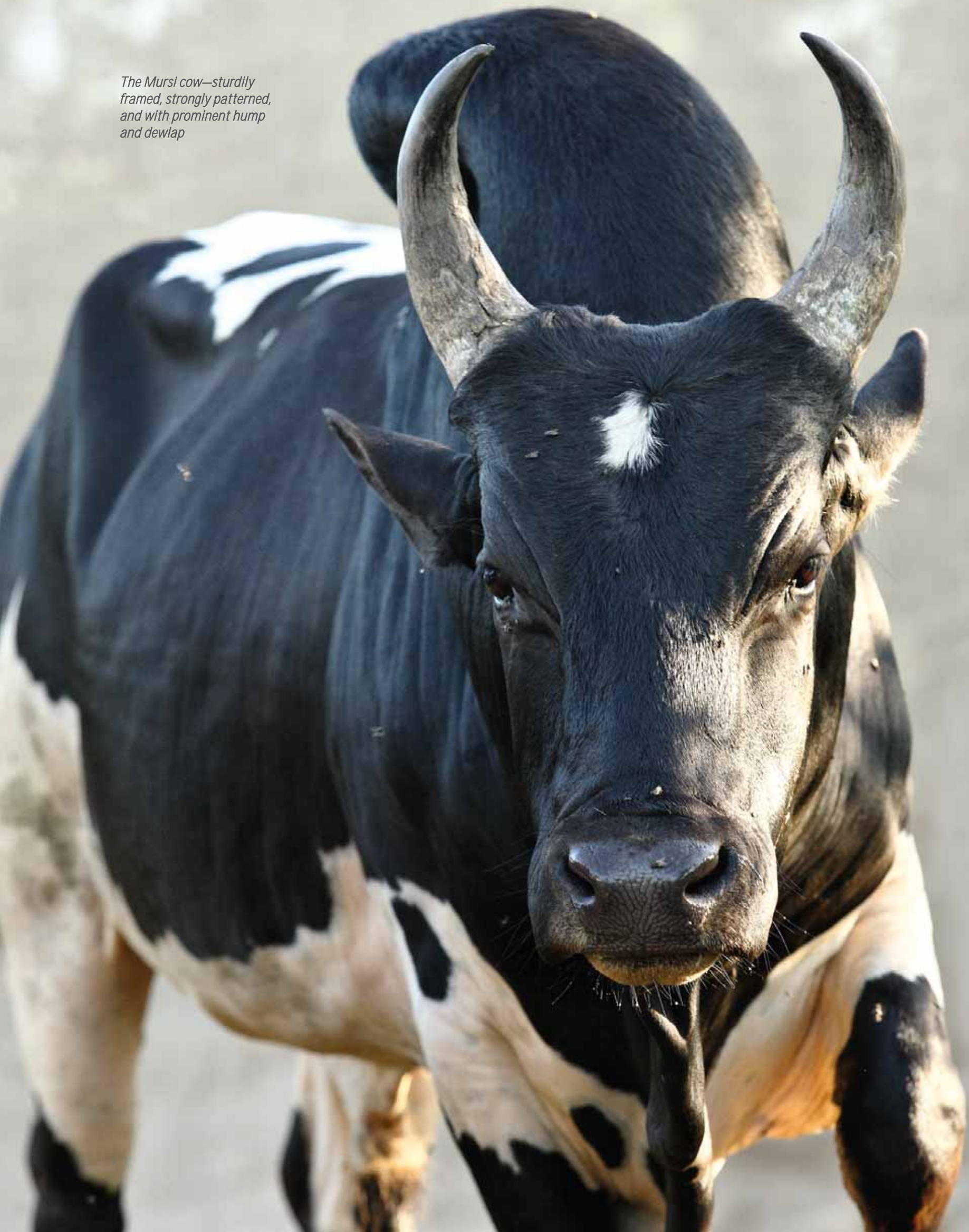


Larger-scale changes will no doubt have even greater impact on the Mursi. Construction of the Ghibe III hydropower dam on the Omo River, irrigation development in the lower river basin, and construction of sugar cane factories are examples of powerful commercial forces that will make it increasingly difficult for the Mursi to practice their traditional farming methods in the face of rapid and irrevocable changes in river flow, land use and economic priorities.

Mursi cattle are multipurpose animals fulfilling a range of economic and social functions for their owners. In addition to milk, the breed has high meat production potential because of the cattle's large frame and body size, reasonably fast growth and high fertility rates.

The smile on the face of this healthy youngster shows the value of milk as a dietary staple of the Mursi

*The Mursi cow—sturdily
framed, strongly patterned,
and with prominent hump
and dewlap*





What next for the Mursi and their namesake livestock? The cattle are multipurpose animals fulfilling a range of economic and social functions for their owners. In addition to providing milk, the potential for meat production is high because of the breed's large frame and body size, reasonably fast growth and high fertility rates. However, inadequate husbandry and breeding practices, coupled with lack of access to modern health and market services, have hindered realisation of the breed's genetic potential. Achieving that potential without disrupting the cultural values and lifestyle of the Mursi people will require a careful and sensitive balance of interventions.

The elegantly curved horns of the typical Mursi cow





*Young Mursi woman
with decorated lip plate*





White Fulani

central and western Africa

White Fulani

Built to endure the marathon treks and meagre food and water supplies that are part of nomadic life along the desert fringes of the African Sahel, the lanky White Fulani cattle sport a lean and leggy look. With a strong neck and lyre-shaped horns that ensure they maintain an erect

bearing, the White Fulani possess a number of characteristics of value to their keepers across the region. These animals are a classic example of an indigenous breed whose improvement and preservation would bring major benefits to a swathe of communities on the southern edge of the Sahara Desert.

Built to endure the marathon treks and meagre food and water resources of nomadic life along the desert fringes of the African Sahel, the lanky White Fulani cattle sport a lean and leggy look.



BREED: WHITE FULANI

Also known as Akou, Bunaji, Fellata, White Bororo, White Kano and Yakanaji.

Location: The breed is found in a long belt across the Sahel, from Senegal and Mauritania in the west, through parts of Mali, Burkina Faso, Ghana, Niger, Nigeria, Cameroon and the Central African Republic, to Chad and western Sudan in the east. It is kept by Fulani and Hausa herders.

Origin: The White Fulani is a type of West African zebu that is indigenous to northern Nigeria, southern Niger and northern Cameroon. The breed's origins are disputed, and they may have descended from the western migration of long-horned zebu or a mixture of short-horned zebu and ancient Hamitic Longhorn cattle (*Bos taurus longifrons*), with possible further interbreeding with humpless Sanga shorthorns (*Bos taurus brachyceros*).

Description: The coat colour is commonly white on a black skin, and the horns are lyre shaped. Reflecting their mixed origins, the hump may sit above the chest and shoulders (a zebu characteristic), or further forward towards the neck (showing some Sanga heritage). Their narrow bodies and long legs give them a gangly appearance and good trekking ability. They are used for milk, meat and draught power, including ploughing.





More diminutive than the Red Fulani, the lean and leggy White Fulani are built for long-distance treks in harsh environments



White Fulani cattle bring greater heat tolerance and disease resistance to this mixed herd



Small-scale livestock keepers, like this Fulani herder at the Koutaba market in Cameroon, have much to gain from a growing demand for meat and milk products



Great survivors with wide appeal

Slightly smaller and not as meaty as their Red Fulani cousins, White Fulani require less food and will eat 'on the go', making the best of what scant grazing is available along their path. Compared to other zebus, they are docile and better at fending off drought, heat and diseases than larger breeds of cattle, White Fulani are relatively tolerant of tsetse fly-transmitted sleeping sickness (trypanosomiasis), helminth parasites that infect the digestive tract (such as tapeworms, round worms and flukes), and a common and potentially mortal skin disease called 'rain scald' (dermatophilosis) that affects cattle in wet zones. The breed also has a higher tolerance for insect bites and shows less stress than other cattle in hot climates.

'This is a resilient breed that requires minimal food,' says Ardo Saidou, a Fulani herder and village chief from Cameroon who has added White Fulani animals to his herds of Red Fulani and Gudali cattle in order to better cope with a drying climate and dwindling land resources. 'They hardly ever become ill and are so gentle they can be herded by children.'

It is this hardiness and the cattle's easy manageability that makes them a favourite breed among the Fulani and Hausa herders of Nigeria, where the White Fulani make up close to half of the country's cattle herds. Likewise, they comprise a third of the cattle kept in Cameroon and are widely found across the semi-arid central belt of Africa that separates the Sahara Desert in the north from the green ranges, tropical forests and grassy savannahs to the south.

As drought and desertification gain further ground in areas south of the Sahel, the popularity of the small but sturdy White Fulani is likely to expand even further. But the purity of its genetic base—and with it the breed's hardiness—is under serious threat; persistent efforts to increase the amount of milk and meat produced by this breed have led to extensive crossbreeding with higher-yielding imported cattle and with larger indigenous breeds.

White Fulani are relatively resistant to tsetse fly-transmitted trypanosomiasis disease, helminth parasites that infect the digestive tract, and a common and potentially mortal skin infection called dermatophilosis.





Keeping up with the livestock revolution

The African continent is home to some of the fastest growing economies in the world. And as incomes rise, so too does the demand for milk and meat products, particularly among the growing ranks of city dwellers. Meat consumption in the urban areas of Burkina Faso, for example, is expected to jump six-fold by 2030 compared to rates in 2006, along with a four-fold growth in the demand for milk. In Niger, urban appetites for beef are expected to triple during that same period. In Nigeria and Cameroon, the rapid rise in demand for dairy products is far outstripping the local supply, resulting in a massive dependence on imported milk.

Known as the 'livestock revolution', this trend is radically reshaping the economic landscape for small-scale livestock keepers, who stand to profit significantly from the booming demand for their products—but only if they can boost the supply and quality of the meat and milk they provide. In Nigeria and Cameroon, where local milk production satisfies only a tiny fraction of consumer demand, cattle keepers are using artificial insemination to cross



Comparative studies in Nigeria suggest that efforts to improve the milk yields of White Fulani cows, without resorting to cross-breeding, may reap considerable benefits.

breed their White Fulani cows with that powerhouse of milk production, the European Friesian (known as Holsteins in North America). The goal is to create mixed breeds that combine the hardiness of the indigenous animals with the high dairy yields of the exotic ones. Likewise, herders like Ardo Saidou in Cameroon are letting the White Fulani interbreed with Red Fulani and Gudali cattle in the hope of boosting their size and meat production, while retaining the White Fulani's more resistant traits.

The desire to intensify the productivity of indigenous animals is acute, and understandable given the rapid increase in consumer demand. But doing so through hybridization with other breeds is also creating what some researchers call a 'silent threat' that is diluting—and could potentially decimate—the White Fulani's distinctive genetic make-up. Incentives to encourage the preservation and within-breed improvement of the White Fulani are urgently needed to complement efforts to develop more productive animals through mixed breeding.

Comparative studies in Nigeria suggest that parallel efforts to improve the productivity of White Fulani cows, without resorting to crossbreeding, may reap considerable benefits. Findings suggest that White Fulani cows can produce as much or more milk than White Fulani-Friesian crossbreeds when the cattle are kept under similar conditions (plenty of nutritious feed and good veterinary care). Moreover, the purebred White Fulani cows have shorter dry spells between births, producing calves, and thus milk, at much shorter intervals than the Fulani-Friesian mixes.

'Though livestock keepers feel more competitive with imported genes, the fact is that there is more than one pathway to sustainable intensification for livestock producers,' explains Jimmy Smith, director general of the International Livestock Research Institute (ILRI). 'The challenge is to produce incentives, investments and enabling policies that will support multifaceted approaches that capitalise on the benefits of each.'

White Fulani among Gudali and Red Fulani at Koutaba market in Cameroon waiting for buyers to arrive





Nganda

Uganda

Nganda

Nganda cattle have long been an integral part of the mixed crop-and-livestock farming system of the villages found in the fertile, well-watered hills west of Kampala, the Ugandan capital. The people there value these hardy animals for the milk, meat, manure and draught power they bring to the local farming system, adding to the cultivation of bananas, sweet potatoes, maize, beans and vegetables, along with some cash crops such as coffee. Many households keep a small herd of 5 or 10 cattle, tethered in the compound unless they are out grazing. The Nganda are adaptable animals, easy to keep, and they are regularly seen on the roadside feeding on grass verges and food scraps. In addition, they are highly prized for their tolerance to drought and diseases.

Nganda cattle are integral to the crop-livestock farming system in the environs of Kampala

But the very existence of the breed is threatened. It is a story duplicated throughout Africa—in a period of unprecedented economic, social and demographic upheaval, attention is shifting away from traditional breeds and farming practices towards more immediate solutions to the challenge of food security. As the population of Kampala and its environs increases, and as economic pressures lift land prices, local farmers have to adopt more productive and cost-efficient practices. For these mixed crop-livestock farmers, it seems sensible to import exotic temperate breeds, such as the Friesian and Jersey, and crossbreed them with the Nganda to produce a cow that yields more milk under this more intensive management and so the Nganda is being rapidly displaced.



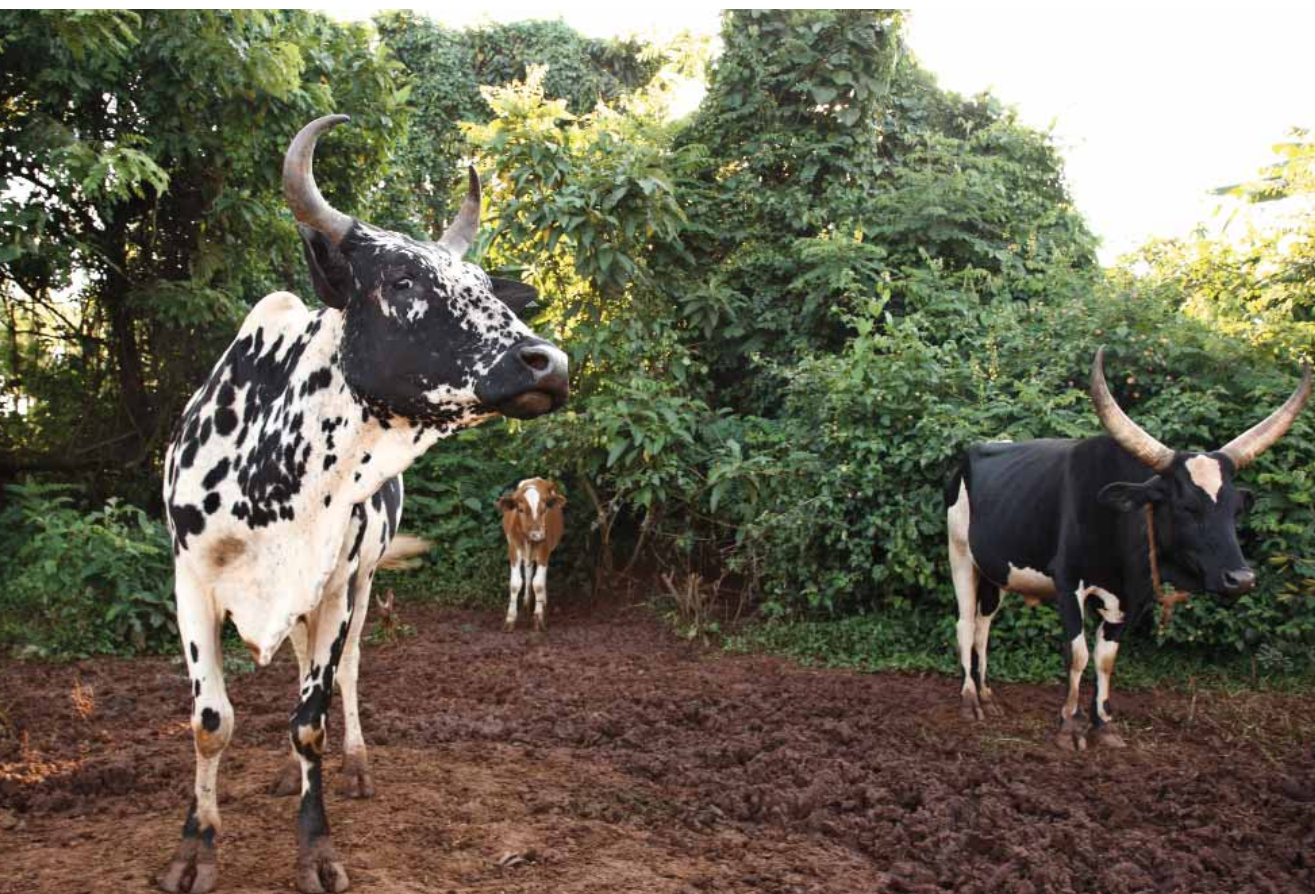
BREED: NGANDA

Also known as Sese Island, Nyoro, Kyoga, Nsoga, Serere and Toro.

Location: Central Uganda, north of Lake Victoria (including around Kampala) and between Lakes Kyoga and Albert; also found in the tsetse fly-infested area south of Lake Albert and east of the Semliki River.

Origin: Developed from the interbreeding of small eastern Africa zebu in Uganda (mainly the Nkedi) and Ankole Sanga populations (mainly the Bahima). Interbreeding has been going on since the 17th century.

Description: Longish horns, small hump, and moderately sized dewlap; coat colour variable, with red, black and brown being the most common; used for milk, meat and draught power.



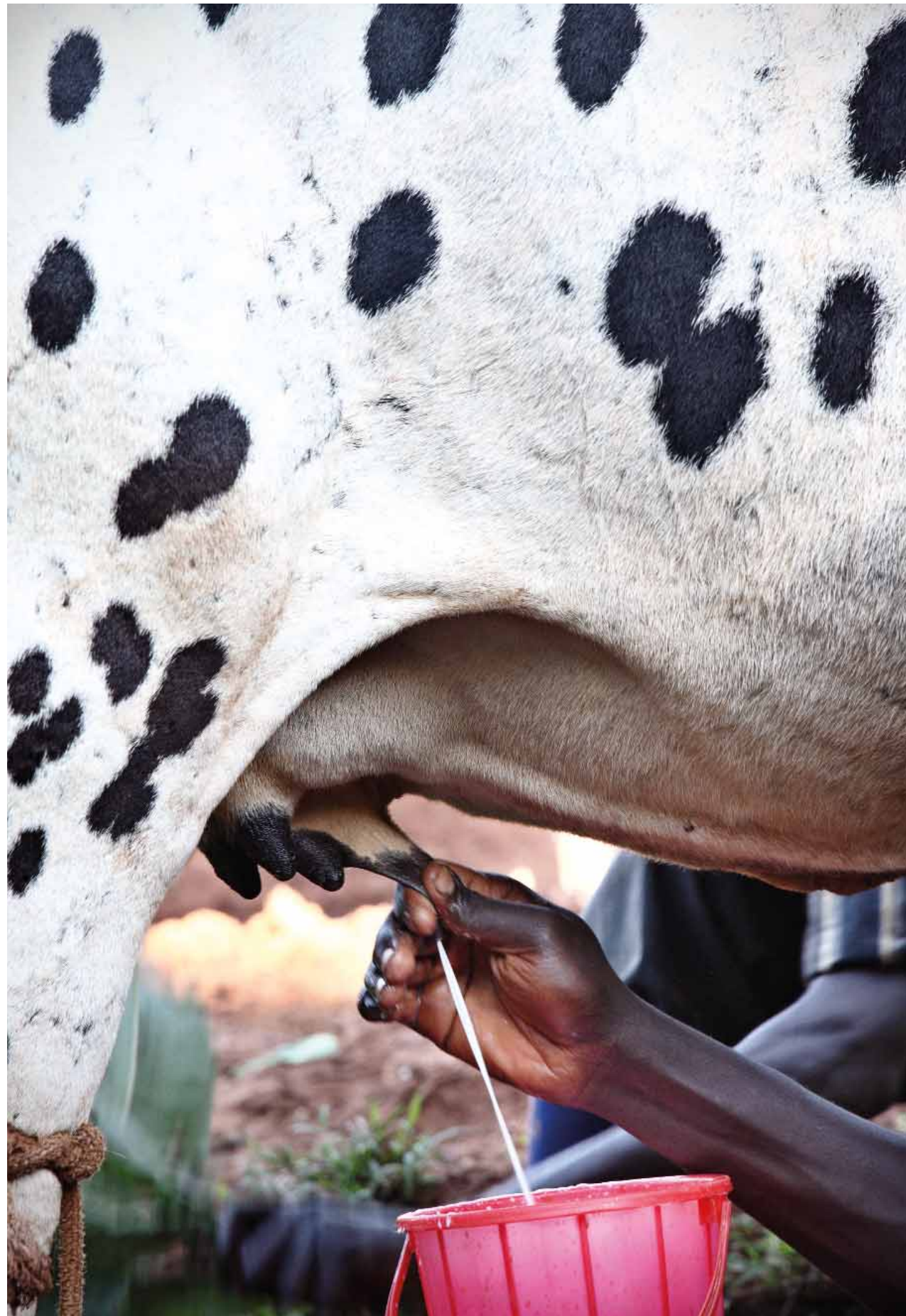
Cows and crops in the traditional farming system

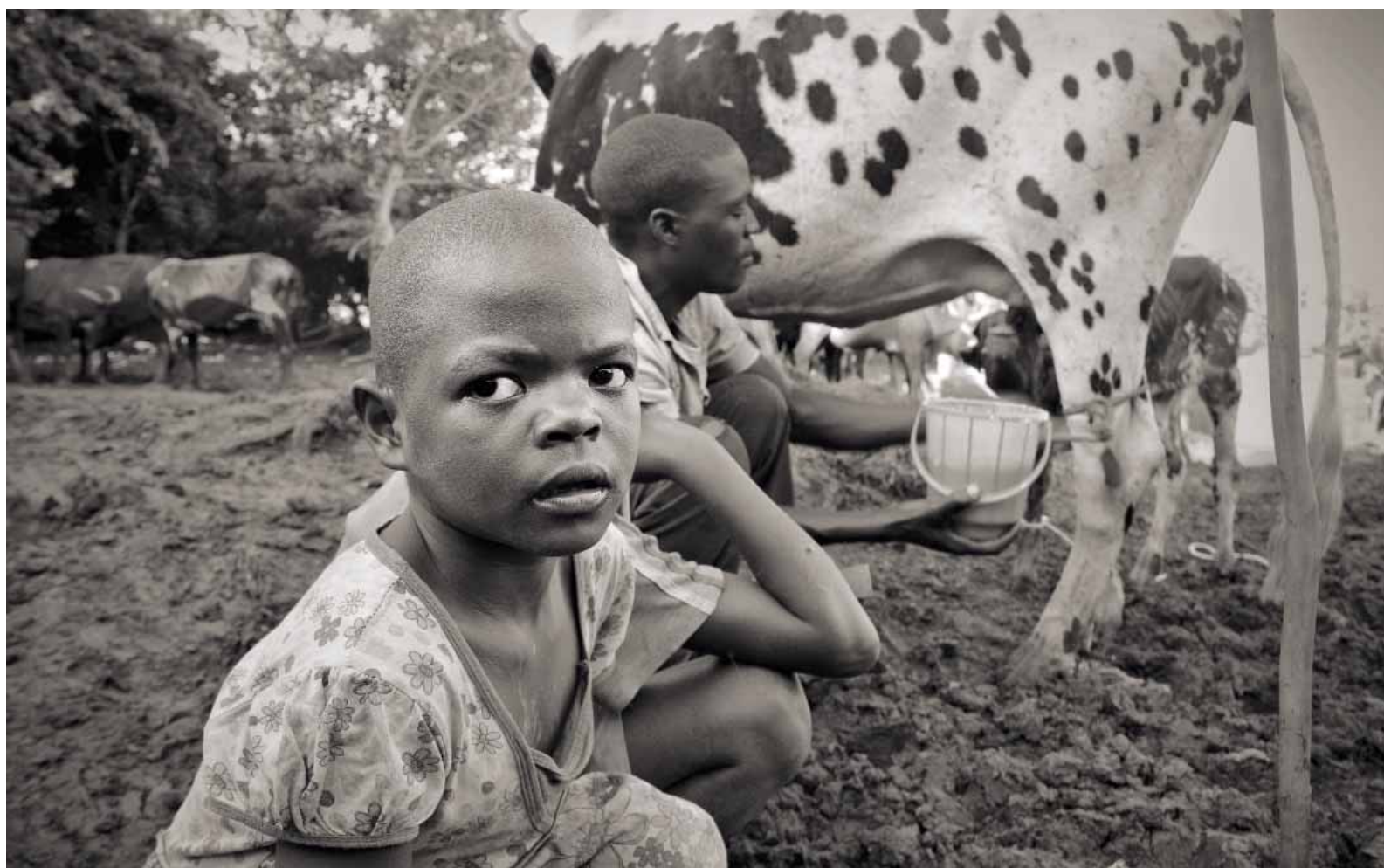
In the village of Katende, west of Kampala, Father Njala—a Catholic priest—was given one Nganda cow by a parishioner when he started his pastoral mission. Now, 25 years later, he has gradually increased the stock on his small farm to about 40 cattle, a big herd for this locality. A hired herder takes the cattle to graze during the day on nearby riverine or hillside pastures, often in the company of other herds. During the night the cattle are paddocked in the farmstead. They are milked in the morning before leaving for the pastures, and in the evening when they return. The milk is considered to be nutritious, with a good smell and flavour. Some is kept for family use, while the surplus is sold in local markets.

The farm also has five acres of land under crops, including sweet potatoes, beans, bananas and cabbages. Crop residues, such as banana peel and sweet potato vines, can be fed to the cattle. Their diet is also supplemented by mineral blocks, which the cattle lick to obtain a variety of minerals vital to their welfare, including calcium, phosphorus, magnesium, sodium and potassium.

The Nganda herd has been of great benefit to Father Njala and his family over the years, with the sale of cows providing capital to educate the grandchildren of his mother, one of whom became a veterinary doctor. And to ensure that the herd could still be looked after while the menfolk were away, the grandmother, now in her eighties, has attended regular training workshops in Kampala on cattle management.

At an average of only two litres per day, Nganda cows are not big milk producers, but the breed is highly prized for its tolerance of drought and diseases





This young boy's education may depend on the sale of his family's Nganda cows

An opportunity arose to further knowledge on the Nganda when the breed was selected as part of a regional research project, supported by the Association for Strengthening Agricultural Research In Eastern and Central Africa (ASARECA)

MIGRATION: A KEY SURVIVAL MECHANISM

Efforts to preserve the Nganda and increase their productivity have been hindered by lack of data on the breed and its attributes, says Donald Kugonza, animal science professor at Makerere University. An opportunity arose to add to the knowledge about the Nganda when the breed was selected as part of a regional research project aimed at developing an inventory of selected breeds and enhancing their conservation; the project was supported by the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA).

The study concluded that farmers should be sensitised to the value of maintaining indigenous cattle breeds, including the Nganda, which tolerate adverse weather conditions and are adaptable to climate change, and that

such breeds should be improved by way of a community-based breeding scheme. The study also noted that more training was needed on the types of diseases affecting livestock productivity and how they are best treated.

Based on these findings, a community-based breeding scheme was put in place. Farmer training sessions were held at the subcounty level on breeding management, record keeping, and nutrition and health; farmers keen on keeping Nganda cattle were organised into cattle farmers' associations in Busaana, Kayonza and Kiringente subcounties.

The breeding scheme was bolstered by the introduction of 10 elite yearling bulls procured from the Nganda herd kept at the National Livestock Resources Research Institute at Namulonge. The bulls were distributed to selected farms, with neighbouring farmers given free access to the bulls to service their cows.



The Nganda under threat

The small quantity of milk produced by the Nganda cows—not much more than 2 litres per day—is sufficient for a subsistence farming operation, but not enough to satisfy the demands of a rapidly growing local market. Higher market demand for milk and meat (as well as other agricultural products) is raising the status of local farmers, and this change is often accompanied by a move to better-performing breeds. This move is made much easier by the wide availability of artificial insemination for Friesians and other exotics.

However, even ambitious, market-oriented farmers will often keep some purebred Nganda, despite the challenges. There is affection for the breed, and it gives a measure of security compared to the more fickle Friesian crossbreeds, which are fussy eaters that are subject to tick infestations and cannot walk very far. Compare that with the Nganda, which can be grazed in the valley pastures all day long. Still, with increasing urbanisation and commercial development, good-quality grazing lands are becoming ever more scarce, and even the most committed advocates of the Nganda are finding it difficult to sustain their herds.

The small quantity of milk produced by Nganda cows—only about two litres per day—is enough for subsistence, but insufficient to meet the demands of a growing market economy.

The well-proportioned Nganda cow displays characteristics of both the zebu and sanga cattle types

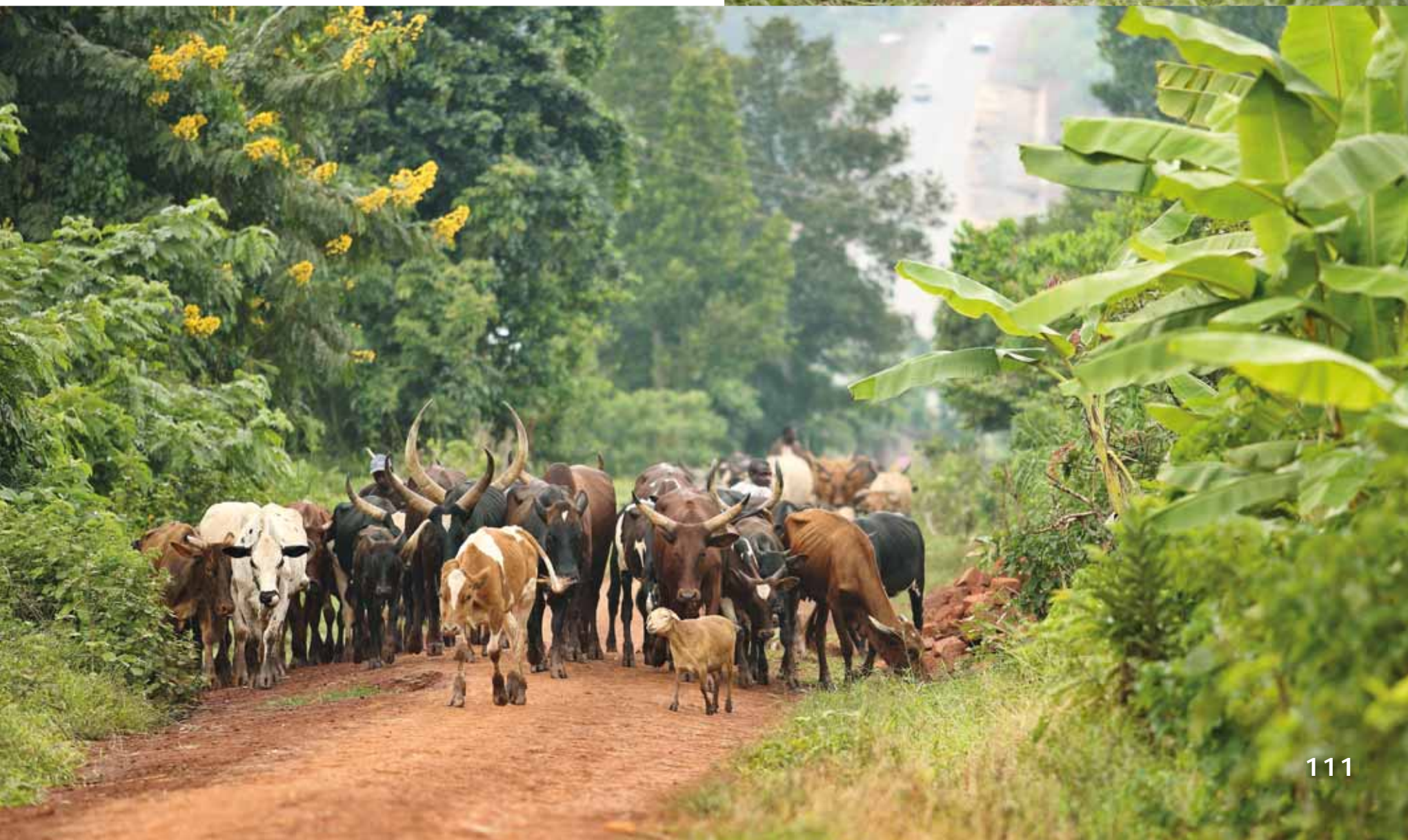


Future of the Nganda

The Nganda is the ‘forgotten breed’ of Uganda. With the focus on preserving the Ankole and other high-profile breeds, the Nganda has been in danger of slipping into obscurity. This is not due to disdain for the breed—it is still held in high esteem by its keepers—but rather because of changes in socioeconomic and commercial circumstances that are leading to crossbreeding aimed at increasing milk production.

Despite this response to changes in the market, a community-based breeding scheme holds out hope for the future and is promoting renewed recognition of the value of the breed through a combined program that integrates education with awareness creation, health interventions, and improved management and breeding.

This verdant landscape is well suited to supporting a mixed crop-livestock farming economy





Turkana

Kenya

Turkana

The Turkana tribe refer to themselves as the 'people of the grey bull', recalling the legend that they made their way into the remote stretches of northwestern Kenya in pursuit of an unruly animal of that description. With their large frames and beautifully mottled coats, Turkana cattle dominate the region's dusty hills and plains, as well as the lives and livelihoods of the Turkana herders. Considered to hold a higher place in the eyes of Akuj (God) than do people, cattle are the true measure of wealth and status among the Turkana herders, whose language has no words for rich or poor but does have terms to distinguish between a person who has many animals, just a few, or none at all.

Turkana cattle descend from the large East African zebu, and their ability to regulate their body temperature means they are particularly well adapted to withstand the heat and inhospitable terrain of Kenya's dry north. The animals can endure long migrations on little water and will dig with their hooves into the beds of dried-up rivers or lakes to find water during dry periods. The cattle are very efficient at converting poor pasture into milk and meat, which allows their keepers to thrive in the forbidding environment.

But the future of the large Turkana herds is in question. Years of failing rains, an endless pattern of violent human conflicts, and growing population pressures are pushing the Turkana people and their cattle to the brink, threatening the survival of their pastoral system and reshaping their futures.

A Turkana cow displays the prominent hump and dewlap that characterize zebu-type cattle



An ancient heritage now shrouded in dust

The area inhabited by the Turkana pastoralists is part of the East African Rift Valley, known as the 'cradle of mankind' due to its rich archive of human fossils. Archaeological sites near Lake Turkana have yielded hominin remains dating back millions of years, and some excavations have provided evidence for the development of complex societies and the advent of cattle herding in western Turkana some 12,000 years ago.

BREED: TURKANA

Location: Maintained by the Turkana tribe, on the western side of Lake Turkana in northern Kenya.

Origin: The breed originated in Ethiopia and is descended from the large East African zebu, first introduced from Asia around 2,000 years ago by seafaring Indian and Arab merchants.

Description: Large framed, with a dome-shaped hump, dangling dewlap, and short to medium-length horns. Often white, sometimes brown, grey or black, with intricate speckled or mottled patterns. They have strong hooves and light bones for trekking long distances, and can survive on poor pasture and scarce water. Used for milk, blood and (less commonly) meat or leather.



By comparison, the Turkana people and cattle who inhabit the area today are mere newcomers. Originating in present-day Ethiopia, the herders and their animals migrated in the early 17th century to the Karamoja area of what is now northeastern Uganda, before moving on a few centuries later to settle along the western side of Lake Turkana. The Turkana people have largely maintained the pastoralist lifestyle of their ancestors, and are considered to be great survivors. They have endured the region's harsh conditions for generations by using an

intricate system of livestock management that involves splitting herds among family members and moving from one semi-permanent settlement to another when pasture or water resources are scarce.

Since the mid-2000s, however, the frequency and severity of droughts in the Turkana region have reached levels beyond living memory. The usual bimodal rain pattern of the area, with wet seasons in March-May and again in October-December, has all but disappeared, leaving a lunar-like

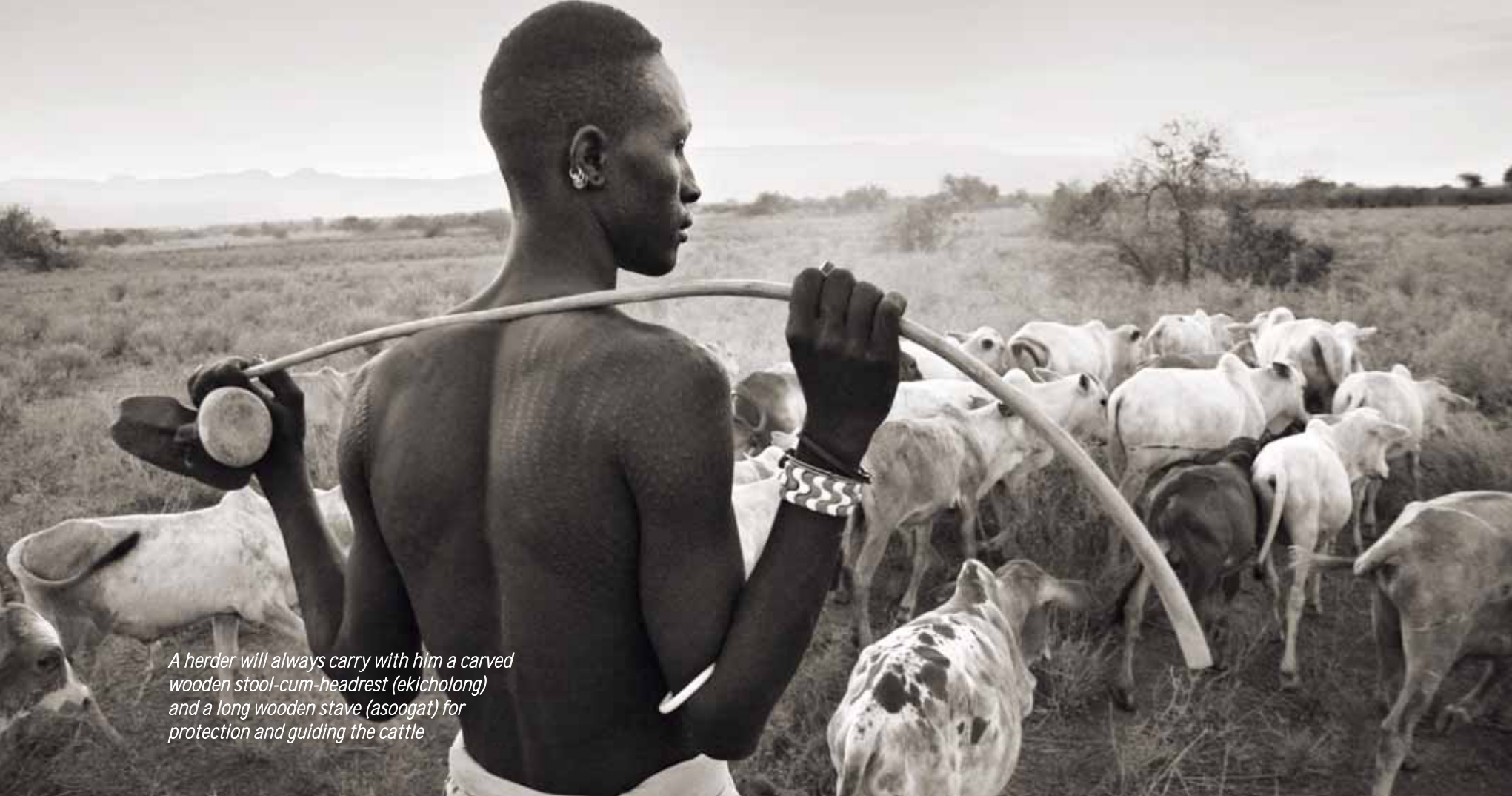
terrain covered in dust and scattered with sharp volcanic rocks and sparse vegetation. When the rains do fall, their irregularity and unpredictability frustrate even the most seasoned pastoralists.

'Twenty years ago, the grass here grew knee high,' says an older herder, casting a sad eye across the barren landscape of Kokuro, Kenya. 'But now, without rain, there is no pasture.' The daily trek to find grazing land, he says, is growing longer, with cattle and herders often returning well after dark.

The Turkana people have largely maintained the pastoralist lifestyle of their predecessors, and they are distinguished as being great survivors.

Shrouded in a cloud of dust, Turkana cattle make their way to a watering hole across the barren, volcanic terrain





A herder will always carry with him a carved wooden stool-cum-headrest (ekicholong) and a long wooden staff (asoogat) for protection and guiding the cattle





From arrows to AK-47s

Livestock raids have long been part and parcel of life for the Turkana herders who, like many other pastoralist groups, hold traditional beliefs that all cattle belong to them by natural right. Skirmishes with rival tribes, such as the neighbouring Pokot of Kenya, the Merille (or Dasanach) from Ethiopia and the Samburu from the eastern side of Lake Turkana, have traditionally served as a means to build up and restock herds, or to exact revenge for previous raids.

Milking a cow at daybreak, a Turkana woman wears heavy layers of necklaces, which mark her wealth and beauty. They are only removed in times of mourning



Older herders recall a time in Turkana when grass was abundant and droughts less frequent

But as the tribesmen's spears and arrows have given way to automatic weapons, the impacts of cattle raids have escalated dramatically, leading to countless deaths and a vicious cycle of attacks and counterattacks so deeply rooted that no one remembers their origins. Significant losses of human lives and the reduction of livestock numbers are resulting in greater food insecurity and physical hardship among Turkana herders; this in turn is leading to forced migration and the further marginalization of a population that already lives on the edge—not only geographically, but also socially and politically.



From herding to hybrid pastoralism

Constant pressures from climate change and human conflict are continuously undermining the Turkana herders' traditional coping strategies, driving them to adopt new practices that are redefining their survival tactics and very way of life. Though strongly bound to their pastoralist identity, the Turkana are slowly diversifying their livelihood activities and adopting a system of 'hybrid pastoralism' that blends livestock keeping with other activities, such as cottage industries (for example the sale of wild fruits, handicrafts or charcoal), fishing, crop production or alternative employment.

As the sun sets, skittish Turkana calves gambol inside the fenced stockade

Though strongly bound to their pastoralist identity, the Turkana people are slowly diversifying their livelihood activities and adopting a system of 'hybrid pastoralism' that blends livestock keeping with complementary activities.



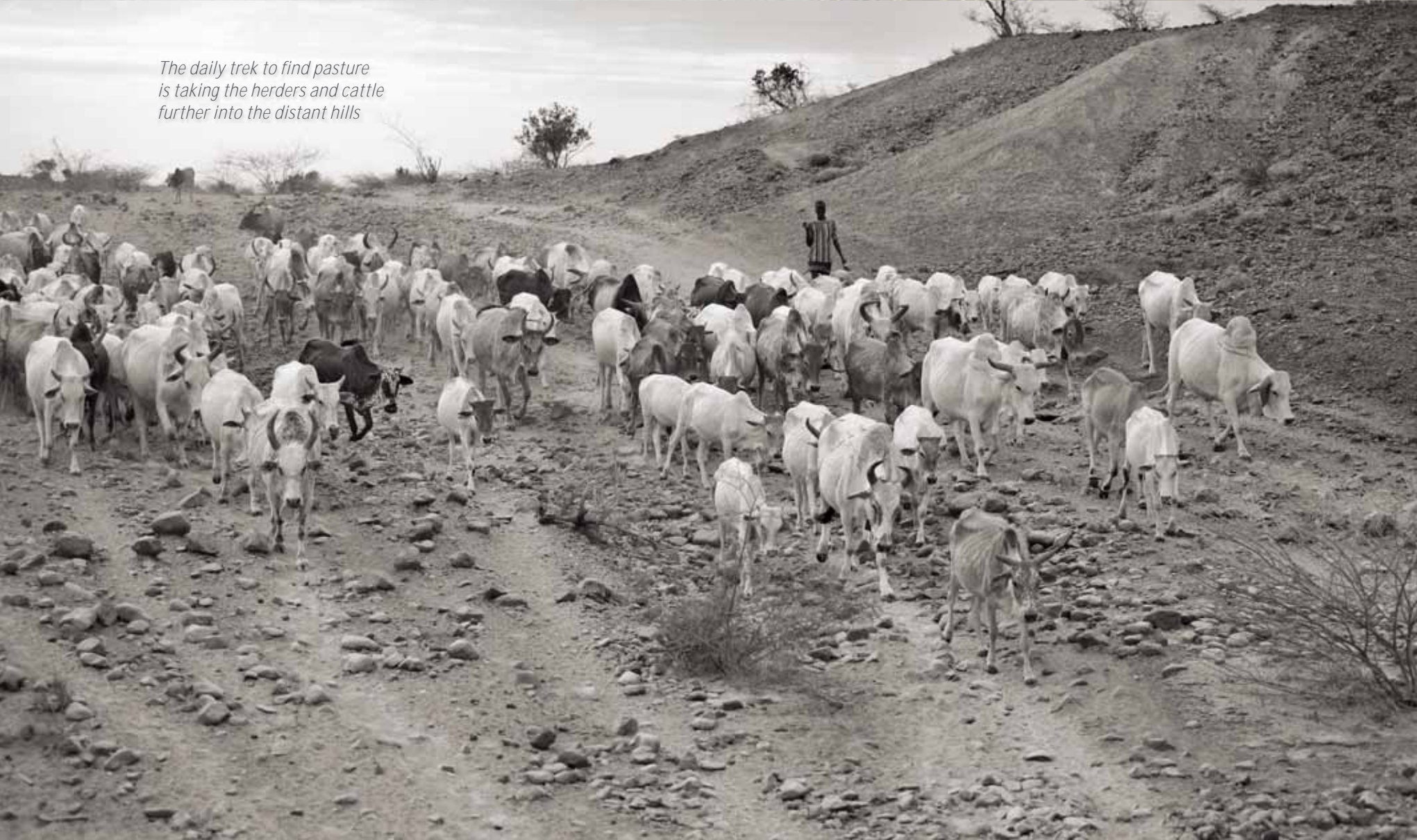
During a visit to the watering hole, Turkana cattle will drink enough to last two to three days, if needed



But the pace of change for the Turkana people and their cattle is accelerating and is likely to overwhelm their ability to adapt. Grave concerns surround the potential impacts on Lake Turkana's water levels and ecosystems of the Ghibe III hydropower dam, currently being built by Ethiopia on the Omo River, which flows into the northern end of the lake and is its primary source of water. In contrast, the discovery in 2013 of a vast repository of underground water in the Turkana region holds promise for alleviating drought impacts. In addition, the recent discovery of substantial mineral oil deposits in the Turkana region could be a curse or a blessing to the Turkana and their livestock. Tapping these resources will require good planning and innovative and inclusive actions in a vulnerable region. This process will involve significant changes for the Turkana people and their livestock.



A dam secures a watering hole for people and livestock



The daily trek to find pasture is taking the herders and cattle further into the distant hills



Improved Boran

Kenya

Improved Boran

The story starts nearly 100 years ago, when the early British ranchers that settled in the Kenyan highlands found that the Shorthorns and other European breeds they imported were ill adapted to tropical environments and soon died. Searching for a local breed with the potential for genetic improvement to satisfy the settlers' demand for milk and meat, the ranchers' attention turned to the Boran of northern Kenya and southern Ethiopia—a sturdy and resilient breed well adapted to local conditions, and with strong herding and mothering instincts. The improvement of the breed, which included retaining a pinch of the exotic Shorthorn genes, was given impetus in 1951 when the Boran Cattle Breeders Society was established in Kenya. The purpose of the Society: to promote and maintain excellence in improved beef production by the breed while retaining its traditional qualities of hardiness and fertility.

With 2,000 pure Boran breeding cows, the OI Pejeta Conservancy has the largest Boran gene pool in the world. A quarantine area and embryo transfer centre were constructed in 1992, and embryos, semen and live animals have since been exported to Zimbabwe, South Africa, Uganda, Tanzania and other destinations in Africa.

In a scientifically managed enterprise, the numbers on the cows' haunches provide immediate information on the identity, date of birth and lineage of the animal

At OI Pejeta Conservancy, there is an additional dimension. Here, on the high grassland plains of Laikipia in central Kenya, the cattle share the rangelands with an array of wildlife, including herbivores and the carnivores that prey on them. The integration of wildlife conservation and tourism with commercial livestock production has proved an enlightened and successful approach that is increasingly being emulated elsewhere.

The Improved Boran bull—muscular and well proportioned, yet docile and easily managed



BREED: IMPROVED BORAN

Location: Commercial ranches of the semi-arid uplands of central Kenya, including Laikipia county.

Origin: Ethiopian Boran cattle that migrated or were traded into northern Kenya were taken up by British settlers in Kenya and genetically improved for beef production, giving rise to the Improved Boran breed.

Description: Large zebu-type cattle, with prominent hump and dewlap; an excellent tropical beef breed.





This calf already displays attributes that mark it as a potential high-quality bull—well-developed, beefy back and hindquarters, bean-shaped hump positioned over the forelegs, impressive reproductive attributes, wide muzzle for efficient grazing, good overall shape and build



The prominent hump and dewlap signal the profile of a classic zebu bull. At OI Pejeta the horns are polled, though around 20% of animals are naturally without horns

OI Pejeta Conservancy Livestock and lions, herders and tourists

On 350 square kilometres of grassy plains and acacia woodland, OI Pejeta challenges the traditional view that game parks and cattle ranches are strictly separate enterprises. Until the 1970s, OI Pejeta was a fenced-off system devoted purely to cattle ranching, but an influx of elephants and other wildlife prompted a management rethink, resulting in the establishment of the Sweetwaters Game Reserve in the 1980s, and the gradual development of a symbiotic environment that successfully integrates wild animals and domesticated livestock. In this

Until the 1970s, OI Pejeta was a fenced-off system devoted purely to cattle ranching, but an influx of elephants and other wildlife prompted a management rethink.

system, wildlife are seen as financial and ecological assets rather than as a threat to the grazing and health of the cattle, and the combination of cattle production and tourism provides more income and better security against production or market fluctuations.

Furthermore, new scientific evidence, much of it developed at OI Pejeta, shows that cattle can be used as an ecological tool to manage the rangelands, maintaining biodiversity and encouraging fresh grass growth through controlled grazing.



In the early morning light, cattle eagerly head out of their protective enclosure for a day of grazing

'The cattle go where we want, and the wildlife come in behind,' explains Giles Prettejohn, livestock manager at the conservancy.

Throughout the conservancy, cattle graze freely alongside buffalo, antelopes, zebra and other herbivores of the grassy plains. While the breeding centre—comprising the 300 registered cows and their followers, and the breeding bulls—is securely fenced to exclude predators, various methods have to be employed in the predator zones to safeguard the cattle.

Throughout the conservancy, cattle graze freely alongside buffalo, antelopes, zebra and other herbivores of the grassy plains.

The total stock of 6,000 cattle is divided among 100 herders who are given incentives to protect the cattle, including gifts of cows for their own herds if they keep losses below an agreed limit. The conservancy has also developed portable paddocks (called 'bomas') that are constructed of metal sections and in which the cattle are secured at night. Even with these precautions, about 1% of the herd is lost to predators each year. But the tourists pay good money to see the lions and other carnivores, so it is an acceptable and sustainable loss.

The Improved Boran 'An incredible animal'

Giles Prettejohn is an avowed enthusiast of the Improved Boran breed. 'It is an incredible animal,' he says, as he outlines its strengths: drought and disease resistance, high fertility rates (producing a calf a year), rapid calf growth, strong maternal and protective instincts that ensure a high survival rate for calves, docility and ease of handling, and the ability to walk and graze simultaneously (up to 20 kilometres a day) which allows them to make full use of available pastures. In addition, the breed is tolerant of heat and is able to continue grazing while exotic breeds seek shelter during the heat of the day.

Improved Boran
bulls weigh in at an
impressive 700 kilos,
compared to the
450 kilos of a typical
indigenous bull.

'They are a winner. You can turn rough grazing into good beef,' says Prettejohn. The calves are weaned at eight months, and the target is for each cow to produce 50% of its body weight at weaning each year—so a 400-kilo cow should yield a weaned calf that weighs about 200 kilos. The bulls weigh an impressive 700 kilos, compared to the 450 kilos of the indigenous bulls. But Prettejohn stresses that in the dry local conditions, grazing efficiency is more important than size: 'We don't want cattle so large that we have to supplement their feeding,' he explains. 'This is a commercial enterprise.' Consequently, the larger and smaller calves are culled, with about 60% of the calves being kept for breeding purposes.

*Improved Boran are efficient
converters of rough grazing
into good beef*



*A Boran bull
with good overall
shape and build*

The priority is commercial beef production—the highly nutritious milk is used only to nourish the calves. Up to 25% of the herd is slaughtered on the farm each year, with the carcasses delivered principally to the voracious and discerning Nairobi market, where the high-quality, well-marbled beef of the Improved Boran is in great demand. The Improved Boran blends well with other breeds for both prime beef and profitable milk production. 'If there is an all-round cattle breed from which a perfect tropical synthetic breed can be developed, the Improved Boran is it', says Okeyo Mwai, a principal scientist at the International Livestock Research Institute (ILRI).



*Cows and calves are corralled
overnight for security*



Improved Boran

A model for the future of African indigenous breeds

The success of the Improved Boran breeding program in Kenya has attracted considerable attention and clearly demonstrates a replicable model for the preservation, improvement and commercial development of indigenous breeds throughout Africa. There is a growing realisation that improving the productivity, quality and value of indigenous breeds can be achieved by combining long-term genetic selection with sound management, while at the same time preserving the unique traits that have made them so valuable to the local communities that keep them. In addition, integrating cattle ranching with wildlife tourism offers hope for the sustainable conservation of wildlife on a continent where commercial interests and environmental conservation are too often viewed as mutually exclusive.

Long-term genetic selection, accompanied by sound management, can lead to sustained improvements in the productivity, quality and value of indigenous breeds while preserving the unique, adaptive traits that make them so valuable to the local communities that keep them.

On the acacia-dotted high grassy plains of Laikipia, Improved Boran graze alongside zebra and other herbivores





*A magnificent Improved
Boran bull in majestic stride*



The model of integrated cattle ranching and wildlife tourism offers hope in a continent where commercial interests and environmental conservation are too often viewed as mutually exclusive.



Orma Boran

Kenya

Orma Boran

Orma cattle are kept in vast herds, and with their light colouring tend to be difficult to distinguish from both the arid landscape of southeastern Kenya and each other. But ask a young Orma pastoralist to identify their cattle among a crowd of hundreds, and they will pinpoint them in an instant.



Cattle ownership is paramount to the Orma people, semi-nomadic herders living in eastern Kenya. It is so deeply embedded in their culture that ownership begins shortly after birth. When a child is but a week old, he or she is bestowed with a cow and the right to keep all of its future offspring, promising the beginning of a herd that will define the child's marriageability, sense of belonging and social status within the community. Even as prolonged droughts and disputes over land use increase the pressure on the Orma's traditional pastoralist system, these proud and stately livestock keepers maintain an unwavering attachment to the small Boran cattle that carry their name.

The beards of the tribal elders are often dyed with henna





A newborn calf is nuzzled by its mother; Boran cows are renowned for their fertility and strong mothering instincts

BREED: ORMA BORAN

Also known as Tanaland Boran

Location: Southeastern region of Kenya, Tana River, where they are herded by Orma pastoralists.

Origin: Descended from the large East African zebu and evolved from the Ethiopian Boran cattle that migrated into present-day Kenya and Somalia during the 15th century.

Description: The smallest of the Boran breeds, typically cream coloured, sometimes grey or light brown, with short to medium-length horns and a prominent hump and dewlap. Easy to manage in bush country due to their strong herding instinct and ability to graze 'on the trot'. Primarily used for milk. Unique among East African breeds for their high tolerance to sleeping sickness (trypanosomiasis).



Masters of adaptation

For more than 600 years, Orma herders and their cattle have coped with the demanding conditions of life in the dry lowlands of Kenya's Tana River region—an area plagued by natural pests, a harsh climate, and human conflicts that range from inter-tribal clashes to international competition for local land resources. Descended from the Borana people of southern Ethiopia, Orma herders have adjusted their pastoralist system to the patterns of drought and flooding of the Tana River basin, demonstrating a skill for adaptation that serves them well in confronting the rapid social, environmental and technological changes engulfing their region.

Orma cattle have inherited the great heat and drought tolerance of their zebu ancestors. Their light coat colours help protect them from solar radiation and, like other Boran cattle, the Orma are built to withstand long migrations and survive on limited water.

One feature, however, distinguishes the Orma breed from other East African Boran types—its tolerance of trypanosomiasis (sleeping sickness). Trypanotolerance is a trait more often associated with some humpless *Bos taurus* cattle of western Africa, which arrived on the continent long before the humped *Bos Indicus* lineage from which the Orma Boran are descended. However, through natural selection over generations of living in tsetse fly and trypanosomiasis-infested areas, Orma Boran cattle developed a degree of trypanotolerance which far surpasses that found in other East African Borans.

Standing wealth or tumbling investment?

'One pastoralist started with 121 cattle and ended up with only 18,' he adds. 'Losing your livelihood in that way, it's like being robbed.'

Cattle ownership confers social standing among the Orma. 'Having a herd of more than 20 animals means that you are somebody,' explains Robo Mohamed Alio, a pastoralist who commands significant respect due to his large herd of over 200 cattle, worth up to USD 500 each.

Although cattle represent a sizeable store of wealth and potential source of income, Orma herders are reluctant to sell or sacrifice them other than for a major life event (for example, a wedding)

or to cover large expenses, such as for urgent medical care.

Holding on to large herds of cattle can also be a costly gamble when conditions are as devastatingly dry as they have been in recent years. 'From 2009 to 2011, we had a prolonged drought, and herders lost half or more of their cattle,' says Abdi Habana Issack, the headman in his community, who has considerable wealth tied up in his own herd of more than 150 cattle. 'One pastoralist started with 121 cattle and ended up with only 18,' he adds. 'Losing your livelihood in that way, it's like being robbed.'



As the dry season progresses and grazing becomes sparse, the Orma will start to move their cattle towards the lush grasslands of the Tana Delta



Orma Boran cattle stand out among East African breeds for their high degree of trypanotolerance



*Large herds, gathered here
at a watering hole, signify
substantial wealth*





Negotiating the forces of change

To help thwart such losses, agricultural extension workers try to convince the Orma herders to reduce their herd numbers before the dry season hits, when the animals are well fed and likely to fetch higher prices. The advice is not easily followed but is gaining acceptance amongst the Orma people as the herders adapt to the relentless forces of social and environmental change.

'Now we are more aware of the need to give children an education, and each year we are sending more of them to school,' says Robo Mohamed Alio. 'It is better to use the cattle's worth to educate our children than to see the animals sick or dying from drought.'

'Now we are more aware of the need to give children an education, and each year we are sending more of them to school,' says Robo Mohamed Alio.

These Orma youths show off their calves, which constitute the beginnings of their personal herds



The Orma have also adapted modern technology to their semi-nomadic lifestyles. They use mobile phones, even if it means climbing up a tree to get reception, to contact the milk buyers who purchase the Orma pastoralist's daily supplies of milk; these sales are vital to the community, constituting its primary source of income. The buyers collect the milk each day, riding out to the herders on their motorbikes, even when the herders are on the move. The mobile phones used by the herders' show milk buyers where they are, and enable the parties to negotiate prices and quantities before they meet.

An Orma herder communicates via mobile phone with a vendor, who will make his way through the bush on his motorcycle to collect milk from the Orma encampment



*Young Orma girls typically
look after the goats*





An Orma woman milks a cow at dawn

Livestock development and economic development Can they be aligned?

The Orma rangelands (or *chaafa*) around the Tana River Delta are facing both natural and human-induced threats. Rainfall is increasingly unreliable, soils are sandy and saline, and invasive mesquite trees are blocking sunlight and reducing the growth of the grass. Meanwhile, local and foreign investors are scrambling to reap potential riches from the area, encouraged by the national government's efforts to stimulate economic development in a region known to be one of Kenya's poorest. Tens of thousands of hectares are slated for sugar cane plantations, biofuel production, and oil and gas prospecting, among other schemes. The stage is set for irrevocable changes that will surely affect both the human and geographical profile of the region.

The question for the Orma pastoralists, threatened by displacement and climate change, is how to align livestock development with economic development so that they can boost the productivity of their indigenous cattle and ensure the future of their pastoral system. It is a question that also touches cattle breeders on a far broader level, as the fast-growing and trypanotolerant Orma Boran cattle are ideal candidates for breed improvement. Their unique genetic pool is a valuable asset that could be used not only for livestock development but also, ultimately, as an important contribution to sustainable economic growth in the region. Innovative use of genomic and reproductive technologies can make Orma cattle more productive, without losing their exceptional resilience.

*The cattle make
their way to the
pastures at dawn*





Brown Atlas

Atlas Mountains of northern Africa

Brown Atlas

The Brown Atlas breed is known by various names: Brune de l' Atlas; Beldi; Blonde des Plateaux; d'Oulmes et des Zaers; Oulmes Blond; Oulmes; Blond Moroccan; Blond Zaers; Moroccan Blond; Libyan Brown Atlas; Libyan Shorthorn, and Mahalli. The breed is indigenous to Libya, Tunisia, Algeria and Morocco. The pure forms of these cattle are found in the Atlas Mountains. At least two varieties of the Brown Atlas have been identified—the Moroccan Brown and the Ouelmes in eastern Algeria, Tunisia and Libya.

BREED: BROWN ATLAS

Common names include Brune de l' Atlas; Beldi; Blonde des Plateaux; d'Oulmes et des Zaers; Oulmes Blond; Oulmes; Blond Moroccan; Blond Zaers; Moroccan Blond; Libyan Brown Atlas; Libyan Shorthorn, Mahalli.

Location: Inhabits the coastal areas of Libya, Tunisia, Algeria and Morocco and specifically the Atlas Mountains.

Origin: These cattle are generally considered to be of *Brachyceros* (Shorthorn) type indigenous to Libya, Tunisia, Algeria and Morocco. The pure forms are found in the Atlas Mountains. At least two varieties of the Brown Atlas subgroup were known, namely the Moroccan Brown, and the Ouelmes in eastern Algeria, Tunisia and Libya; interbreeding among these and other indigenous breeds has reduced their distinctions and at present a general name of Brown Atlas is more recognised.

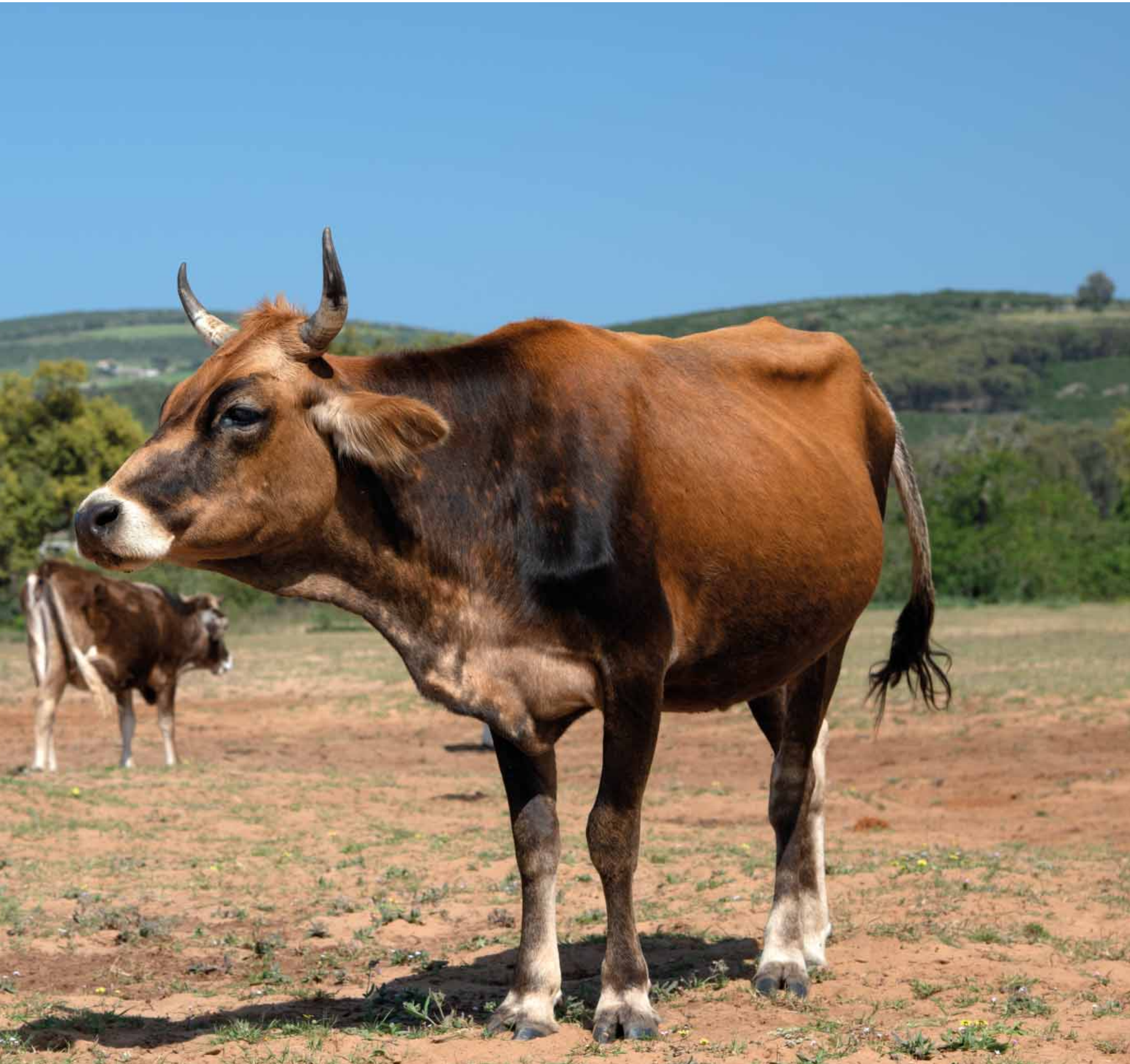
Description: Brown Atlas cattle are sturdy animals with fine limbs, light grey or brown coat color sometimes with a light streak on the top line, short horns with black tips. The steers are docile and good draught animals. Cows weight about 300 kg and bulls can weigh from 350 to 450 kg. Those in Libya were reported to produce about 4 kg/day of milk for ordinary cows and up to 10 kg from good cows.



The Brown Atlas derives its name from its brownish-red coat, and the breed's small size helps it adapt to the mountains and lightly forested areas of its habitat



Brown Atlas cattle in Tunisia are used both for milk and meat, although originally they also provided traction; manure from these animals is used to fertilize crop fields.



However, interbreeding among these and other indigenous breeds has reduced their distinctiveness and the general name of Brown Atlas is now more widely used to describe the breed.

The Brown Atlas is yet another living example of indigenous livestock that have time-tested adaptability to harsh seasonal climates, to limited quantities (and often, poor quality) of forage and feed, and to prevalent diseases and parasites. Decades of persistent pressure from deliberate as well as inadvertent crossbreeding and breed replacement have pushed the Brown Atlas to the edge of extinction. Preservation of these indigenous animals and their genetic resources is essential if the unique traits of the breed are to be sustained for present and future generations.

According to the Slow Food Foundation for Biodiversity, the Brown Atlas cattle in Tunisia are an important source of both milk and meat, although they were also originally used for traction, with their manure used to fertilize crop fields. They have small body sizes, and a dominant coat colour

Brown Atlas cows produce only moderate amounts of milk (4-10 litres/day), but it is of excellent quality: the fat content may even exceed 5%. Brown Atlas meat is tender and highly sought after, mainly for the preparation of couscous, a traditional dish in the region.

Brown Atlas cattle are another living example of indigenous livestock with time-tested adaptability to harsh environments



of brownish-red. The cows weigh about 300 kg and bulls between 350 and 450 kg, making them well suited to arid, mountainous and forested habitats. This breed is able to live on very little and consumes plants that people in the area do not use. The breed can rapidly replenish its reserves in the spring and is easy to breed. The cows have excellent maternal qualities that help ensure the growth of calves even under the toughest conditions.

Cows produce an average of four litres of milk per day, although the best cows can produce up to 10 litres per day. The lactation period can reach 300 days. The low level of milk production is compensated for by its excellent quality: the fat content exceeds 5%. In addition, the meat from the Brown Atlas is tender and highly sought out, mainly for the preparation of couscous, a traditional dish of the region. The decline of this breed began following the intensification and industrialisation of crop and livestock production. The breed's current estimated population in Tunisia is only 500 animals, and better management and utilization options are needed to improve its chances for long-term survival.

Decades of well-intentioned genetic improvement efforts have pushed the Brown Atlas breed to the brink of extinction. Preserving these valuable indigenous genetic resources is essential for keeping the breed's adaptive traits available to present and future generations.



Genetic diversity of the Brown Atlas in Tunisia

Evidence of genetic admixture

To clarify the genetic structure and diversity of three endangered types of indigenous Brown Atlas cattle in Tunisia, detailed genetic analyses were undertaken from the three known populations: The Blonde du Cap Bon (BLCAP), the Brune de l'Atlas Grise (BRATG), and the Brune de l'Atlas Fauve (BRATF).

The results showed that the three populations represent a blend of genetic backgrounds with varying proportions of African and European ancestries. The BLCAP population has a balanced proportion of African and European ancestries while the BRATG has a more pronounced European influence. Both the BRATF and BRATG populations show a substantial presence in their backgrounds of the Brown Swiss breed, but

this influence is much less significant in the BLCAP population. This indicates that there has been gradual movement of Brown Swiss genes into the BRATF and BRATG populations, including more recent transfers as shown by pronounced traits of the Brown Swiss in a few individual animals in the BRATF population.

These genetic analyses indicate that the Brown Atlas populations sampled have an Africa Longhorn taurine origin with a small amount of indicine (zebu) ancestry. This confirms the archaeological evidence that the African taurines were introduced into Africa from western Asia, where they were first domesticated, entering through Egypt and the Horn of Africa in about 5000 BC, while the zebu were introduced later into Africa from Arabia and Asia.



*Mohamed Nefzi and his daughter
Falza, observe the family's Brown
Atlas cross-bred cattle at their farm
in Beja Governorate, northern Tunisia*



Being shy animals, Brown Atlas cattle will typically avoid human contact, preferring instead to graze by themselves on the slopes of the mountains. Calving mothers, however, will seek human help in caring for their young—farmers keep the calves indoors during the day to ensure they get the milk they need, as well as important supplements







Tuli

Southern Africa and Gabon

Tuli

According to the Zimbabwe Tuli Society, it is through 5,000 years of natural selection, mutations and artificial selection under a diverse range of local southern African counties' environment that has resulted in the wide adaptability of Tuli cattle in this region. The Tuli breed is exceptionally well suited to extensive ranching systems. It is able to utilise even the worst quality grazing and still produce top quality meat. The Tuli flourish in sandy, semi-desert areas in Namibia, Botswana, Zimbabwe and many parts of South Africa—from high rainfall and high altitude areas to the Drakensberg Mountains where snow falls regularly;

from the extensive savannah grassland of the Free State to the cold, misty mountains and coastal bush of the Eastern Cape.

Human ingenuity in developing the breed has resulted in this excellent beefy breed, which has several important attributes, according to the Zimbabwe Tuli Breeders' Society: with its exceptional tolerance to high environmental temperatures, the Tuli breed can literally take the heat; Tuli bulls are ready to work at two years of age, and heifers can be successfully served as early as 20 to 24 months of age; Tuli cows rarely have calving problems; and

A Tuli bull lightly soaked by seasonal rain, which falls between November to the end of March—mostly in the afternoons—in much of the Zimbabwe highveld





The rinderpest epidemic of 1896 and subsequent interbreeding nearly wiped out the original Awabowe stock. In the 1940s, the best of the surviving cattle were collected in the Tuli area of Zimbabwe, and these hardy animals became the foundation stock for the Tuli breed.

Most Tuli cattle have golden brown coats, but they can vary in colour from a deep brownish-red to blond



BREED: TULI

Also called Harvey's Cattle, after the settler farmer who back in 1942 assembled the original Amabowe cattle that formed the foundation stock for the Tuli.

Location: Mainly in southern Zimbabwe and neighbouring countries that have commercial farmers; exported first to South Africa, and later to Gabon, Australia, USA, Canada, South America and tropical Zambia.

Origin: Tuli cattle are Sanga-type descendants of the Amabowe or Ngwato Sanga cattle of southwest Zimbabwe, which were originally brought into southern Africa by migrating tribes around 700 AD. This original stock was nearly

wiped out by the rinderpest epidemic of 1896 and subsequent interbreeding. In the 1940s, the best of the surviving Amabowe cattle were collected in the Tuli River area and used to develop an improved Tuli breed that has since spread widely in southern Africa and beyond.

Description: Medium to large body size and good beef-type conformation; mostly golden brown coat; a quarter of whose population is polled (hornless), while the majority have long and occasionally loose horns. Tuli cows are highly fertile and have good mothering ability and low calf mortality. Cows have long longevity and remain reproductively active until as late as 15 years of age.

The Tuli are easy to handle, except for cows with new born calves which indicates good protective mothering instincts; bulls are extremely docile and oxen can be easily used for draught power.

the breed enjoys strong natural resistance to ticks, flies and internal parasites. The short, straight and glossy coat is tough and supple, making it difficult for ticks to latch on or for flies to bite. The animals' long active tails can swat flies away over the length of their bodies. The Tuli breed's long exposure to many African tick- and

fly-borne diseases and parasites has enabled it to develop resilience to stressful grazing environments. Moreover, the Tuli are easy to handle, except for cows with newborn calves, which indicates good protective mothering instincts. The bulls are extremely docile and can be used as oxen for draught power.

The Tuli have a high level of natural resistance to ticks, flies and internal parasites. Their short, straight and glossy coats are both tough and supple, making it hard for ticks to latch on or flies to bite





Development of a wonder breed

Evolution of the Tuli from Zimbabwe to the world

The idea of developing the Tuli breed was first advanced by Mr. Len Harvey, who in 1942 noticed some distinct yellow Sanga cattle amongst the ordinary native stock near the confluence of Guyu Creek and the Tuli River in southwestern Zimbabwe. These cattle seemed better adapted and more productive than the rest of the stock. In 1946, a foundation stock of 20 cows and a bull were purchased from local people by a government research station that was run by Mr. Harvey.

*A Tuli herd huddles together,
grazing at the tail end of
Zimbabwe's rainy season*

The objective was to select and breed bulls that could be used to improve the local stock. Many commercial farmers in the area followed up by purchasing Tuli breeding stock and by 1961 the Tuli Breed Society was formed. When the war of liberation heated up, the whole Tuli herd was transferred to its new home at the Matapos Research Institute, and from there it began its commercial spread to the world.

The Tuli Breeders' Society in Zimbabwe introduced the first Tuli cattle (30 pregnant heifers and three bulls) into South Africa in 1976. The breed quickly gained popularity and in 1994 the Tuli Cattle Breeders' Society was established in South Africa. By 2013, 72 Tuli cattle breeders with about 8,400 head of breeding stock had registered with the Society's Studbook.

The Tuli were introduced in Australia in 1990 via embryo transfer. The country's national science research agency- the CSIRO, worked in collaboration with the Zimbabwe Boran and Tuli Consortium to establish the Tuli breed in Australia. Embryos were collected from purebred registered Tuli donors in Zimbabwe and were implanted into Australian-bred recipients in Cocos Islands.

Many commercial farmers purchased Tuli breeding stock and by 1961 the Tuli Cattle Breeders' Society of South Africa was formed.



Tuli cows have a high fertility rate and good mothering instincts, which leads to low calf mortality; they have been known to breed for up to 15 years or more



The ability of Tuli cattle to produce excellent beef in a wide range of environments attracted the attention of commercial beef breeders in other countries as well. and the breed has gradually spread to the USA, Canada, Argentina and Mexico, and is being used for pure and crossbreeding and improvement operations. Mr. Harvey's insights into the commercial potential of the Tuli breed, supported by standardised selective breeding strategies and championed by the various breed societies, has produced the extraordinary Tuli breed of today.

Despite their commercial spread to many countries, the Tuli are facing serious development challenges at home. The breed has been declining in Zimbabwe ever since the the country's Land Reform Program was instituted, which saw a large number of Tuli breeders forfeiting their farms and studs.

Tuli bulls are docile and oxen can be easily used for draught power





The Tuli has a natural ability to survive and reproduce in environments that range from semiarid desert to sour-veld (pasture), and from hot to cold ambient temperatures

Despite its impressive potential for development and commercial popularity in many countries, in their home country, Zimbabwe, the Tuli cattle are facing serious development challenges. AU-IBAR reports that the Tuli population in Zimbabwe has been declining since the implementation of the Land Reform Programme, which led to a large number of Tuli breeders forfeiting their farms and studs. For example, some of the famous Tuli studs, including the Lebar Tuli Stud that belonged to the family of the breed's founder, Mr. Harvey, were recently disposed of through public auction.

Although Matopos Research Institute, salvaged 58 head (10 bulls, 38 cows and 10 heifers) from this stud, the fates of the rest of the breeding stock are unknown.

The Zimbabwe Tuli Society still has 11 active members, who together have over 2,600 animals registered with the Zimbabwe Herd Book; a wide selection of quality genetic resources can still be obtained by interested breeders.

Although the interest in this breed, remains high, going by the increased number of breeders joining the Zimbabwe Tuli Society, the Society has lost some key members and corresponding studs in recent times. The Society has still 11 active members with over 2,607 animals registered with the Zimbabwe Herd Book and still selecting quality genetic materials. Understandably, this situation requires that the breed status needs constant monitoring in Zimbabwe and beyond.

*A typical Tuli bull weighs as
much as 800 kg or more*





Nguni

Southern Africa

Nguni

The Nguni are robust multipurpose cattle used for milk and meat production, draught power, and for various socio-cultural purposes. Nguni bulls have a rather docile temperament compared to such breeds as the Bonsmara,

Afrikaner, Jersey, Friesland, Simmental and Hereford. This allows them to be used as part of a 'span' or team of draught animals. The passive nature of Nguni cattle also contributes to the production of high-quality meat.

Being smaller at maturity, the Nguni breed requires less grass to sustain itself, and survives nicely on South Africa's available pasture (veldt).



BREED: NGUNI

The Nguni belong to the Sanga group but their actual origins are hotly contested. Nguni cattle derive their name from the Bantu tribes of southern Africa, collectively known as the Nguni people. Nguni cattle came to Africa about 8,000 years ago, and are descended from both *Bos taurus* (humpless) and *Bos indicus* (humped) cattle.

Location: The ancestors of the present-day Nguni of South Africa were brought into the country by the southward migration of the Khoi people from the central lakes area of Africa. These cattle are found wherever the descendants of the original groups of the Nguni people settled, including Eswatini, Zululand and Mozambique. Some of the improved Nguni populations have also been imported into Namibia and Zimbabwe.

Origin: It is often said that the Nguni cattle arrived in southern Africa with the Nguni-speaking people, ancestors of today's Zulu, Xhosa and Swazi people. However, recent research has revealed that the cattle were probably introduced into southern Africa much earlier than originally thought by the Khoisan-speaking people. Linguists say that the click sounds in Nguni languages comes directly from the Khoisan dialects.

Description: The Nguni is a small- to medium-sized cattle breed, depending on the prevailing nutritional conditions; bulls weigh between 500-700 kg and cows 320-440 kg. Its coat is short, fine and glossy, and its hide is well-pigmented, motile and of medium thickness. Nguni cattle are either unicoloured or multicoloured; white, black, brown, grey,

and red varieties can be found. Unimproved animals are small, with withers height of about 105 cm, whereas improved Nguni cattle have heights at withers of 135 cm for bulls and 125 cm for cows.

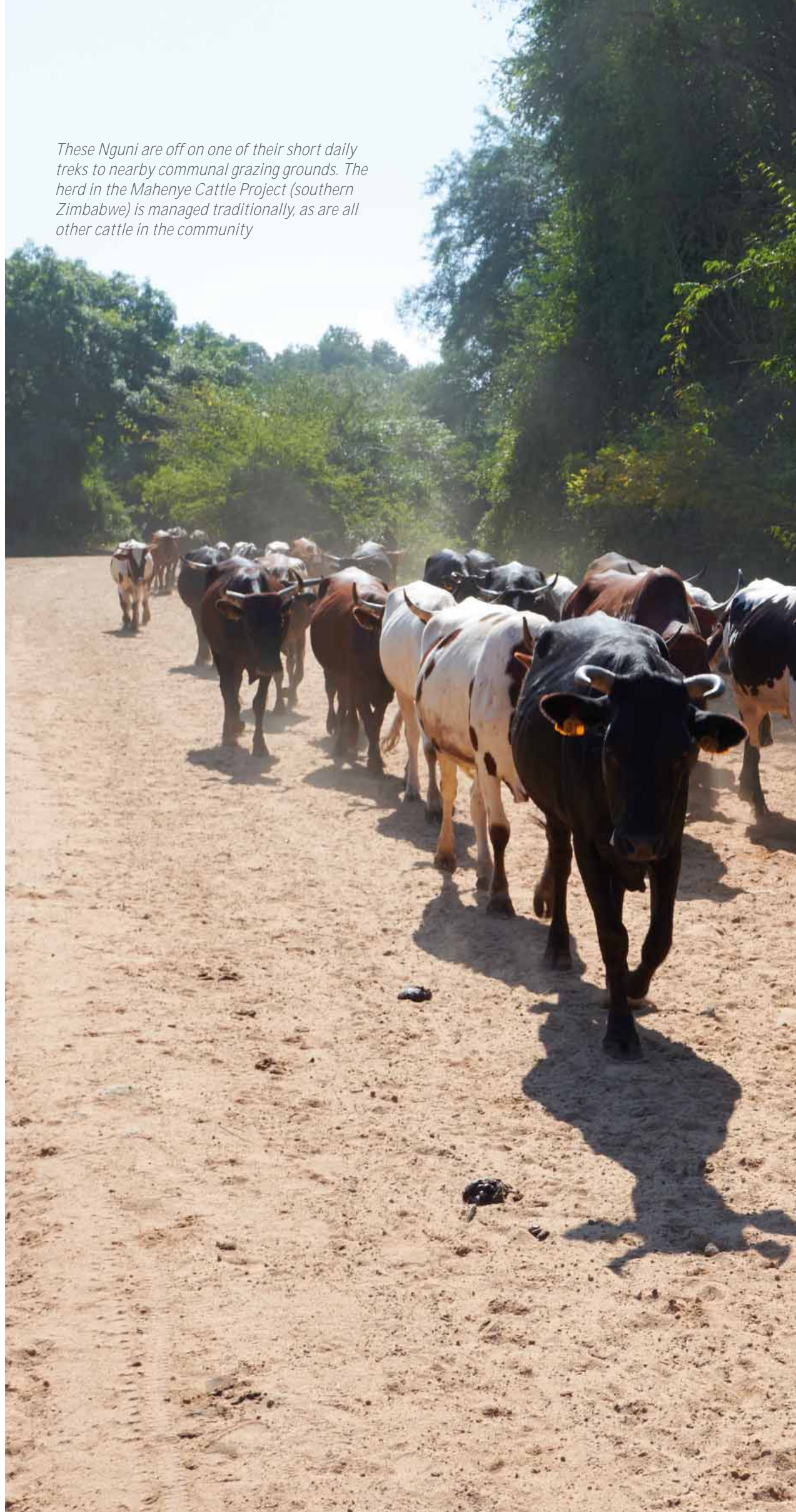


The Nguni are medium-sized animals, have good tolerance to ticks and are resistant to prevalent diseases. Being smaller at maturity, the breed requires less grass to sustain itself and survives nicely on South Africa's available pasture (veldt). These characteristics and the genetic profile of the Nguni breed resulted from a process of natural selection under harsh environmental conditions. Many generations of Nguni survived exposure to climatic extremes (such as high temperatures and drought), as well as internal and external insect pests (such as nematodes and ticks), poor grazing conditions and primitive management practices. This evolutionary history has produced not only a resilient breed of cattle, but one that also has the genetic potential to respond well when reared under optimal production conditions.

Nguni cattle have long productive lives with excellent fertility. Cows have an average reproductive life span of 16 years and an average calving rate of 90% meaning that they calve regularly and typically produce 10 or more offspring over their lifetime.

The Nguni's evolutionary history has produced not only a resilient breed of cattle, but one that also has the genetic potential to respond well when reared under optimal production conditions.

These Nguni are off on one of their short daily treks to nearby communal grazing grounds. The herd in the Mahenye Cattle Project (southern Zimbabwe) is managed traditionally, as are all other cattle in the community







The Nguni herd at the Mahenye Cattle Project in southern Zimbabwe have adequate handling facilities and are kept for the night in a purpose built kraal



The Mahenye community uses their less productive fields for livestock grazing. Pumpkin and corn fields are a favourite for the animals

A new-born Nguni calf gets an antibiotic agent applied to its umbilical cord to prevent infection





A herd forages on a typical Nguni communal grazing field. This field produced a less than satisfactory maize and pumpkin crop, and the cattle are enjoying the remnants



In 1932, the late Professor HH Curzon started breeding Nguni cattle, and his efforts eventually led to the establishment of the Bartlow Combine breeding station in the late 1940s, which was a major milestone in the formal recognition of the Nguni as a valuable indigenous breed. Another such milestone came in 1950, with the publication of the Bonsma Report on indigenous cattle of South Africa. This report highlighted the adaptive and productive characteristics of the Nguni and served to draw further attention to the breed. Still more recognition came in 1985 when the Nguni Cattle Breeders Society was officially accepted as a member of the South African Stud Book and Livestock Improvement Association. Today, there are on-going 'Nguni Cattle Improvement Projects' aimed at upgrading local indigenous cattle in communal areas to the status of 'improved Nguni'; the long-term goal is to expand the availability of Nguni cattle as a beef animal for the lucrative international niche market for organically produced Nguni beef.





The Mahenye community starts teaching its children about cattle and other livestock at an early age. Livestock are at the core of the community's livelihood and often the only means of survival

A trio of new-born calves show the wide variety of coat colours and patterns typical of the Nguni

Some Nguni have sleek plain hides of various hues, but many have patterned coats; no two animals are alike, which makes this breed distinctive from others







Mashona

Zimbabwe and Mozambique

Mashona

The Mashona are a Sanga-type breed—a stable cross between humped (*Bos indicus*) and humpless cattle (*Bos taurus*). Mashona cattle originated with, and derived its name from, the Shona people of eastern Zimbabwe.

It is the numerically dominant indigenous cattle breed in the country, says Patrick Tawonezwi, who commercially farms these cattle. Its geographical location covers much of Zimbabwe and extends eastwards over the Mozambique border into a large area that is free of tsetse flies.

The Mashona breed is usually black or red in colour

Table manners—calves crowd together at feeding time as their mothers huddle together in the background





BREED: MASHONA

Also known by various local names, including: Makalanga, Kalanga, Makaranga, Ngombe dza Vakaranga, Shona Mashuk and Mashukulumbwe.

Location: The Mashona breed is found across a wide area covering most of the eastern half of Zimbabwe and a large adjoining region in northern Mozambique.

Origin: The Mashona breed originated with the Shona people of eastern Zimbabwe, who gave them the name Makalanga. The rinderpest epidemic of 1896-1898, coupled with the subsequent East Coast fever epidemic of 1900-1906, nearly wiped out the Shona's herds. In an effort to rebuild their herds, surviving Makalanga bulls were mated with cows introduced from Zambia, mainly Angoni-type shorthorn Zebus. The indigenous breeds found today in Zimbabwe—the Mashona, Nkone and Tuli—are all descended from this original stock.

Description: The Mashona breed is reared mainly for meat production, and they also serve as docile work animals. The body weight of mature males and females range from 350-635 kg and 260-410 kg, respectively. The Mashona tend to be long-lived and to have better pregnancy and re-conception rates than the Africander and Tuli breeds. The coats of the Mashona are usually black or red, and most are now polled (hornless).



Mashona cattle

Mashona cattle are small in stature, with mature bulls weighing 400-635 kg while mature cows weigh 275-400 kg. The Mashona are rounded in appearance with a compact body conformation, sloping rumps, sleek and shiny coats, and long, thin tails. When they have them, the horns sported by the cows curve outward and forwards; the horns of the bulls curve outward and upward, but are shorter and heavier. Some Mashona animals are naturally polled (hornless), although after decades of selection most of the animals reared on commercial ranches and government breeding stations are now polled.

On rare occasions, different patterns may appear in place of the usual plain coat

“For hundreds of years, African people raised these cattle for meat. A cow that was not a good meat animal was not selected for breeding”.

dairy nutritionist and agronomist,
Jaime Elizondo

The predominant coat colour of this breed is black, followed by red and brown, with yellow and dun being less common. Their hides often feature broken (irregular) white patches or stipples.

Mashona cattle are reared for meat as well as for draught power. They also produce milk for household use, and their manure helps to enrich the soils tilled by smallholder farmers.

The Mashona is appreciated for its docile temperament. It is a hardy, well-adapted breed recognized for its high fertility and survival rates, and for its disease resistance and longevity. Research done in Zimbabwe shows that the Mashona is the most productive breed in the country in terms of the total weight of weaned calves per cow in the breeding herd.





For young Mashona calves, feed is sometimes fortified to supplement available grazing and hay



Animal handlers wear bright and luminous outfits easily identifiable over the vast veld



Herd management is facilitated by the numbers on the animals' haunches and ear tags, which provide immediate information on the identity of the cow

Its productive superiority over other Sanga breeds (the Africander, Nguni and Tuli), the Brahman, and various European beef breeds, is credited to its adaptability, which results in low production and maintenance costs, and high pregnancy, re-conception and survival rates.

Another desired attribute of these cattle is their unselective grazing behaviour, and their ability to walk long distances to graze.

*A group of
heifers relax in
the mid-day sun*



The Mashona Cattle Society champions the development, improvement and marketing of the Mashona breed and has established breed standards for improved Mashona cattle. Currently, there are more than 500,000 head of Mashona cattle being kept and the breed is not at risk. In fact, it has a bright future as long as breed choices are made based on productive merits.

Mashona breeding stock are appealing to smallholder farmers planning to build up their herds. Many of these farmers seem to prefer Mashona cattle because they can build their herds more rapidly due to the breed's early sexual maturity, short calving intervals, and lower calf mortality rates compared to the exotics often promoted by restocking programs.

The Mashona cattle have a very long history of being handled by people.

To supplement their grazing, some cows occasionally browse the shrubs that dot the veld



A young heifer walks past a daily hazard!

Top facing page: Mashona bulls dispute grazing territory as handlers attempt to separate them

Facing page: Mashona cattle easily convert any improvements in feeding to muscle, as well as to breeding; good early rains that improve pastures have a positive impact on conception rates





*Adult Mashona bulls
can weigh as much
as 600 kilograms*



*Steers are fattened in
feedlot pens for about
two years, then marketed
to the beef industry*



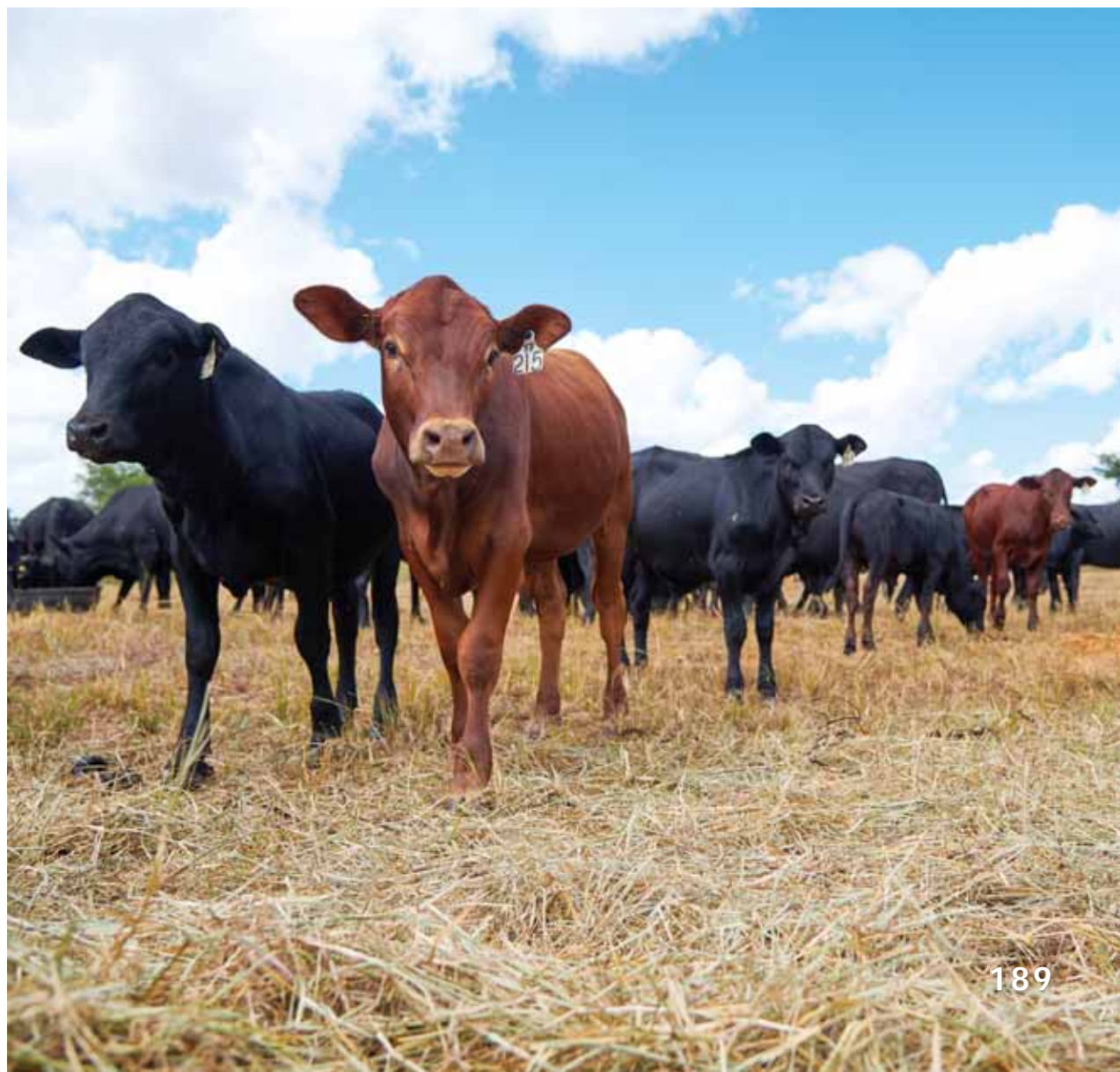
Unfortunately, choice of breeds in Zimbabwe is generally not based on their productive merits. The policy and marketing environments promote the use of exotic breeds, which are seen as more productive due to their higher growth rates and larger sizes at maturity.

Consequently, like many other indigenous African breeds, the Mashona breed is experiencing genetic erosion from indiscriminate crossbreeding with the larger but less adapted and less productive exotic breeds. However, growth rates are not the major determinant of productivity or profitability in a cow-calf production enterprise, and most beef consumers in Zimbabwe are more concerned about meat quality and price than size. In addition, the meat quality of the Sanga breeds is similar to that of the traditional beef breeds from Europe. If policy makers and other stakeholders are fully informed of these facts, the Mashona breed will have a promising future.

If policy makers and other stakeholders are fully informed of these facts, the Mashona breed will have a promising future.



Weaning starts early and the Mashona calves join their mothers in the grazing fields





Calves spend their early weeks in the care of their mothers, followed by a brief weaning period. Steers are separated by age groups and fattened in feedlot pens until they reach commercial maturity, usually after about two years. The sparkling sheen on the coats of these animals is typical of the Mashona breed





The health of the Mashona herd is carefully monitored and constantly managed to ensure both high productivity and preservation of the breed







Fogera

Ethiopia

Fogera

With its distinctive combination of a black muzzle, black inner ears, a black, white and grey coat colour, and its long legs and tail, the Fogera are one of the most iconic cattle breeds of Ethiopia. Found in the district bordering Lake Tana, Ethiopia's largest lake and the source of the Blue Nile, the breed is particularly well adapted to wet soils and swampy areas and copes well with the heavy fly, parasite and disease infestations, as well as low quality of feed, that characterizes this challenging environment.

The breed is characterized as medium to large with short or stumpy horns, a well-developed dewlap, a navel flap and udder in females and a small to medium thoracic hump in males and females. Black with small spots of white is the most dominant coat colour.



BREED: FOGERA

Location: The Fogera is one of the most populous and productive breeds in Amhara region and across Ethiopia. It is reared in districts surrounding Lake Tana in the southern Gondar and western Gojam zones of Amhara region. The breed is conserved ex situ at Andassa Livestock Research Center (ALRC) and on Metekel Fogera Cattle Conservation Ranch (MFCCR) and the villages surrounding them.

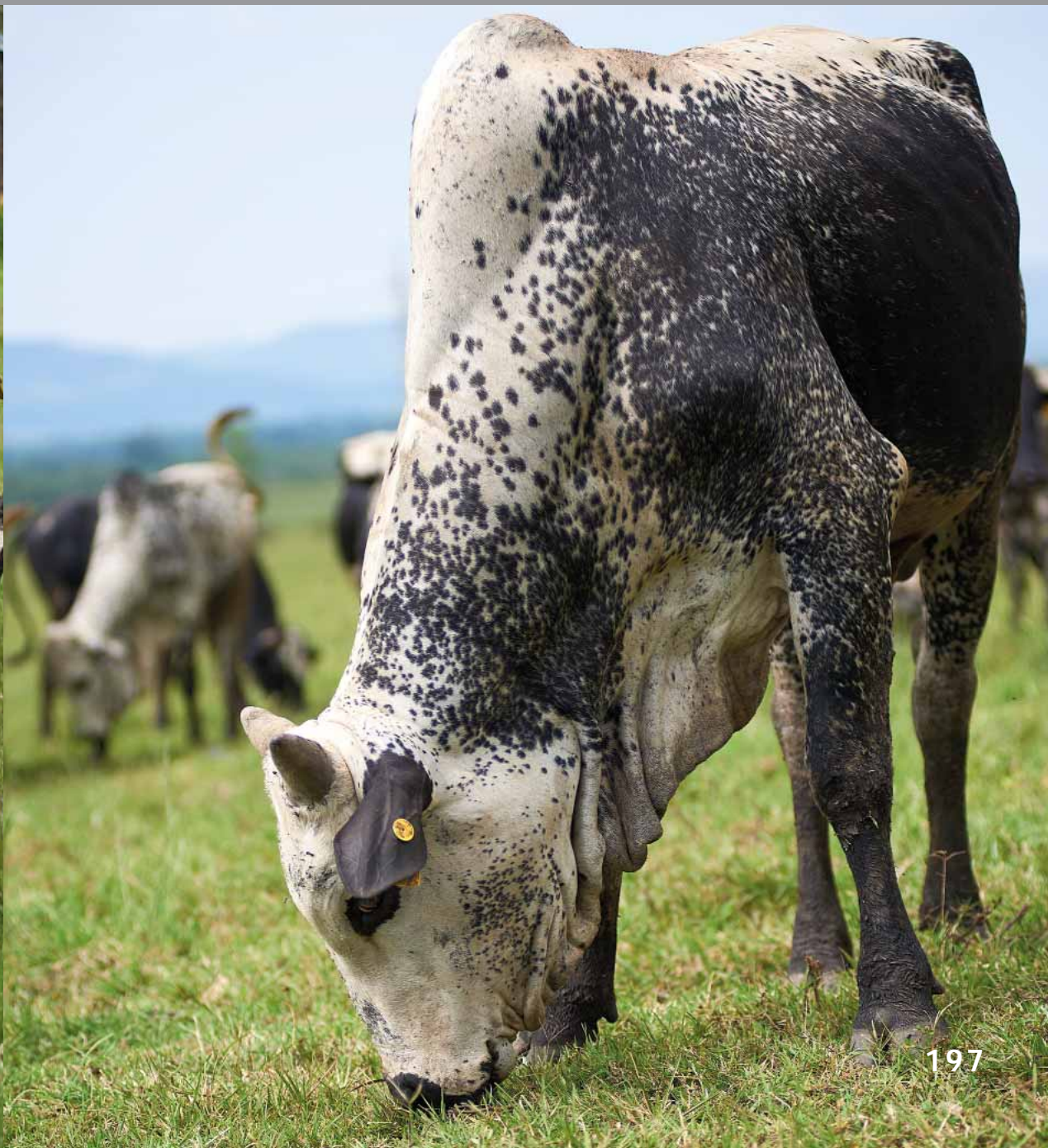
Origin: The Fogera is one of the 27 recognized indigenous cattle breeds of Ethiopia. After the rinderpest epidemic in the early 1900s and consequent decimation of the dominant Sanga populations, zebu cattle were introduced from Asia into Africa at various points on the east coast of the continent. Interbreeding with Sanga remnants resulted in several zebu-Sanga and Sanga-zebu mixed populations. The breeds

that emerged from these crosses have been classified in a separate group of "Zenga" cattle. The Fogera developed out of interbreeding of Abyssinian Zebu from the central highlands and the local Sanga breed.

Description: The Fogera are generally large, being tall with long legs and a massive body with solid, strong bones. It is officially characterized as being a medium to large breed with short or stumpy horns, a well-developed dewlap, a navel flap and udder in females, and a small to medium thoracic hump in males and females. The most dominant coat colour is black with small spots of white. The breed is an intermediate zebu-Sanga type characterized and well known by its pied coat of black and white or black and grey. It has short, stumpy, pointed horns, a thoracic to



cervicothoracic hump, a moderate to large folded dewlap, and a docile temperament. It is used for draught power and provides its keepers with milk and meat.



Ethiopian farmers choose the Fogera breed for several reasons: these cattle tend to begin calving at an earlier age than other breeds; their strength gives them the ability to plough the heavy clay soils found in the country's wetland areas; and the breed is valued for various social purposes, including, for example, as an important part of a bride's dowry.

Farmers choose the Fogera breed because of its tendency to have its first calf at a younger age than most breeds, its ability to plough marshy lands, and its higher value for dowries and other social purposes. The unique value of this the breed was recognized during the reign of the late Emperor Haile Selassie and in 1964 a Fogera cattle conservation and improvement centre was established. Today, along with the Arsi and the Ethiopian Boran, the Fogera benefits from *ex-situ* conservation measures in Ethiopia, with the breed present in two regional ranches—the Andassa Livestock Research Center and Metekel Fogera Cattle Conservation Ranch.

Fogera cattle are generally rather large animals. They are usually tall with long legs, and have massive bodies with solid strong bones. Their size is one of the breed's main features, as are their strikingly speckled black and white or black and grey coats





The nucleus herd

There are about 330 breeding females and 100 breeding males in various age groups at the Andassa Livestock Research Center. The first group includes calves up to the weaning age of the breed (about 8 months). The second group includes females and males aged 8-19 months from which bulls are distributed to farmers and community-based improvement and conservations herds. The third group contains animals 19 months old and above, with the females included in the nucleus herd and the males used for natural mating based on their pedigree.

A herdsman and a Fogera bull watch over the herd at Andassa Livestock Research Center near Lake Tana in northern Ethiopia



Breeding bulls that are used for the Fogera nucleus herd are sourced from two centres: Metekel Ranch, in the Binishangul Gumuz Region of Ethiopia, and the Andassa Livestock Research Center, located near Lake Tana in the north.

In terms of reproduction, the total Andassa Fogera herd includes four natural mating herds, one artificial insemination (AI) herd, and one bull herd. When distributed in the community, breeding bulls are sourced from Metekel Fogera Cattle Conservation Ranch and Andassa Livestock Research Center, based on their birth weight, weaning and yearling weight, morphological conformation, pedigree, and health condition of the testis and scrotum.



The breeding program involves both natural mating with Fogera bulls and artificial insemination with Holstein Friesian semen to produce Fogera and first-generation hybrid calves, respectively.



Breeding program

In the breeding program, both natural mating with Fogera bulls and artificial insemination with Holstein Friesian semen are used to produce Fogera and F1 hybrid calves, respectively. The objectives are to maintain and improve a pure population of the breed while providing communities with higher milk-yielding crossbred cows.

The pure breed herds are kept with selected bulls (45-50 breeding cows with one breeding bull) and mating is done in the field and entered in the register by watchmen. The F1 herds of the crossbreeding unit (CBU) are bred using AI, and F1 and F2 generations are distributed to farmers at a subsidized cost after pregnancy has been confirmed.

Calves born on these farms are registered, weighed before first suckling, and tagged immediately after birth. The sex of the calves, and the sires and dams are also recorded in the field record book. This information is then transferred

to each individual cow's record card and century book, and a new card is entered for each calf. All calves can run and suckle their dams until they wean. After weaning, the best heifers from the pure Fogera breeding unit (FBU) based on their performance data (birth and weaning weight, body conformations) are kept as a replacement herd.

Fogera crosses can be seen working the teff, rice and wheat fields in the Lake Tana region

Facing page: Fogera cattle are a common sight along the highways in the Lake Tana region, always accompanied by herdsmen leading them to pasture













Sheko

Ethiopia

Sheko

Official estimates indicate that up to a fifth (or about 200,000 km²) of Ethiopia's agriculturally suitable land is exposed to tsetse-borne trypanosomiasis, and hence agricultural development in these areas is heavily constrained. The unique trypanotolerance of Sheko cattle is therefore especially relevant to the fertile warm and humid agro-ecologies of southwestern and western Ethiopia, where tsetse flies and trypanosomiasis are endemic. But crossbreeding with humped animals may have brought the Sheko to the brink of extinction as a pure taurine (humpless) breed. The earliest documented estimate of the Sheko breed population was 31,000 animals at the turn of the millennium.

In Ethiopia's Ghibe Valley, tsetse fly control methods have allowed cattle to flourish in an area previously almost uninhabitable for them. This has encouraged more farming in the area, relieving to a degree population and soil erosion pressures in higher, tsetse-free, elevations. At the upper Ghibe ILRI station, cattle in a control herd are monitored monthly for trypanotolerance in different breeds. Below, cattle stand in the crush ready for sampling and weighing





The milk, traction and reproduction performance of the Sheko are known to be much better than other breeds found in tsetse- and trypanosomosis-infested areas of southwestern Ethiopia.

BREED: SHEKO

Also known as Goda (the most common local name) and by other names as well, including Mitzan, Tunt, Tunibey, Dello, Mulge, Mugul, Gombel, Semo and Dobe.

Location: Ethiopia, Southern Regional State, Bench Maji Administrative Zone in the southwest of the country, in particular in the districts of Sheko, Semien Bench and Debub Bench, but also in the adjoining parts of Kaffa and Shaka Zones.

Origin: Sheko are believed to be the last remnants of the original humpless Shorthorn *Bos taurus* cattle in eastern Africa, which were perhaps the first cattle to be domesticated in the region. The humpless Shorthorns descended from domestic cattle populations that evolved from the initial domestication

centre(s) in the Fertile Crescent. These cattle were subsequently introduced into Africa, occupying different agro-ecological zones north of the equator, including the tsetse belt in West and East Africa. They are today increasingly mixed with local *Bos indicus* (humped) cattle and, as a result, the Sheko as a pure taurine breed may be essentially extinct.

Description: The Sheko are medium sized, stocky animals with glossy coats of variable types and patterns. The coat colour is predominantly red with a plain pattern, but also in a patchy or spotted pattern. While glossy red coats are most common, brown and black coat colours have also been reported. This breed has superior trypanotolerance compared to other breeds in the region. Its milk production, traction capacity and



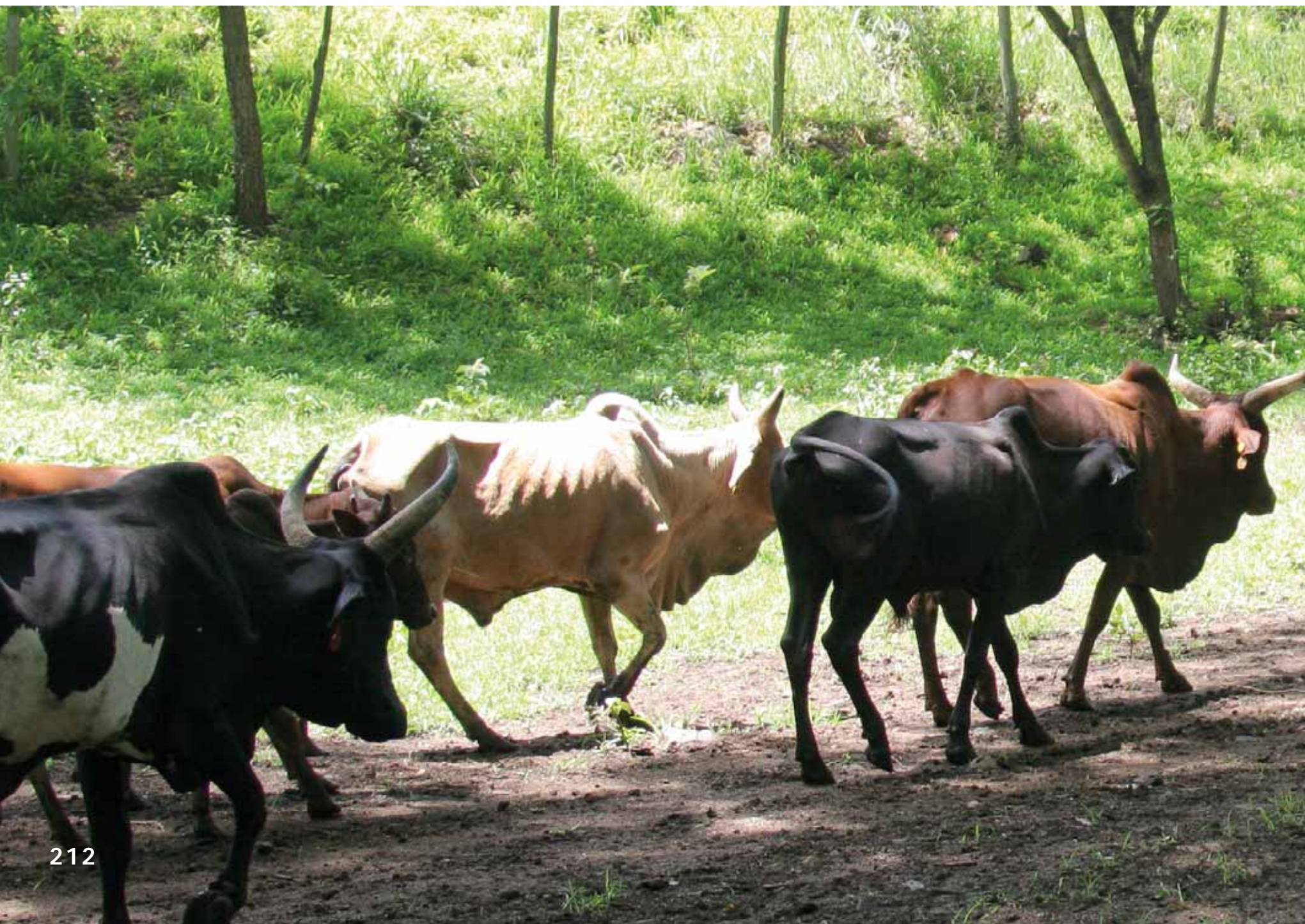
reproduction performance are also known to be much better than other breeds found in the tsetse- and trypanosomosis-infested areas of southwestern Ethiopia. They adapt well to the humid and warm climate of their home area and are recognized for their relatively voracious grazing habits in the area.

Recent studies on the Sheko have established that, in addition to its strong trypanotolerance, the breed is better adapted to the prevailing warm and humid climate, and provides attractive milk production levels and good traction capacity compared to other indigenous breeds found in the region.

By 2005, a breed survey with cattle owners reported only about 4,040 head of true-to-type Sheko cattle, and only a few years later, just 2,040 Sheko were reported, confirming that the breed's population is declining at an alarming rate. Recent studies on the status and relative performance of the Sheko breed established that, apart from its

strong trypanotolerance, it is better adapted to the region's warm and humid climate compared to other indigenous cattle breeds found there, and it has attractive milk production levels and good traction capacity. However, its voracious feeding habits, larger body size and more aggressive temperament make it less appealing to mixed crop-livestock

farmers who extensively use cattle for oxen traction, compared to the smaller and more docile zebu-type cattle in the higher altitude areas. The declining preference of farmers for the breed in increasingly densely populated crop-livestock farming areas has therefore led to a consistent decline of the breed population over recent decades.



In Ghibe Valley, tsetse fly control methods have allowed cattle to flourish in an area previously almost uninhabitable for them. Such is the impact this has had on the livelihood of farmer Worku Mengiste



Trypanotolerance

A key breed rescue and sustainable management

Smallholder subsistence farming predominates Ethiopian agriculture, and as long as it does Sheko cattle will offer realistic options, both for exploiting the potentially productive valleys of southwestern Ethiopia, where trypanosomiasis and its vector, the tsetse fly, are endemic, and for promoting sustainable management of the breed.

Despite decades-long efforts to control tsetse flies and trypanosomiasis in this region, large and highly fertile areas remain underutilized for crop and livestock production.

Despite decades of trying to control tsetse fly infestations and the trypanosomiasis that the insect transmits, large and highly fertile landscapes remain under-used for crop and livestock agriculture.

One tsetse control method, known locally as 'pour on', involves applying a repellent to the skin of the cow. The process is community run as a service co-operative, and here farmer Megersa Balcha, left, helps with the application to one of his cows

At the upper Ghibe ILRI station, cattle in a control herd are monitored monthly for trypanotolerance. They are sampled routinely for parasite levels







Farmer Adisu Getu with yoke on the way home after an afternoon of ploughing



At the same time, a lack of effective planning for and implementation of sustainable breed management plans has put the Sheko breed under sustained pressure from both deliberate and inadvertent cross breeding.

Farmers in the region prefer smaller, less voracious and more docile cows and traction oxen, and have been crossing Sheko cattle with various zebu breeds to get them; at times they even resort to simply replacing their Sheko with other breeds. Under these circumstances, the Sheko breed not only needs to be rescued from extinction, but its unique genetic identity, trypanotolerance, good adaptation, and productive performance merit the development of a broad breed conservation and management plan.

In 2005, a breed survey reported only 4,040 head of true-to-type Sheko cattle, according to their owners. A few years later, just 2,040 of Sheko cattle were reported, confirming that the breed population is declining at an alarming rate.

In fact, the Sheko breed offers a rare best case scenario—the chance to develop a comprehensive program for sustainable breed management that rests on actually using the breed’s high-value genetic background to harness the potential of the Sheko to meet the current and future development needs of the rural communities that have for generations been the sole custodians of this unique breed.

Farmer Ayalnesh and daughter Eyerus Kasie milk their cows





Young Adena Tibabu tends his family cattle on the outskirts of Addis Ababa during school holidays



Traders take cattle to market in winter rain along the road to Woliso in Ghibe Valley



A woman carrying fodder for her family cattle in the town of Wolliso, Ghibe Valley





Africander

Southern Africa
and the Democratic Republic of the Congo

Africander

The long evolutionary history of Africander cattle has exposed the breed to diverse climatic conditions and a variety of diseases and parasites, all of which have contributed to the broad adaptive capabilities of the Africander we know today. Early migrating populations endured arid desert conditions and the extreme heat of the east coast of Africa. Internal and external parasites, as well as tropical diseases posed serious health challenges to the breed as it expanded across southern Africa.



BREED: THE AFRICANDER

Also known by the common names Afrikaner (In Afrikaans) and Izankayi.

Location: Mostly maintained by commercial farmers (of European origin) in South Africa and is the most popular indigenous breed. Also found in Botswana, Mozambique, Namibia, the Democratic Republic of Congo, Zambia and Zimbabwe.

Origin: The original cattle and their traditional owners arrived in southern Africa about 590-700 AD and migrated along the western side of



the region into what is now the Western Cape Province of South Africa. The breed evolved through gradual genetic selections from among the local Sanga stock (initially for traction); these selections were made by the Dutch who settled in South Africa in the 18th and 19th centuries. Herds that survived the rinderpest plague of 1896-99 and the Boer War of 1899-1902 provided the foundation stock of the modern Africander breed. The herd book was set up in 1907 and the breed association was established in 1912. The breed has since been exported to neighbouring countries, as well as to the UK, the US and Australia.

Description: Typically, Africander cattle have large bodies with spreading lateral horns that are oval in cross-section. The preferred coat colour is dark red. They have good walking and grazing abilities, and cows calve easily and have exceptionally good mothering abilities, making them ideal for crossbreeding and development of hardy composites. The breed is known for its longevity and for its good quality beef. It is tolerant of high temperatures and does well under harsh conditions. All in all, the Africander is a high-performance tropical beef breed.



By the 15th century the Hottentots in the southwestern region of present-day South Africa were known to have maintained Africander cattle herds.

By the 15th century, the indigenous nomadic pastoralists (known as the Khoikhoi) who were living in the southwest region of present-day South Africa maintained Africander cattle herds. In 1912, Mr. Alex Holm initiated the planned development of the breed and formed the first breed society in South Africa. Today, the Africander is the most popular indigenous cattle breed in the country, comprising 30% of South Africa's cattle population.

The Africander has been bred according to clearly established standards for many generations and as a result the breed shows a high degree of uniformity in colour and conformation, which is rarely found in other African livestock breeds. Africander cattle are physically among the largest in Africa. The breed is typically red in colour, the intensity of which can vary from a light tan to deep cherry red. They have long lateral horns that range from a flesh tone to a creamy white colour with amber

tips. A polled (hornless) type has also been developed. The body conformation of the Africander may lack the compact, angular body of typical beef breeds, but these animals have good depth with muscular backs, loins, rumps and thighs.

The cows produce enough milk to support fast calf growth. Experiments have shown that, during a suckling period of 210 days, the calf on average consumes 900 litres of milk. At 210 days, the female

Early migrating populations of cattle endured arid desert conditions and the extreme heat of Africa's east coast. Internal and external parasites, as well as tropical diseases, posed serious health challenges as the cattle migrated into southern Africa.

A typical Africander ox wagon transporting forage in the Orange Free State (now Free State) circa 1940s. Photo courtesy of The South African Railways and Harbours Publicity and Travel Department



calves weigh about 205 kg and the bull calves about 225 kg. Africander cows have excellent mothering abilities, and also have a strong affinity for protecting the calves of other cows. Under good grazing conditions, healthy cows can produce a calf every 12 months.

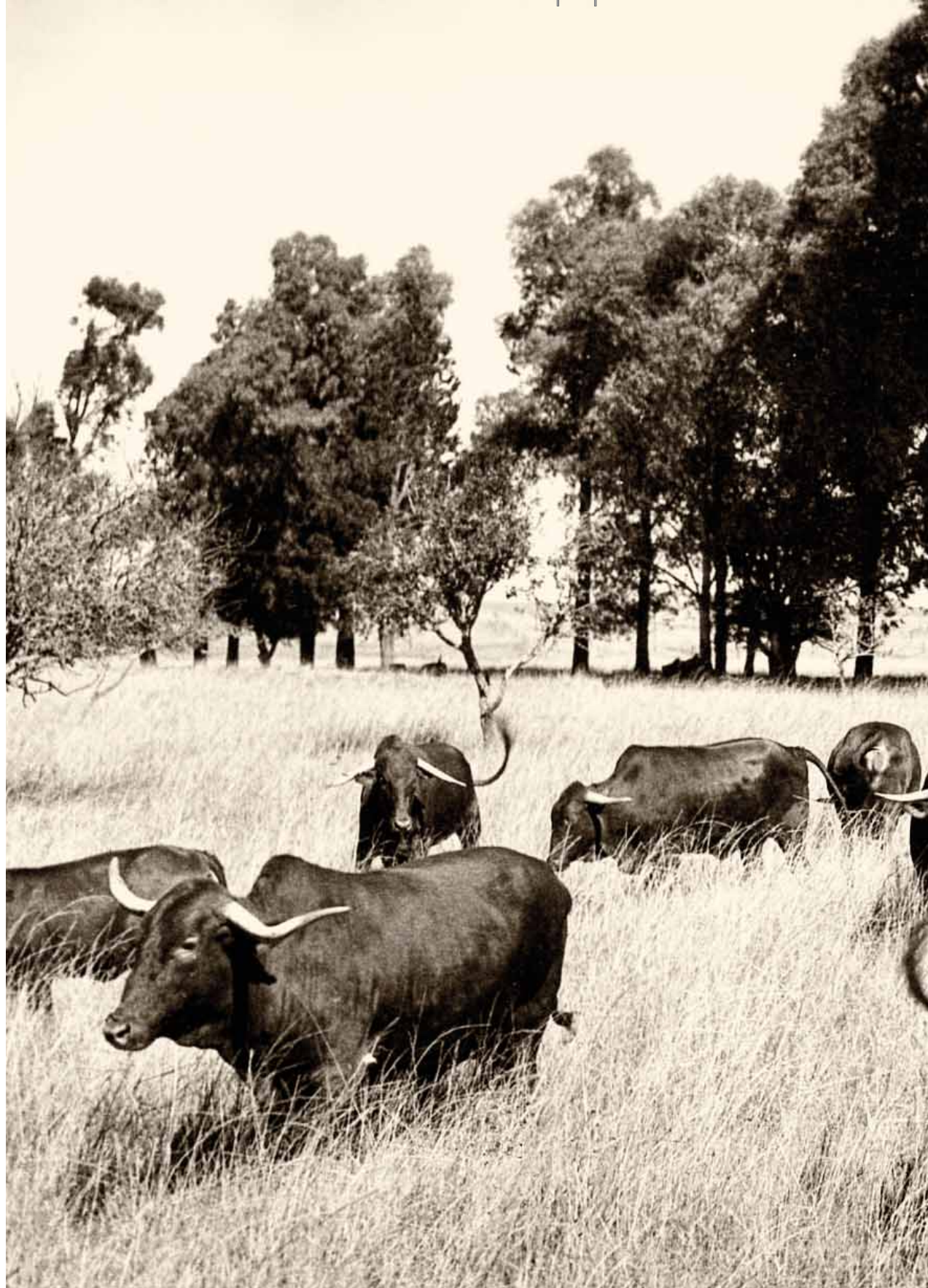
Africander cattle thrive under extreme heat, partly because they have numerous sweat pores. They resist tick infestations and have a quiet temperament, and they maintain high levels of fertility even under stressful conditions. Mature cows weigh up to 600 kg while mature bulls weigh from 750 to 1000 kg. The Africander is also remarkable for its longevity; they can continue to reproduce up to 16 years of age and even older.

Africander cattle grazing at Ermelo, Eastern Transvaal (now Mpumalanga province) in 1958. Photo courtesy of The South African Railways and Harbours Publicity and Travel Department

Africander cattle thrive under extreme heat, resist tick infestations and have a quiet temperament. They maintain a high level of fertility even under stressful conditions. Mature cows weigh up to 600 kg and mature bulls weigh from 750 to 1000 kg.



The Africander is South Africa's most popular native breed, comprising 30% of the cattle population.





The Africander was almost exterminated Active breeding activities rescued the breed

Rinderpest, the South African civil war, and extensive introductions of exotic breeds led to a near extinction of the Africander breed. The hitherto ubiquitous Africander population was decimated by the influx of large numbers of Sanga cattle from as far north as Ethiopia into much of present-day South Africa. The civil war also widely disrupted rural life, which exacerbated the decline of the Africander cattle population.

Likewise, commercial interests let the Africander breed down, with many commercial farmers choosing to breed and expand herds of exotic breeds imported mainly from Great Britain and Europe. Fortunately, early in the 20th century some South African cattle farmers began to appreciate the Africander's outstanding qualities and started maintaining purebred animals, thereby ensuring the continued existence of this hardy breed.

The hitherto ubiquitous Africander cattle population was decimated by the rinderpest epidemic of the late 1800s and the extensive introduction of exotic breeds.

A stamp printed in South Africa, circa 1961, shows an Africander bull. Shutterstock photo



A typical Africander cow grazing in Transkei. They are a hardy breed of beef cattle, popular in South Africa. Photo courtesy of Armada44





Fortunately, at about the same time some South African cattle farmers began to appreciate the Africander's outstanding qualities and started maintaining purebred animals, thereby ensuring the continued existence of this hardy breed.





*Africander oxen, forerunners to tractors,
were used in South Africa mainly from
1700s until early 1900s.
Shutterstock photo*





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Maps: Not to scale—*depiction of boundaries is for illustration purposes only*

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The story of cattle in Africa

Why diversity matters

Cattle are central to culture and to life in Africa. This book explains why and how cattle have evolved in Africa over centuries and the role they play today. The African cattle breeds that exist today comprise a critical long-term asset. They also provide short-term income and the daily food and nutrition for some 800 million livestock keepers across Africa. The diversity of African cattle ranges from breeds adapted to the edges of the Sahara Desert in North Africa, to those able to survive in wet tropical lowlands, to breeds that thrive in the vast savannahs of southern Africa.

Where you find people, you find cattle.

