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ANIMAL GENETIC RESOURCES INFORMATION

BULLETIN D'INFORMATION SUR LE RESSOURCES GÉNÉTIQUES ANIMALES

BOLETIN DE INFORMACION SOBRE RECURSOS GENETICOS ANIMALES

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Organisation des Nations Unies pour l'alimentation et l'agriculture
Organización de las Naciones Unidas para la Agricultura y la Alimentatción

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Initiative pour la Diversité des Animaux Domestiques
Iniciativa para la Diversidad de los Animales Domésticos

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Editorial
Development of breeding strategies

Livestock breeds are a valuable heritage of humankind. They developed through many generations of both man-made and natural selection. However, man is having increasingly the means to control the environment, he could provide shelter from many environmental factors that affect these breeds, i.e. man has been more able to alleviate the effect of environment. While this has been true in developed countries and in high-input-high-output production systems, it is not generally so in less developed countries and under lower input conditions.

In the former situation a few breeds have been developed during the past six decades that best suite the conditions under this situation while many other breeds declined in numbers and even are facing extinction with the implications of reduced biodivesity and limiting man's ability for sustainable development now and in the future. On the other hand in developing countries and in inherently low input situations little breed development has taken place, and when it has it was for the detriment of the local breeds through rapid replacement and / or indiscriminate crossbreeding in many of the cases. A main reason for this development is the near absence of practical guidelines and methodologies appropriate to the lower animal production systems even though theory is the same for all types of production systems. The question that arises here is can we have breed development at no or minimum loss of local genetic resources in lower input production environments? In other words is it possible to practice conservation through utilisation of local breeds in a way capable of satisfying human needs? Towards that end FAO / AGA and the International Committee for Animal Recording (ICAR) organised a Workshop on Developing Breeding Strategies for Lower Input Production Environments that took place from 22 to 25 September 1999 at Bella Station of Italy's *Istituto Sperimentale per la Zootecnia*, with the support of the Swiss Agency for Development and Cooperation. Preparations for the workshop started by commissioning seminal papers covering the main components in the establishment of breeding strategies, and actual case studies, covering all major livestock species and different parts of the world. The workshop considered the present knowledge and drew lessons from these documentation to develop an integrated set of recommendations for the successful design, implementation and maintenance of animal genetic improvement activities in lower input production systems emphasising the policy, technical and operational needs of developing countries. The results from this workshop will further guide FAO and ICAR in developing decision-support tools to assist member countries, especially the developing ones, in sustainably developing their local breeds. The workshop proceedings will come out early in the year 2000 and be reported on in AGRI 27 in the Recent Publications section

The workshop was attended by 34 participants from 22 countries, beside ICAR and FAO staff. They were scientists, research workers, developers and practitioners in the field of animal breeding. Participation was planned to cover developing and developed countries, most important livestock species and different world regions.

The Editors

Editorial
Développement des stratégies de sélection

Les races domestiques sont un patrimoine de grande valeur pour l'humanité. Elles ont été développées à travers les générations aussi bien par l'homme que par sélection naturelle.

Cependant, l'homme dispose chaque fois plus de moyens pour contrôler l'influence des milieux et peut donc proportioner des refuges contre les différents facteurs environnementaux qui ont une influence sur le développement des races, c'est à dire que l'homme a été suffisament habile pour pouvoir diminuer les effets du milieu. Cette réalité peut être appliquée aux pays développés ou aux systèmes de production avec des *input* et *out-put* élevés, mais beaucoup moins dans le cas des pays en développement ou dans des conditions d'*input* inférieurs. Dans ce cas seulement quelques races bien adaptées aux conditions décrites ont été développées dans les 6 dernières décades, tandis que grand nombre d'autres races ont diminué en nombre et parfois se trouvent même en voie d'extinction, ce qui entraîne une perte de biodiversité et une limitation de la capacité de l'homme pour le développement durable. D'autre part, dans les pays en développement et sous les conditions d'*input* inférieur, il y a eu peu de changements et lorsque c'était le cas il a toujours été au détriment des races locales et à travers une substitution rapide et/ou indiscriminée dans la plupart des cas. Bien que la théorie soit la même pour tous les systèmes de production, il n'existe pratiquement pas de lignes guide pratiques et des méthodologies appropriées pour les petits systèmes de production. La question est si nous pourrons obtenir un développement des races sans, ou avec un minimum, de perte des ressources génétiques locales dans des milieux de production à bas *input*. En d'autres mots, est-il possible de conserver à travers l'utilisation de races locales de façon à satisfaire les besoins des humains?
Tenant compte de tout ceci la FAO (AGA) et le Comité International pour le Contrôle des Performances en Elevage (ICAR) ont organisé un Workshop sur le "Développement de stratégies de sélection pour les milieux de production en conditions difficiles" du 22 au 25 septembre 1999 à Bella (Italie) à l'*Istituto Sperimentale per la Zootecnia*, avec l'appui de l'Agence Suisse pour le Développement et la Coopération. La préparation du Workshop a été introduite par des études de fond suivies par des études de cas actuels représentant les races les plus importantes et couvrant différentes régions du monde. Le Workshop a tenu compte des connaissances actuelles et s'est basé sur cette documentation pour développer un ensemble intégré de recommandations dans le but d'obtenir un dessin, une mise en oeuvre et des propositions de conservation et des activités d'amélioration génétique dans des systèmes de production difficile, tout en soulignant les besoins politiques, techniques et opérationnels des pays en développement.

Les résultats de ce Workshop serviront de guide à la FAO et à l'ICAR pour développer des outils de décision-support qui serviront aux pays membres, surtout ceux en développement, et au développement durable des races locales. La publication des comptes-rendu du Workshop sera prête au début de l'an 2000 et nous en parlerons dans le numéro 27 d'AGRI dans la section Publications Récentes.

Il y a eu 34 participants au Workshop provenants de 22 pays, mis à part le personnel de la FAO et de l'ICAR. Les participants étaient principalement des scientifiques, des chercheurs et des spécialistes dans le domaine de la sélection animale. La participation a été planifier de façon à toucher aussi bien les pays développés que ceux en développement, ainsi que pour couvrir les espèces les plus importantes et différentes régions du monde.

Les Editeurs

Editorial
Desarrollo de estrategias de selección

Las razas domésticas son un patrimonio de gran valor para la humanidad. Han sido desarrolladas a través de las generaciones tanto por medio de la selección artificial como por selección natural.

Sin embargo, el hombre dispone de medios cada vez más eficaces para controlar el medio ambiente, pudiendo proporcionar protección contra muchos de los factores ambientales que afectan a esta razas, siendo por tanto capaz de paliar estos efectos ambientales. Ello ha sido posible en los países desarrollados y en los sistemas de producción intensivos, pero lo ha sido en menor medida en los países en vías de desarrollo y en condiciones de baja intensificación (bajo *input*). En este último caso sólo unas pocas razas, las que mejor se adaptan a las condiciones descritas, se han desarrollado durante las últimas 6 décadas, mientras que muchas otras han disminuido en efectivos e incluso se encuentran en vía de extinción, lo que implica una reducción de la biodiversidad y una limitación de la capacidad del hombre para un desarrollo sostenible. Por otra parte, en los países en vías de desarrollo y en condiciones de bajo *input*, ha habido poco desarrollo en la mejora de las razas y cuando lo ha habido ha sido en detrimento de las razas locales y a través de una sustitución rápida y / o indiscriminada en la mayoría de los casos. Una razón importante para que ésto haya ocurrido es la casi total inexistencia de recomendaciones prácticas y de metodologías apropiadas para los sistemas de bajo *input*, a pesar de que la teoría es, en principio, la misma para todos los sistemas de producción. La cuestión que se plantea aquí es si podemos obtener un desarrollo de las razas sin, o con un mínimo, de pérdida de los recursos genéticos locales en ambientes de producción con bajo *input*. En otras palabras, es posible conservar, a través de su utilización, las razas locales de manera que se satisfagan las necesidades humanas? Con estos objetivos, la FAO (AGA) y el *International Committee for Animal Recording* (ICAR) han organizado, con el apoyo de la Agencia Suiza para el Desarrollo y la Cooperación, un Seminario sobre "Desarrollo de estrategias de mejora genética para sistemas de producción con bajo *input*" que ha tenido lugar en el *Istituto Sperimentale per la Zootecnia* de Bella (Italia) del 22 al 25 de septiembre 1999. La preparación del Seminario se inició encargando unos informes de referencia que consideraran los aspectos principales a tener en cuenta para el establecimiento de las estrategias de mejora, así como una descripción de casos reales, y que representaran las especies ganaderas más importantes así como las distintas regiones del mundo. El Seminario tuvo en consideración los conocimientos actuales y se apoyó en esta documentación para desarrollar un conjunto integrado de recomendaciones para el diseño, implementación y mantenimiento adecuados de las actividades de mejora animal en sistemas de producción de bajo *input*, resaltando las necesidades políticas, técnicas y operacionales de los países en vía de desarrollo. Los resultados de este Seminario servirán de guía a la FAO y al ICAR en el desarrollo de herramientas de ayuda a la decisión para asistir a los países miembros, especialmente aquéllos en vía de desarrollo, para la mejora sostenible de sus razas locales. Las Actas del Seminario serán publicadas a primeros del año 2000 y serán reseñadas en el próximo número 27 de AGRI en la sección Publicaciones Recientes.

Participaron en el Seminario 34 expertos provenientes de 22 países, además de personal de la FAO y del ICAR. Los participantes fueron principalmente científicos, investigadores, extensionistas y técnicos de desarrollo del campo de la mejora animal. La participación fue planificada con el fin de incluir tanto países desarrollados como en vías de desarrollo, así como las especies ganaderas más importantes y las diferentes regiones del mundo.

Los Editores

The state of African cattle genetic resources II. Geographical distribution, characteristics and uses of present-day breeds and strains

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Summary

This paper summarises preliminary results of a survey conducted as part of a large effort to systematically collate information aimed at assessing the status of cattle genetic resources of sub-Saharan Africa. The 146 indigenous breeds / strains identified from the survey are classified into nine broad groups (Humpless Longhorns, Humpless Shorthorns, Large East African Zebu, Small East African Zebu, West African Zebu, Sanga, Zenga, Recently Derived Breeds and Commercial Composites) some of which are further subdivided into several groups (based on possible genetic relationships) and clusters (based on eco-geographical locations). Each breed is then described in terms of location, physical characteristics, adaptive attributes, if known, current main uses and status in terms of qualitative or quantitative indication of trends, where available, and presence or absence of programmes for its management or further development.

Résumé

Cet article présente un résumé des résultats préliminaires d'une enquête conduite au sein d'un programme plus large mené pour recueillir sistématiquement l'information permettant d'évaluer la situation des ressources génétiques des bovins dans l'Afrique Sub-saharienne. Les 146 races / lignes identifiées par l'enquête ont été classées en neuf groupes: sans bosse à longues cornes, sans bosse à courtes cornes, grand zébu de l'Afrique de l'est, petit zébu de l'Afrique de l'est, zébu de l'Afrique de l'ouest, Sanga, Zenga, races dérivées récentes et lignées commerciales. Certains de ces groupes ont été divisé selon leur relation génétique en d'autres groupes, et en sous-groupes suivant le lieu éco-géographique de provenance. Chaque race est donc décrite suivant la situation, les caractéristiques physiques, la capacité d'adaptation, si elle est connue, et l'utilisation principale et la situation du point de vue de la qualité ou quantité selon les indications du marché, si elles sont disponibles, ainsi que la présence ou absence de programmes pour leur gestion ou futur développement.

Key Words: *Breed distribution, Breed characteristics, Bos taurus, Cattle, Derived breeds, Phenotypic diversity, Sub-Saharan Africa, Sanga, Zebu, Zenga.*

Introduction

The background to, and conduct of, the breed survey has been described in paper I of the series (Rege 1999) which also presents the framework for the classification of sub-Saharan African cattle breeds and identifies breeds at risk and those which may have become extinct in the last 100 years. The present paper presents a status analysis of each of the individual breeds and breed groups identified in paper I, taking into account the historical perspective and

available information from the conventional and grey (unpublished) literature, and updating this, to the extent possible, with facts and figures from the local sources. These are presented in terms of physical description, geographical distribution, indication of general trends in population statistics, where available, known adaptive attributes, major uses, indicative performance figures and status of the management of the breed, including genetic improvement. Known and conjectured evolutionary relationships among breeds are also identified, providing bases for hypotheses to be tested in the molecular genetic characterisation. Some of the African cattle breeds are shown in figure 1 to 5.

Humpless Longhorn Cattle of West Africa

This group is represented by only two breeds - the *N'Dama* and the *Kuri.*

N'Dama

The N'Dama's habitat includes the Fouta Djallon plateau in Guinea (original "homeland"); the whole of coastal West and Central Africa – from Senegal through Gambia, to the Democratic Republic of Congo (former Zaire)

The N'Dama continues to play an important role in tsetse-infested regions of West and Central Africa. Increasingly more compelling evidence for its tolerance to trypanosomiasis is serving to promote the breed. Overall population is increasing and geographical range expanding. The current population is estimated at some 4 863 million head.

The N'Dama is compact and set on short legs of fine bone; neck is thick and deep; back is straight from withers to tail head, of good width and well-fleshed. Hind quarters are deep and well muscled. The dewlap and

Figure 1. Skeko cattle breed.

umbilical fold are poorly developed. Coat colour is typically some shade of fawn with darker extremities and lighter underside: Solid colours are most common-light to dark fawn, grey, dun, light red, chestnut, red with black head; belly and lower part of tail may be white. Skin pigment is either red or black. Body size is small, but conformation is that of a beef animal. Oxen make good work animals. Cows are poor milkers: 100 to 475 kg over 150 to 210 day lactation periods have been reported. The breed is the focus of research of many groups in Africa.

Kuri

The Kuri habitat is the shores and islands of Lake Chad. Main location is in southern Chad and northern Nigeria, and smaller populations in northern Cameroon and the N'Guigni province of Niger.

Due to its inability to thrive outside its lake habitat, the Kuri is threatened. Retreating waters of the Lake and consequent reduction in its habitat is a major threat. Resulting rangelands are increasingly populated with zebu cattle, especially neighbouring Arab Shuwa and M'Bororo (Red Fulani), resulting in increased interbreeding. There is also deliberate crossing of Kuri with zebu breeds by Kuri owners to increase milk yield and fertility and by zebu owners in mixed crop-livestock areas to enhance draught power capability. Protracted civil conflict has further worsened the situation in recent past. The Kuri population is estimated at 110 000 head.

Origin, distribution and characteristics of the Kuri are the subjects of a recent review by Tawah *et al.* (1997). Although there are some efforts at characterisation of the breed, there is currently no programme for the management of the Kuri.

Humpless Shorthorn Cattle of West and Central Africa

The present-day distribution of the humpless Shorthorn cattle breeds is restricted to the tsetse-infested areas of West and Central Africa. Indeed, they occupy the same habitat as the N'Dama. There are some 14 breeds / strains of "pure" Shorthorn cattle and five breeds which have been derived from zebu-Shorthorn interbreeding. The pure Shorthorns are of two types: the larger Savanna type predominantly found in the Guinean or Sudano-Guinean savannas from Cote d'Ivoire to Cameroon, and the smaller Dwarf (or Forest) Shorthorns mainly restricted to the coastal forest regions. In French-speaking countries, the Savanna Shorthorns are called Baoulé and the Dwarf type Lagune (and some local synonyms). In English speaking countries the name Muturu is used for Shorthorn cattle. A small population of the Dwarf type found in Cameroon between Buea and Victoria in the South West Province, is known locally as Bakweri, while the Savanna type is represented by Kapsiki, Doayo (synonym Namchi or Poli) and Bakosi.

The status, characteristics and main uses of the humpless Shorthorn cattle breeds have been comprehensively reviewed by Aboagye *et al.* (1994) and Rege *et al.* (1994a; b; c), while their classification has been summarised by Rege (1999). Existing programmes for the management of humpless Shorthorn cattle have been summarised by ILCA (1992).

The Zebu Cattle of Eastern and Southern Africa

The term "East African Zebu" is used to embrace all the "Shorthorn Zebu" of eastern and southern Africa. These populations can broadly be classified on the basis of size and conformation into "large" and "small" types (see Rege, 1999). While the large types predominate the marginal lands of northern Kenya, north-eastern Uganda, northern

Sudan, southern Ethiopia and western Somalia, the small breeds thrive mainly on the high rain-fed lowlands and uplands.

The Large East African Zebu

Boran

The main habitats of the Boran are the Borana plateau of southern Ethiopia, stretching from the Liban Plateau to the extreme southern part of Ethiopia, semi-arid and arid lands of Northern and Rift Valley provinces of Kenya and western Somalia and Jubaland of southern Somalia.

Subtypes or strains of the Boran include: the Somali Boran; the Orma or Tanaland Boran owned by the Orma tribe of the south, and west of the Tana River district of North-Eastern province of Kenya, where they inhabit the tsetse-infested basin of the Tana River; the Kenya Boran also known as Improved Boran which is a result of long-term selection under good management conditions on the commercial ranches in the semi-arid uplands of Rift Valley and Eastern Provinces of Kenya; and the Ethiopian Boran, or Borana of southern Ethiopia.

The Boran is basically a beef animal but is milked by the pastoral communities. Programmes for development of the Boran exist in Kenya, where there is also a breed society, but no such programme exists for strains in the other countries. However, Ethiopia has previously undertaken some on-station evaluation studies.

Karamajong Zebu

This breed inhabits north-eastern Uganda (Jie and Karamajong), south eastern Sudan (*Toposa* strain) and north-western Kenya (*Turkana* strain). The people of Jie, Turkana and Toposa are supposed to have originated from a common tribe as the Karamajong-the Karamajong cluster. The Karamajong zebu are morphologically quite similar to the Boran-large and heavy-boned. No breeding programme exists.

Sudanese Zebu

This is a large group consisting of several breeds belonging to two sub-groups: The *Northern Sudan Zebu* (also known as *Arab Zebu* or *North Sudan Zebu*) and the *Southern Sudan* (or *Nilotic*) *Zebu*.

North Sudan Zebu

This sub-group comprises the *Baggara, Butana* and *Kenana* of Sudan and the *Barka* of Eritrea. The first three are found principally in the grass acacia savanna belt around the irrigated areas and narrow strip of farmland, from Khartoum to the Egyptian border. The Barka inhabits the western lowlands of Eritrea, with a small population being found across the border in Ethiopia.

Kenana

The *Kenana,* the nomadic cattle of northern Sudan, have numerous synonyms related to their tribal (e.g. *Kenana, Rufáai El Hoi* and *Rufáai El Sherik*) and ecological (e.g. *Fung, Gezira* and *White Nile*) origins. They have also been referred to as *Northern Riverain* or *Northern Province* cattle. The traditional habitat of the Kenana is the east of the confluence of the Blue Nile and White Niles at Khartoum and south-east to the Ethiopian border, on the western banks of Blue Nile to the south of Khartoum. The breed is typically more of a dairy than a beef type. It produces some 1 000-5 600 kg of milk of about 5.5% butter fat over a 190-580 day lactation.

Butana

The *Butana* inhabits the Butana plain in central Sudan, an acacia scrub and desert area lying between the Blue Nile and Atbara Rivers. They are referred to as *Dar El Reih* cattle across the White Nile in the northern part of Darfur and Kordofan. Like the Kenana, the Butana is also typically a dairy animal, producing 700-4 600 kg of milk of 4.5% butter fat in a 220-420 day lactation

Figure 2. Horro cattle breed.

period. Both Butana and Kenana have been studied on-station, but no breed improvement programme is in place.

Baggara

The *Baggara* or *Western Baggara* cattle are owned by the Baggara nomadic Arab tribes in the west, central and southern Darfur, central and southern Kordofan and Nuba Mountains, and Suliem Baggara, west of the White Nile. They are typically used for beef, and have been characterised for this purpose in a few studies. No breeding programme exists.

Southern Sudan Zebu

Both *Toposa* (of the Karamajong cluster) and *Murle* cattle predominate in southern Sudan. The former is located in the southern-most part of the country while the latter inhabit the Pibor Post district of the Upper Nile province. Both are owned by the Boya, Murle and Toposa tribes. They are principally used as beef animals. However, there is no breeding programme for any of them.

The Small East African Zebu

These are smaller and more compact animals than the "large" types. They are also more numerous. They thrive in much wetter habitats than the large types and manifest greater variability in size and conformation. However, the two ("large" and "small") types are believed to have common ancestry. Like the Large Zebu group, the breeds / strains or sub-types of the Small Zebu group have tribal and ecological origins. It should, however, be noted that, whereas isolations imposed by tribal boundaries – physical and / or cultural – as well as those due to ecological restrictions are partially responsible for the genetic differentiation leading to different breeds and

strains, the variations in nomenclature associated with tribes and ecology do not in themselves necessarily imply genetic differences. In general, only a small number of breeds / strains in this category have been characterised in any systematic way. Most of them are still in the hands of their traditional owners. There is no breed improvement programme for any of them.

Abyssinian Shorthorned Zebu

The *Abyssinian Shorthorned Zebu* are a mixture of small, thickset and short-horned cattle mainly found in the central highlands of Bale, Harar, Shoa, Sidamo as well as the lowlands of the Ogaden plains in Ethiopia. They are also called *Ethiopian Highland Zebu*. Indeed, the only members of the group which inhabit the lowlands are the *Jijiga Zebu* and the *Ogaden Zebu* which are sometimes referred to as "*Lowland Zebu*".

The *Jem-Jem* or the *Black Highland Cattle* are principally found in the northern parts of Sidamo, in the Bale highlands and surrounding locations of Bale area including Yirga-Alem in Sidamo. They are adapted to the wet and cold highland conditions and are found at altitudes as high as 2 500 metres. They are solid black, black with a white face or white patches on a mainly black background. They are smallish in body, are compact and have slender limbs. They are mainly used as draught animals, but may also be milked. Traditionally only culled animals were slaughtered for meat but increasingly excess adult males are sold off for fattening.

The other Abyssinian zebu strains are distinguishable mainly in relation to the tribes which own them, minor phenotypic differences, habitat, production system and main uses. The *Jijiga* are found in the Jijiga area of Somali Region of Ethiopia in an area adjoining (on the Somali side of the border) the habitat of the *western* strain of the North Somali cattle. The major coat colours are chestnut, black, white or red. It has short horns, the majority of which point sideways or downwards. Their hump is small but prominent. The udder is small to moderate. They are milked routinely.

The *Arsi* cattle inhabit the highlands of Arsi, Bale, Harar, Shoa and Sidamo. They are compact animals with a generally dimiutive length. The dewlap is prominent but thin of skin. The horns are small and short. The coat colour is variable: red, black, roan, white and grey as well as various combinations. They are mainly kept for draught and are poor milkers.

The *Harar* are found in eastern and western Hararghe plateaux. They have short, thick horns and well-developed dewlaps. The common coat colours are black, roan and red. They are used primarily for draught.

The *Bale* are found in the high plateaux of the Bale zone, in areas adjacent to the habitat of the Jem-Jem. They are black, chestnut, white and roan. They have short to medium horns and a prominent hump, and are principally used for draught.

The habitat of the *Smada* cattle is in the area of Lie Gayint, Tach Gayint and Smada in South Gonder, northwestern Ethiopia, an area lying roughly between the bend of Abay River to the south and Mount Guna to the north. They are also found in adjoining areas of Wello. They are mainly black, but other colours and combinations (red, roan, black-and-white) are not uncommon. Horns are short to moderate in length. Humps are small to medium in size. They are mainly used for draught. Although they are milked, yields are quite low.

The *Adwa* are found around Adwa, in the Central Zone of the Tigray Region. They are mainly red, chestnut, black, roan and white and are kept for draught. Milk production is low.

The *Hammer* cattle of Hammer area in South Omo are a variety of the Borana cattle. They supposedly descended from Borana cattle looted from the Borana people hundreds of years ago during a war between the two tribes. Hammer cattle are mainly white or grey, but there are also some chestnut and roan animals. They are of

medium to large build. The horns are short to medium and humps are prominent. They are primarily kept for milk.

The *Mursi* are found in South Omo, in the Mursi area. They are big animals relative to members of the Abyssinian group. The majority have big horns, usually curved inwards – either naturally or through "training". The hump is prominent and well-developed. Coat colour is highly variable, and solid colours are rare. The colour combinations include grey, white, black, chestnut, roan, pied with spots, and striped. The Mursi are mainly kept for milk, but have good "beef conformation".

The *Goffa*, or *Goffa Dwarf*, is probably the smallest strain of the Abyssinian zebu cattle, indeed among all Ethiopian cattle. It is found in Goffa area, principally around Sawla. Humps are small and coat colour is mainly red. Horns are small to medium. Despite their diminutive size, they are used mainly for draught, but are also milked.

The *Guraghe* zebu is found around the Guraghe and Hadiya areas in close proximity to the tsetse-infested valleys of the Ghibe tributaries. They are mainly red, chestnut and roan. Main uses are draught and milk production, but due to the poor pasture conditions and tsetse infestation, they do not perform either function well. The *Ambo* cattle, found in western Shewa around Ambo, Dandi, Addis Alem and Holetta are quite similar to the Guraghe. However, their habitat is much better endowed with grazing. This may be responsible for their apparent larger size, and more "compact-looking appearance" compared to the Guraghe cattle.

Ogaden cattle are a variety of the Borana found in the Ogaden area of the Somalia Region of Ethiopia and bordering Eastern Hararghe. They have a well-developed hump and a large dewlap. Horns are short. They are mainly kept for milk production, but are good beef animals.

The cluster of southern Sudan and vicinity

The *Lugware*, typically short-horned, are found mainly in the region to the west of Aru in the Kibali–Ituri district of north-eastern Democratic Republic of Congo and in the western part of the West Nile district of northern Uganda. They are owned by the Lugwari and Lugbara tribes. Some are also found in the Yei district of southern Sudan. They are phenotypically quite similar to the Mongolla zebu to which they are thought to be related: They are believed to have been brought south from the Sudan two centuries ago.

The *Mongalla* are small, compact animals found in the valleys and lower slopes of the hilly areas around Mongalla and Torit of the eastern part of the Equatoria Province of southern Sudan. They are owned by a number of tribes, mainly of the Nilo-Hamitic origin (the *Didinga*, *Latuka*, *Bari*), hence strains are also named after these tribal groups. They are also known as *Southern Sudan Hill Zebu* and *south-Eastern Hill Zebu*. The Mongalla are rather heterogeneous. The *Bari* strain has extremely long horns and may have Nilotic influence, while the Didinga strain of Didinga Hills and Dongotona Mountains probably carry Toposa blood. Like the Nuba Mountain cattle, the Dongolla have traditionally lived in tsetse "pockets" and may exhibit a degree of tolerance to trypanosomiasis.

The *Nkedi* are found in north-eastern Uganda in the Pallisa, Iganga, Kamuli and Tororo areas. They used to represent the dominant cattle in the Teso district. However, recent cattle raids in the district led to quasi-complete annihilation of the Teso cattle. Consequently, Soroti and Serere districts were restocked with Nkedi cattle from Pallisa and some cattle from Tanzania. The Nkedi are believed to have originated from northern Sudan and have previously been classified with the Mongalla and the Abyssinian Shorthorned Zebu. Ross (1958) identified four strains of Shorthorned Zebu in Teso district, the Serere, Kyoga, Usuk and Karamajong. The Usuk and Kyoga cattle which border the

Karamajong, a "Large Zebu" type, are somewhat larger than the Nkedi and the Serere. Ross (1958) considered that while the Serere was of the Nkedi type, the Kyoga was of the Karamajong type and the Usuk was a fairly recent cross between the Nkedi and the Karamajong, and hence the greater variation. We have classified the Kyoga, Usuk and Serere in a separate group of small zebu, the Teso group.

The *Nuba Mountain Zebu* are extremely small animals, often referred to as 'dwarf' or 'pigmy' cattle. Mainly found in southern Kordofan in Sudan, they are also known as the *Kaolib* cattle. They are phenotypically similar to the dwarf cattle of the Ingessana Hills (Ingessana cattle) and the Mongalla cattle. They also have some similarities, especially with regard to size, with the N'Dama and some West African Shorthorn cattle breeds. Moreover, like the latter, they thrive in tsetse "pockets" and are, thus thought to be tolerant of trypanosomiasis. The Ingessana and Nuba Mountain cattle are steadily decreasing in numbers as a result of indiscriminate crossbreeding with Kenana and Baggara cattle, respectively.

The Somali group

The *Somali Shorthorned Zebu* consists of various strains of small zebu cattle. These include the *Garre*, *Gasara* and *North Somali Zebu*. Mason and Maule (1960) referred to another strain found in Eritrea, the *Bahari* which is quite similar to the North Somali zebu. These are most certainly cattle of the *Arab* or *Baherie* strain. The distribution of the Somali Shorthorned Zebu stretches from Djibouti in the north, along the coast of the Gulf of Aden to Cape Guaradfui and thence to Kismayu in the south of Somalia. Their distribution in the south overlaps with the larger cattle types — the Boran and Jiddu. *Garre* cattle are named after the Garre or Gherra tribe who live in the middle and upper Wabe Shebeli area of southern Somalia. They are also known as "Dauara" cattle. Epstein (1971) considered that the *Garre* belonged to the "large zebu" group. It is probably the best milk-producing breed within the Somali zebu. A variety of Garre known as *Bimal*, was previously reported to inhabit the coastal sand dunes between Mogadishu and Meream but its existence at present could not be confirmed, and is thus considered extinct (see Rege, 1999).

The name *Gasara* was originally used to refer to all the small zebu cattle of Somalia, but was found to be unfamiliar to some tribes. Subsequently, usage of the name was united to the cattle of Mudugh, Nogal and Mjiertein. Today the name Gasara is used to refer to the cattle confined to central and northern Somalia — away from the Somali Boran, Jiddu and Garre cattle in southern Somalia. The *Magal* (or *Correi*) cattle in the Juba area was earlier considered to be a variety of the Gasara. It was subsequently noted that "Magal" which means "black" was a description of the cross between the Jiddu and the lead-coloured Gasara.

The North Somali cattle are encountered in western and eastern parts of North-East Somalia. There are two strains: the *Western* and the *Eastern* North Somali cattle. The former is principally found in the Borama-Hargesia area of the North-West province of Somalia bordering Jijiga on the Ethiopian side of the border. They are highly variable in size and colour, roan and spotted being quite common. They have a rather small hump and lyre-shaped horns, features suggesting influence of sanga cattle. *The Eastern North Somali* cattle are found mainly in the Burao area on the eastern side of North-East Province of Somalia. They are characterised by a less variable morphology and are spread in small, isolated pockets. They are also a bit smaller but are considered to have a "better conformation" than the Western type.

The *Baherie* or Arab cattle represent the fourth strain of the Somali shorthorned Zebu. They inhabit an area along the coast of Massawa Region in western Eritrea. They have variously been called *Bahari* (cattle from the Sea / Ocean), *Berbera* (cattle from Somalia), or *Aden* cattle. These names suggest recent origins from Arabia and / or close relationship

with the cattle of Somalia. Giuliani (1936) made reference to similar cattle on the east coast of Somalia and Bettini (1941), observed a few small cattle of a similar type in Mjiertein in the extreme north of Somalia. The present survey could not confirm the existence of these similar types in Somalia (see Rege, 1999).

The Kenya Cluster

In Kenya, the term "Small East African Zebu" has been traditionally used to refer to all zebu populations/strains, except the Boran. In the present survey, an attempt was made to identify these strains or "ecotypes". The strains identified were: the *Kikuyu* or *Highland* Zebu; *Lowland* or *Coastal Zebu* (incorporating the *Taita/Taveta, Giriama, Duruma* and *Kamba* Zebus); *Maasai Zebu* of the Maasai tribe of Kenya and Tanzania; *Winam* or *Kavirondo* Zebu inhabiting the lowlands of Lake Victoria Basin in Nyanza and Western Provinces (ethnic Luo and parts of neighbouring Luhya areas); the *Nandi* Zebu; *Teso* Zebu; *Kamasia/Samburu* Zebu; and the *Watende*, bred by the Watende/Kuria tribes in an area south of the Kavirondo Gulf of Lake Victoria in the Suna–Isebania area towards the Kenya-Tanzania border, adjacent to the western limit of the Maasai. The Watende are fairly deep-bodied, have a smallish hump and short horns. They are usually black, occasionally brown. The Teso zebu of Kenya is related to members of the "Teso group" described later.

The *Nandi Zebu* is owned by a group of closely related pastoral tribes, the Nandi, inhabiting a vast area to the north east of Kavirondo. Known for their long history of cattle raids, the Nandi people are believed to have acquired cattle from several tribes, including the Maasai. Nandi Zebu is small and fine-boned; the hump varies in size, but is usually large and hanging backwards in the bull.

There is not much left of the *Kikuyu Zebu*, having suffered greatly from the impact of upgrading with exotic European cattle since the 1930s. The *Maasai* and *Kamasia/Samburu Zebu* are probably the most phenotypically heterogenous, a reflection of the traditional and continuing raids and counter-raids among these pastoral groups.

The Teso group

This group comprises three strains inhabiting the Teso district of Central Uganda (the *Kyoga* and *Usuk* strains) and in the Serere Peninsula of Lake Kyoga (the *Serere* strain). These strains are at risk of loss due to continued interbreeding with the Nganda and Ankole cattle, especially in recent times. The Kyoga strain is bred by the Kuman tribe in the Lango and Kaberamaido areas. It is larger than the Nkedi, and has a deeper chest and shorter legs. The forehead is broad and ears are usually pendulous. Epstein (1971) contended that the Kyoga was a derivative of Nganda cattle. Our investigation revealed that a typical pure Kyoga animal is (phenotypically) no more crossbred than an average zebu of the Lake region.

The *Usuk* of north and north-east Teso inhabit areas adjacent to the Karamoja. It is larger and heavier-boned than the Nkedi and considered by some to be a product of Nkedi-Karamajong interbreeding.

The *Serere* of south Teso around the shores of Lake Kyoga are quite similar to the Kyoga cattle. Although they have some conformational similarities with the Nkedi, they are slightly larger, but the hump of the Serere is smaller, indeed inconspicuous, in cows. Horns are typically similar to those of the Nkedi (short and thick at the base) but animals with long and thin horns similar to those of the Bahima cattle are also quite common.

The Tanzania cluster

The *Tanganyika* and *Zanzibar Shorthorned Zebu* are found, respectively, throughout mainland and coastal Tanzania, and on the offshore Indian Ocean islands of Zanzibar and Pemba. The *Zanzibar Zebu* is thought to have originated from repeated introductions of Indian cattle and cattle from Barawa on the

Figure 3. N'Dama cattle breed.

Somali coast into Zanzibar and Pemba. Most of these cattle are concentrated in Pemba as the presence of tsetse fly is a limiting factor in Zanzibar. The *Tanganyika Zebu*, erroneously called Tanzania Zebu in the literature, is the mainland type characterised by a broad genetic diversity between and within breeds / strains. The group is widely dispersed throughout mainland Tanzania and consists of various, breeds / strains, some of which are results of earlier local attempts to breed for specific phenotypes, primarily coat colour. For example, it is believed that the *Iringa Red* was created by a Chief who insisted that his people should only keep red-coloured cattle. Other strains include the *Maasai Grey*, *Mbulu*, *Mkalama Dun* and *Singida White*. Strains named after tribal groups or locations are *Pare*, *Tarime* or *Shashi*, *Wachagga* and *Ugogo Grey*. Even though definitive genetic evidence is lacking, remarkable phenotypic diversity is apparent among these populations. For example, those, such as the Mbulu and Wachagga, in the more hilly areas, are much smaller than those in the lowlands such as the Maasai Grey. The *Wachagga* on the slopes of Mount Kilimanjaro, in close vicinity to a tsetse fly belt, have been characterised as "dwarfed, light-boned and weedy", being kept under poor conditions.

Approximately 90% of the *Tanganyika Zebu* are found in the Dodomo area of central Tanzania. The most distinctive strain, the *Ugogo Zebu*, is much smaller but is very well adapted to the harsh environment. They are considered "browsers" because of their selective grazing, including an ability to discriminate between browses during the dry season. Like the *Maasai Grey*, the *Wachagga* or *Chagga Zebu* is found in the Moshi, Upase and Usambara areas of northern Mainland Tanzania, but the latter is a little smaller than

the former. The *Singida White*, *Iringa Red* and *Mkalama Dun* are confined to the Singida region of central Tanzania, while the *Tarime Zebu* is distributed in the Musoma area of the Mara region of the country. The Chagga, Mkalama Dun, Pare and Singida White, with populations estimated at under 5 000 head, and decreasing, are considered at risk (see Rege, 1999). Preliminary results of molecular genetic characterisation suggest that the Tarime has a substantial proportion of taurine influence, most probably a result of sanga (principally Ankole) introgression at the areas of contact.

The Angoni group

The *Angoni* cattle are believed to be descendants of the original zebus introduced through the Horn of Africa. They are the cattle of the Angoni people. Historically, the Angoni people descended from the Nguni tribe which broke away from the Zulu of South Africa in about 1820. They are supposed to have wandered as far north as Lake Tanganyika, raiding cattle along the way. Subsequently, they supposedly migrated with what became known as Angoni cattle to settle, between 1850 and 1870, in the eastern region of present-day Zambia and adjoining areas of Malawi between the Lungwa River in the west and Lake Malawi in the east. They later spread southwards reaching north-western Mozambique. These cattle are today known as *Angoni* in Zambia, *Malawi Zebu* in Malawi, and *Angone* in Mozambique.

In Zambia, the *Angoni* are located between 9^{o} and 14^{o} S latitude and longitude 30^{o} and 31^{o} E, and are confined between Mporokoso and Petanke to the west and the borders with Mozambique and Tanzania to the east. The Zambia Angoni cattle are believed to be still quite pure with the exception of a small amount of exotic influence around Chipata.

Except those in central and southern Malawi, the "Angoni" are generally fairly similar in size and conformation. The Malawi "Angoni" (*Malawi Zebu*) of central and southern Malawi, considered to have been adultered with some sanga blood are more compact than the "Northern type". The two are also different in hemoglobin frequencies (Osterhoff, 1975). That the Malawi Zebu has a hump which is farther forward (i.e. more cervico-thoracic) than would be expected of the typical zebu, suggests possible interbreeding with sanga, most probably Nguni, cattle. The characteristic features of the Nguni are evident in the large ears, the horn shape, the size, shape and position of the hump and the less-developed dewlap of the Malawi Zebu.

The Mozambique Angoni, known as the *Angone* or *Angonia*, is found north of the Zambezi River. Nearly 50 % of them are found in the plateau of Tete in Tete district, while the rest are in a small area of Angonia to the extreme north east on the Malawi border. A strain of the Angoni found along the coast between Lake Malawi and the Indian Ocean is referred to as "*Bovines of Tete*" and is discussed with the zenga group.

The Madagascar group

Madagascar Zebu

The *Madagascar Zebu*, is a relatively homogenous population of thoracic-humped, short-horned zebu found on the island of Madagascar. They are considered to have reached the island either directly from the Indian sub-Continent or via the Horn of Africa. The latter theory is supported by the usage of such Bantu words for cattle as "omby" or "ngombe" by cattle-rearing communities in Madagascar. There is a school of thought which considers that the Madagascar Zebu was derived in ancient times through crossing African sanga with Indo-Pakistanese zebu.

Baria

Found in the Western Region (Plateau de Bemaraha) of Madagascar, the Baria cattle are wild and roam freely. The Baria's classification is uncertain. It has been referred to as a zebu, as sanga and as taurine.

Government reports have, however, been consistent in classifying the Baria as a zebu. Phenotypically the Baria has certain 'zebu features', including presence of a hump. However, the breed has not been sufficiently characterised. The Baria population was estimated at 5 000 head in 1970, but it had declined to an estimated 500 by late 1998, and has been classified in the threat category 'critical' (Rege, 1999).

The Zebu cattle of West Africa

Fulani

The Fulani cattle are mainly owned by the nomadic Fulani people who occupy the belt between the Sahara and the coastal rainforest from the west of River Senegal to the east of Lake Chad, including parts of western Senegal, southern Mauritania, in and around the flood plains of Niger, Chad, northern Nigeria and Cameroon. Origins and classification of the Fulani remains controversial. Tawah and Rege (1996a) have summarised existing theories about the genetic constitution of the Fulani, including evidence suggesting that it has both *Bos taurus* and *Bos indicus* ancestry. Be that as it may, the Fulani is a unique group. It differs from the typical zebu of West and eastern Africa by the presence of long horns and from the cervico-thoracic-humped sanga by the presence of a thoracic, or sometimes intermediate, hump. They have been classified into two sub-groups: The lyre-horned sub-group consisting of the *Senegalese Fulani* (or the *Gobra*), the *Sudanese Fulani*, and the *White Fulani* (or *Bunaji*); and the *long lyre-horned* sub-group represented principally by the *Red Fulani* (or *Rahaji*). *Diali* (or *Djeli*) is a strain of Fulani found on the flood plains and adjacent valleys in that portion of Niger River in Niger and southwest Nigeria.

The *Gobra* and *White Fulani* are predominantly white in colour and are much larger than the Sudanese Fulani which has quite a variable coat colour, usually spotted light grey. The White Fulani is the most numerous and widespread of all the Nigerian cattle breeds, representing some 37 % of the national cattle population. In Cameroon, they represent 33% of the national cattle herd and are only second to the Red Fulani. The White Fulani cattle have been comprehensively reviewed by Tawah and Rege (1996a).

The *Gobra* is the dominant breed in the northern savanna of Senegal and in adjoining regions of Mauritania. Considered principally a beef animal it yields some 550kg of milk over a 180 day lactation period. The bulls and oxen are also used for riding and as pack animals. Of the Fulani cattle, the Gobra have the longest horns.

The *Sudanese Fulani* is found in western Mali along the flood plain of the Niger River from Segon to Timbuktu. They have either lyre-shaped or crescent shaped horns. Most of the cattle are grey with dark patches, but animals with white backs and black speckles are not uncommon.

Gudali

Gudali is a Hausa word for "short-horned and short-legged animals". It is generally used to embrace a large group of short-horned zebus which are also referred to variously as *Fulbe* or *Peuhl Zebu* in West and Central Africa. The Gudali are principally found in Nigeria, Cameroon and Central African Republic, but a small population also inhabits Ghana. Gudali cattle are traditionally kept by Fulani and Hausa pastoralists. There are two major sub-groups of the Gudali: *Sokoto* and *Adamawa* Gudali. Within the Adamawa Gudali, three breed strains are recognised: *Ngaundere*, *Banyo* and *Yola*. All three Adamawa Gudali strains are found in Cameroon, but only the last two exist in Nigeria.

The names of Gudali breeds/strains derive either from their location (e.g. Sokoto, Adamawa, Ngaundere, Banyo and Yola) or the name of the owning tribe (e.g. Fulbe, Peul, Poulfoulo, Fulani), or, in some cases, predominant colour markings (e.g. Tattabareji, a Fulani word for "speckled coat

Figure 4. Ngaundere Gudali cattle breed.

colour" is used as a synonym for Yola Gudali). The Gudali is a long, well-proportioned and relatively compact animal, with a deep, wide body and well-sprung ribs. They are deeper-bodied than the White Fulani, giving them a "close-to-the-ground" appearance. They closely resemble the Boran of East Africa in conformation, size and type. They are also considered to have some similarities with the Kenana of Sudan. There are large variations in coat colour and mature weight between and within the Gudali strains. Tawah and Rege (1996b) have recently made a comprehensive review of the Gudali.

Azaouak

The *Azaouak*, also known as *Tuareg* are cattle of the nomadic Tuaregs and Arabs found in the Azaouak valley in a vast, windy depression stretching 3^{o} to 7^{o} E longitude and 15^{o} to 20^{o} N latitude, covering the arid eastern Mali in the Niger River bend through southern Niger to parts of northern Nigeria. It is considered very well adapted to drought. It is compact and is suitable for beef production and is also used for work. It is routinely milked. They are usually a mixture of red and white, black and white or fawn with white patches. Other local synonyms are the Adar (Nigeria), Azawa, Darmeghou, Tagama (Niger) and Azawaje.

Shuwa

The *Shuwa* or *Arab Shuwa, Arab Choa* or *Wadera* cattle are found throughout Chad (except the southwest), in northeastern Nigeria and in the extreme north of Cameroon. It is considered to have some humpless Shorthorn blood, but phenotypically it is zebu. These animals were brought to the area by migrant Arabs. They are small but well-muscled, deeply built with rounded ribs. They are considered to be good dairy animals, with milk off-takes of 450 - 1 820 kg in lactations lasting 240 - 370 days. They are used for riding by women and as pack animals.

Maure

The Maure cattle are found in the Sahel region of Mauritania and neighbouring Mali. They are owned by nomadic Arabs and Berbers. Humps are more prominent in the eastern part of their distribution range, suggesting possible Fulani influence. They are used by women as pack and riding animals. Cows are valued for their milk yields which average 650 kg over 210 – 240 days. They are usually black or black-and-white, but dark red coats are common in the east. The Maure is loosely built and tends to be more leggy than the Azaouak. Synonyms include *Arab, Mauritanian, Moor* and *Moorish.*

The Sanga of Africa

The area of distribution of sanga cattle extends from Eritrea, through Ethiopia, southern Sudan and the Great Lakes region of East Africa to southern Africa where they are the traditional cattle in all countries south of the Zambezi. It is also considered that before short-horned zebu became dominant in eastern Africa, the sanga was ubiquitous in this area. Ethiopia and environs is considered to be the centre of dispersal of the sanga.

Sanga cattle vary in size from very small to large. The head is usually long, moderate in width with a convex or straight profile. The horns vary greatly in length, base circumference and orientation. Polled sanga are rare. On the basis of horn size and form there are two types: Those with long, relatively slender horns; and those with gigantic horns of great basal circumference. The sanga humps range from small, almost inconspicuous, to medium. Like in the zebu, the hump is more prominent in bulls than in cows and is better developed in some breeds, than others. The hump position varies, but is typically cervico-thoracic. The hump is more thoracic (and larger) in areas with large zebu influence. The sanga hump is typically muscular in structure, not musculo-fatty. While there are hardly any breed improvement programmes for the sanga of eastern Africa, the majority in southern Africa have well-organised programmes and most have Breed Societies.

The sanga of Eastern Africa

Nilotic sanga of southern Sudan and south-western Ethiopia

The sanga cattle of Sudan are found in the southern part of the country, mainly in Bahr el Ghazal and Upper Nile Provinces and the Mandari area of the Equatoria Province, from where they extend into the Akobo-Gambela area of southwest Ethiopia, but here they are restricted in distribution due to tsetse infestation, especially farther inland into Ethiopia. Strains of these cattle, known by names of the tribes, are bred by the *Dinka, Nuer* and *Shilluk*, and to a small extent by the *Anuak*. Several local varieties (*Aliab Dinka, Aweil Dinka, Eastern Nuer* and *Ethiopian Anuak*) could formerly be recognised. With increased communications and tribal admixture, the clear distinction between sub-types has diminished. However, the variation in size between locations is still discernible. Moving from west to east of the enclave of the Nilotic tribes, one finds small, light-bodied, refined animals to the west, and

larger, more heavily built types in the east, around the Sudan–Ethiopian border area. Body conformation also varies immensely between sub-types, as does horn size and shape. The hump also varies in size from very small to moderately large, the latter being more frequent in those strains with heavy zebu influence. In the bull, the hump may lean slightly over at the back and resemble a zebu hump. This is the case among the *Dinka* strain and has prompted suggestions that Dinka cattle are not typically sanga. Among the Dinka, particularly Aliab Dinka, light coat colour, usually white with red or black patterns, is most common. Some Dinka cattle imported into Congo (Democratic Republic) in the 1900's assumed the name *Wadai Dinka,* but the breed is considered extinct (Rege, 1999). The *Abigar* is a sub-type of the Nuer cattle found principally in the border areas, with a large extension into Ethiopia covering the Akebo area of Gambella. While the Dinka may still be distinguished as that population found in south-east Sudan around Bor (the *Aliab Dinka*) and in the north-west of the Nilotic territory-south of 10^{o} N latitude, (the *Aweil Dinka*), *Shilluk* boundaries with the other strains has become rather diffuse. The Aliab Dinka is distinctly larger framed and bears resemblance to the North Sudan Zebu. The Aweil Dinka on the other hand is smaller in frame and has a finer bone structure.

Abyssinian sanga

Today, the only true sanga in Ethiopia, other than the Nilotic *Abigar* on the Sudan border, are owned by the Danakil and the Galla-Azebo tribes. The sanga strains kept by these tribes are correspondingly called the *Danakil* (*Adal,* or *Keriyu)* and *Galla-Azebo* (or *Raya-Azebo*). The *Danakil cattle* are also kept by Afar people. The breeding area of the Danakil is the Awash River Valley (Harer and Shewa, in Wello, parts of Tigray and Afar, stretching into parts of Djibouti). *Raya Azebo* is found east of Lake Ashangi in Tigray and bordering areas of Wello, particularly in the northern parts. Beyond the borders of this breeding area, extending into southern Eritrea, the sanga are greatly interbred with the zebu. This is the habitat of the zenga known as Arado. The Danakil and Raya Azebo are large animals with immense, lyre-shaped horns, small humps and moderately developed dewlaps. The horns sometimes grow upwards and inwards over the head, forming a complete or almost complete circle. They are mainly light chestnut or ash-grey in colour. These two breeds are only distinguishable by the geographical location and the fact that Raya-Azebo is a slightly bigger animal, probably a result of selection for work, being an important source of draught power in this area of settled agriculture.

The Ankole group

The original Ankole stock were supposedly brought to northern Uganda by the Bahima pastoral Nilotes from the north, from the epicentre of sanga dispersal in the Ethiopian highlands, sometime between 13th and 15th centuries. Subsequently, the Ankole cattle were pushed southwards and westwards by tsetse fly. The Bahima settled in western Uganda, but some clans proceeded farther south, west of Lake Victoria, down the eastern border of the then Tanganyika. The Watusi (or Tutsi tribe) are considered to have continued to the Rwanda–Burundi area. From the original cattle there evolved several basic types of Ankole associated with the tribal groups – e.g. the *Watusi, Bahima, Bashi* and *Ruzizi*.

The Ankole of *the Bahima* are among the most typical sanga and, until the recent conflicts in the Great Lakes region (civil strifes in Uganda in 1970s to 1980s and the conflicts in Rwanda and Burundi starting in the early 1990s), had been free from the zebu influence seen in the sanga of Ethiopia and Sudan. These cattle are large to medium in size, tall at the withers, but not particularly heavy. The horns are the most conspicuous and highly regarded feature of the Ankole cattle. The horns are very large, projecting from a pedestal-like base outwards and upwards, from where they may curve to form a circle or crescent or they may spread out. The hump is

small and cervico-thoracic and the dewlap is moderately developed. Coat colour is mainly dark red, but black, brown, white, grey and dun, as well as combinations may also be found. Almost all Bahima cows are milked, despite the low yields.

The *Watusi* strain, found in Rwanda and Burundi and the northern shores of Lake Kivu have much larger horns than the Bahima. The horns range from 70 to 110 cm in length but may be so huge as to hamper normal movement. The Watusi animals are not as large as the Bahima. The neck is relatively short, and the legs are weak. The common coat colours are brown, red and black, often variegated with white. They are shorter than the Bahima cattle.

The *Bashi*, named after an agricultural Bantu tribe of the same name who arrived in the area in the 17th century, is found in the west and southwest of Lake Kivu. It is smaller than the Bahima but of finer build. Horns are generally large, but size and shape are quite variable. The hump is small, but is also variable. The body is short and compact and the chest wide and deep, the sacrum slightly higher than the withers. The legs and joints are strong and the udder and teats fairly well-formed. The coat is mainly red, black or fawn, but mixtures of colours do also occur. The Bashi is slow-maturing. It is milked, producing 300-540 kg over a 100-260 day lactation.

Kigezi District in the extreme southwestern corner of Uganda is home to cattle differing from the majority of Ankole cattle of Uganda. The *Kigezi* cattle are slightly smaller, and finer bodied. The horns are smaller in base circumference and usually shorter in length and more upright than the Bahima type. They also tend to have a paler coat colour than the other Ankole. They are generally similar to the Bashi type.

The *Ruzizi* cattle are found in the Ruzizi valley and in the mountains to the west of the Ruzizi River, between Lake Kivu and Lake Tanganyika, near the border of the Democratic Republic of the Congo with Rwanda and Burundi. This is a strain of the Watusi cattle distinguished by long sickle- or lyre-shaped horns and a very small cervico-thoracic hump. They are considered better milkers than the other sanga of the Kivu region. The coat is usually brown, but red, red-and-white and black-and-white are also found. Also called *Rwanda-Burundi cattle*, the Ruzizi is taller, better built and faster maturing than the other Ankole cattle of the Lake Kivu area. It reportedly fattens well on pasture.

The sanga of Southern Africa

The Shona group

The *Mashona*, the only member of this group, are the traditional cattle of the Shona people of Zimbabwe. Their breeding area extends eastwards over the Mozambique border into a small tsetse-free area south-west of Tete and south-westwards into parts of Matebeleland, including Matopo Hills. It is considered to have received substantial influence from the Angoni cattle and some workers have classified it as a zebu–sanga type. The Mashona is a well-proportioned, fine-boned, strong and sturdy animal used principally for beef production and as a work animal. The common coat colour is black, while red is not uncommon. Other colours are brown, dun, yellow, cream, brindle, red-and-white and black-and-white in various combinations. Black-and-tan merging into each other is also a frequent pattern. Mashona breeders favour solid colours, particularly black. There is a breeding programme for the breed overseen by a Breed Society.

The Nguni group

The Nguni are the cattle of the tribes belonging to the original Nguni tribes, including Swazi and Zulu. They are found in Swaziland (where they are the majority), the eastern part of Zululand through southern Transkei (and in several commercial farms) in South Africa, and in Mozambique. While the populations in Swaziland and South Africa are called *Nguni*, the strain in Mozambique is referred to as *Landim*. The Nguni are of

medium size. Unimproved animals are small, with withers height of about 105 cm and weighing about 225 kg. Under good management bulls attain withers height of 135 cm and over 500 kg liveweight and cows 125 cm and 350 kg. The body conformation of the Nguni is more like a dairy breed, but it is principally used for beef production and for work. Lactation milk yield as high as 1 200 kg, over 298 days has been recorded. The Nguni is quite diverse in coat colour: White, black, brown, red, dun, yellow are common, either as solid colours or in various combinations (black-and-tan or brindle). Animals of solid black colour play an important role in ceremonial life of the Swazi and Zulu. There are elaborate breed characterisation and improvement programmes for the Nguni in Swaziland and South Africa and there is a strong breed Society.

The cattle of the Bapedi sub-tribe of the Nguni, in the Sekhukhuneland area of Eastern Transvaal, are a strain of the Nguni called *Pedi* or *Bapedi*. The predominant colour of the Pedi is black with white on the belly and lower neck area. Blue roan and white with black spots are also common.

The *Nkone*, also known as *Manguni*, represent perhaps the only surviving population of what has been called "Matabele" cattle. Historically, the Matabele nation broke away from the Zulu in Natal in 1817 during Chaka's reign. They settled first in Transvaal, but later, following the arrival of the Boers, moved farther north into the area now known as Matabeleland in southern Zimbabwe. Along the way they acquired cattle of a very mixed derivation. It is considered that the original Manguni cattle, which was principally Nguni, received infusions from Zansi cattle, probably from Zululand, "Boer cattle", Ngwato and Ngami cattle from, Bamangwato and Botawana tribes of Botswana, Mashona cattle, Barotse, Tonga and Afrikaner cattle. Thus, although the Nkone is classified as of the Nguni descent, it is probably genetically more heterogenous than, and more distant from, the other members of the Nguni group. There is only a single pure Nkone herd based at the Matopos Research Station.

The Zambia/Angola cluster

Tonga

A long-horned sanga breed, *Tonga* are the cattle of the Tonga and related ethnic groups (the Ila-Tonga peoples). They inhabit southern Zambia, extending from the Zambezi valley northwards and eastwards to the Sunemfwa River and westwards to the Manyeke River. Tonga cattle are smaller in size than the Barotse. The body is long but of good depth, although often narrow behind the prominent shoulders and at the pin bones. Common coat colours are black, red or patterns of black-and-white or red-and-white. Occasional all light brown or dun is also spotted. There is no breed improvement programme for the Tonga.

Porto-Amboim

The *Porto-Amboim*, named after a coastal Angolan town of similar name, is considered a variety of Barotse cattle. It is found in northern Angola and southwest D.R. Congo (former Zaire) where they are bred by nomadic tribes. The animals are considered poor milkers. Their long, sometimes loose, horns are shorter and more variable than those of the Barotse cattle. The hump is also rather variable in both size and shape. The coat colour is beige to brown, either solid or pied. It is smaller than the Barotse and is poorly muscled. The hump is less pronounced. In Angola they are found in widely separated parts of the western plateau and in scattered locations along the coast. No breed improvement programme exists for Porto-Amboim.

Ovambo and South-Western cluster

The *Ambo* or *Ovambo* cattle belonging to the Ovambo of southwest Angola and northern Namibia, comprising Ovamboland and

Kaokoveld, are generally small in size but well-proportioned. The *Ovambo* tend to be smaller and lighter, rather diminutive compared to the much larger *Kaokoveld* cattle. These cattle have shorter legs and are sturdier than the Setswana cattle. The horns are long, massive and lyre-shaped and circular in cross-section. The hump is cervico-thoracic and the neck moderately long and fairly deep. The dewlap is heavy and folded, thick of skin. The chest is small, of medium width but of fairly good depth. The common coat colour is uniform light or dark dun, slightly darker on the head and over the shoulders and withers. Black, red or black-and-white with white top and underline are not uncommon. Anecdotal reports suggest that the Ovambo and Kaokoveld are, other than size difference, basically similar.

There are two other sanga breeds, found predominantly in Namibia but whose clear definition as distinct strains is lacking. The *Okavango* cattle are cattle that are quite similar to the Ovambo but are located on the right bank of the Okavango River in conditions intermediate between those of the Ovambo and the Kaokoveld. The body size of the Okavango is "about midway" between the Ovambo and Kaokoveld. The term *Caprivi sanga* has been used to refer to another type of sanga cattle of Namibia found in the Caprivi Strip, the long strip in north-east Namibia bordering four countries – Angola, Zambia, Zimbabwe and Botswana. Cattle in this area may have the influence of cattle types from all the adjoining countries.

South of Damaraland, in the northern part of Great Namaqualand, used to be the habitat of *Nama*, cattle brought there by the Rehoboth tribe but which were considered a product of crossbreeding involving Hottentot, Damara and Ovambo cattle with European breeds, particularly Friesian. They were supposedly taller and had better conformation than the Damara and Ovambo breeds. However, like the Damara cattle, the Nama suffered greatly from the rinderpest devastations of 1899/1900 followed by the conflict involving German forces (1904-1908). Some 600 Nama cows were supposedly saved and subsequently used to develop a new strain incorporating European breeds and cattle from the Cape Province.

The cattle kept by the Ovambo tribe of southwestern Angola are locally known as *Humbi*, *Humbe*, or Angola cattle. They differ from the other sanga of the region in that they have a large, heavy and folded dewlap and a sizeable naval fold and sheath. The coat is light to dark beige with a darker front and, often, a white-shaded bottom line. The animals are small to medium in size with long, massive, usually lyre-shaped horns. There is not much going on in terms of genetic improvement of members of this cluster. However, there is substantial on-station characterisation of populations in Namibia.

The Setswana group

The term Setswana has been used to encompass a group of similar sanga breeds which used to occupy the vast arid grassland region in the middle of the northern part of southern Africa and southern part of central Africa. In this context it has also been used to include the sanga of Zambia, Angola and Botswana. Here it is used in a more restricted context.

The *Barotse* are cattle of the Barotse or Lozi tribe, inhabiting the western part of Zambia along the Zambezi river and its tributaries and extending into Angola as far west as 20° E latitude. The Barotse is coarse-boned and large. The legs are long or of medium length, enhancing the langy appearance of the breed. The Barotse are mostly black and brown, but red is not uncommon while dun and fawn are occasionally seen. Barotse is docile and makes a good work animal. They are mainly used for meat, but are also milked. The breed has been studied on-station but there is no on-going programme for its management.

The *Damara*, or *Herero* cattle of southern Namibia were originally a Setswana sub-type. The most remarkable feature of the cattle of the Damara and Herero tribes of central and eastern Namibia was considered to be their horns – beautifully arched and twisted, rarely

bending inwards and of incredible length. The traditional Damara herds tended to consist of animals of the same colour, bright brown being one of the most popular. It is considered that the Damara cattle were decimated by the 1899 – 1900 rinderpest epidemic and subsequently by the introduction of European bulls and interbreeding among cattle of various tribal groups. The cattle owned by the Damara and Herero today are large and "not typical" of what the native cattle used to be: Average horn size is considerably shorter, moderately thick at the base, with thin pointed tips, sickle- or lyre-shaped; the hump is cervico-thoracic, but moderately larger than the other Namibian sanga types.

Botswana is the epicentre of the distribution of Setswana cattle. The Tswana people settled with their livestock in the Ngami region of Botswana early in the 19th century and their cattle eventually displaced practically all the original Ngami animals. Today all sanga cattle in Botswana are basically of Setswana type. Several sub-types have been distinguished. These include *Botawana*, *Bamongwato*, *Damara*, *Sengologa* and *Seshanga*. As a result of constant contact between tribal groups and movements of people and their cattle, old names have been replaced by new ones and certain sub-types subsumed into others. Additionally, crossbreeding has occurred with Afrikaner and European breeds. Epstein (1971) contended that it was still possible to distinguish between Western (*Ngamiland*) and Eastern (*Batawana*) types. This may very well be so. However, all official reports have tended to pool all the sub-types into the *Tswana* breed. The most typical Tswana cattle now occur mainly in the north and north-west of the country in Ngamiland and along the Boteti River. Local Tswana cattle populations, named after the tribal areas where they are kept, are still recognisable in many areas. Tswana-type cattle extend into the southwestern corner of Zimbabwe. Among the distinct breeds that are highly threatened in the process of the "consolidation" of the Tswana breed are the Sengologa and Seshaga which previously inhabited central Kalahari and the Sekgatla cattle of the Bakgatla Reserve. Although rather heterogeneous phenotypically, today's Tswana cattle are generally long-horned, well-built, well-fleshed with moderate to long legs. There is a Government programme for the characterisation and improvement of the Tswana..

Tuli

Red, red-and-white and golden brown were the most common coat colours of cattle of Ngwato Setswana type in South-west of present-day Zimbabwe, the *Amabowe* cattle. Following the 1896 rinderpest epidemic and subsequent indiscriminate crossbreeding of the remnant stock with the Afrikaner and European breeds, the original Amabowe cattle were all but wiped out. In the 1940s, the best of the remaining Amabowe cattle were collected in the Tuli area. Subsequently, a breeding programme was set up at a station in Matabeleland where systematic and sustained selection for beef characteristics, hornlessness and golden-brown colour was implemented. The product was the *Tuli* breed, also called "*Harvey's Cattle*" after the settler farmer who collected the original Amabowe animals. The Tuli is a success story. The breed is now widespread in southern Africa and has been exported to Australia, USA and Canada. The Breed Society is strong and strict breed standards are followed.

Afrikaner

The Afrikaner falls into a group of its own. Previously called Africander, the official name of the breed today is *Afrikaner*. A substantial proportion of the breed is in commercial farms. It is probably the most popular indigenous breed in South Africa, accounting for about 33 % of the cattle population. It has been exported to several countries in southern Africa – Namibia, Botswana, Swaziland, Zimbabwe, Zambia, Malawi and southern parts of D.R. Congo (former Zaire) – and to

Australia and USA. The most important breeding areas of the breed are Hoopstad, Kroonstad and Winburg, in northern, central and southern parts of Orange Free State. Some key herds are also found in the Midlands of Cape Province, and around Pretoria, Potchefstroom and Klerksdorp in Transvaal. The Afrikaner breed traces its origin to the cattle which the early European colonists of South Africa found in the possession of the Cape Hottentots. These were acquired starting about 1652 and improved as draught animals, and were used as riding and pack animals in the Great Trek of 1835 to 1836 from the Cape to the Orange Free State, Natal and the Transvaal. An old breed, the Afrikaner has been bred according to "breed standards" for many generations and shows a high degree of uniformity in colour and conformation, rarely encountered in other African livestock breeds. The colour ranges from dark to light red. Yellow, varying in shade from dark honey to light cream was previously popular with breeders, but the yellow strain is increasingly less common. The long spreading horns leave the head in a downward and backward direction, then, at maturity, bend gracefully forwards, upwards and backwards. Many breeders still attach great importance to the placing of the horns, their uniformity in thickness, and their oval shape. A polled type has been developed. The hump (prominent but not large) is cervico-thoracic. By all measures, a beef-type, the Afrikaner is a heavy animal. Adult cows average 525 kg and adult bulls 745 kg, but Show bulls may exceed 1 100 kg and cows in good condition 800 kg. The animal has brawny thighs, well-muscled withers, and a deep broad chest with round ribs.

The Zenga Cattle of Eastern Africa

Sanga cattle left behind a trail of zebu-sanga crosses. The breeds that emerged from these crosses have been classified in a separate group, the "*zenga*". The location of the *zenga* in eastern Africa is not surprising: the region represents the point of zebu-sanga contact and is also the natural division between the predominantly "sanga country" in the south and "zebu country" in the north. No breed improvement programmes exist for any of the zenga. However, there is an on-going on-station characterisation of the Horro. Table 1 summarises the probable composition, the distribution and characteristics of the zenga breeds.

Recent derivatives

There are several cattle breeds which have been formed as a result of coexistence of two or more breeds in close proximity to each other. In most cases this has been facilitated by increased interaction among tribal groups and sometimes deliberate but non-systematic attempts to improve specific qualities.

The transition between the Savanna and the Forest Zones of West Africa is the home of several "crossbred populations" some of which are locally recognised as breeds. Aboagye *et al.* (1994) and Rege *et al.* (1994a; b; c) have described, in detail, five such "breeds" in West Africa – the *Borgou* (Zebu x Somba or Lagune), *Méré* (zebu x Lobi, Baulé or N'Dama), *Ghana "Sanga"* (Ghana Shorthorn x Zebu), *Keteku* (Muturu x zebu), *Biu* (Dwarf Muturu x zebu), and Djakore (Gobra x N'Dama).

Basuto

Present-day Lesotho (formerly Basutoland) was the home of large herds of *Basuto* cattle prior to the great rinderpest epidemic at the end of the 19th century. Subsequently these cattle were substantially influenced by black sanga cattle from the Drakensberg Mountains and European breeds. Generally, Basuto cattle are smaller than the Nguni and resemble Mashona cattle. They are used mainly for work, but are also milked and slaughtered for meat. Their milk production is, however quite low, and muscular development rather poor. The original Basuto cattle is non-existent today in any significant numbers. The genetic composition of present-day Lesotho cattle

Table 1. Composition, distribution and characteristics of Zenga cattle.

Breed	Probable Composition	Country and areas within country	Main characteristics
1. Horro	Various strains of Ethiopian Highland Zebu and Nilotic sanga, particularly Abigar.	Ethiopia: Horro Gudru of eastern Welega; also western Shewa, and contiguous areas of Ilubabor and Shewa.	Small to medium cervico-thoracic hump; dewlap moderate and thin of skin; horns moderate but larger than zebu ones, deep chest and barrel, well-sprung ribs; udder small but well proportioned, good teat placement; calm disposition; coat colour mainly brown or reddish brown. Variable milk production (700-1350 kg/lactation of 3-8 months). Used for milk, draught and meat.
2. Fogera	Various strains of Ethiopian Highland Zebu, Nilotic sanga and Abyssinian sanga.	Ethiopia: Fogera plains around Lake Tana, southern Gondar and adjoining areas of Gojam.	Black-and-white or black-and-grey coat; short stumpy, pointed horns; hump ranges from thoracic to cervico-thoracic; dewlap is folded and moderate to large. Docile; used for draught, milk and meat.
3. Arado	Barka, various Abyssinian Zebu, and Abyssinian sanga.	Eritrea: highland areas from Senheit southeast to northern parts of Akale Guzai & southwards to areas of Seraye. Also contiguous areas of northern Ethiopia in Tigray-northern Shire, Adwa & parts of Agame.	Coat red, from light to dark shade; red-pied & black-pied common; solid black, brown, grey or white also occur. Hump thoracic to cervico thoracic, small to medium. Body has good depth & length; dewlap well-developed. Docile, very good work animal. Milk yield low; also used for meat.
4. Jiddu (or Tutu)	Somali Boran, Ethiopian Boran, and undetermined sanga ancestry.	Somalia: Ballei on Juba River, Juba Districts of Gasha & Lugh; along Benedir coast between lower Wabe Shebeli River and Indian Ocean. Previously existed in contiguous areas of Kenya (N.E. Province).	About same size as Somali Boran; fleshy, well-proportioned, good depth, well-sprung ribs, large body, fairly short legs. General "type" that of dairy. 450-900 kg/lactation of 6-9 months. Moderate to heavy head, straight profile. White eyelashes, white hair around eye area and inside ears. Body is white, light fawn and dark mahogany; moderate hump, thoracic to cervico-thoracic. Used mainly for milk, but also for meat.
5. Nganda	East African Zebu (mainly Nkedi), Ankole (mainly Bahima strain, but also Watusi in recent times).	Central Uganda, north of Lake Victoria and between L. Kyoga & L. Albert; also tsetse infested south of L. Albert & east of Semliki River.	Horns round in cross-section, white, thick at base and long; hump cervico-thoracic and small; dewlap moderate in size; variable coat colours: red, black and brown most common. Used for milk, work and meat.
6. Sukuma	Various strains of Tanganyika Zebu, and Ankole of Rwanda-Burundi area & southern Uganda.	Tanzania: Sukumaland, a region south of L. Victoria on eastern border of Mwanza and north eastern parts of Shinyanga, an area covering Seke, Lalago, Nyalikangu & upper Semu River.	Horns medium to long, large & crescent-shaped; small hump; dewlap small, thin of skin; coat colour red or grey roan, light dun or solid red. Used for milk and meat: also for work.
7. Alur (or Nyoka, Nioka or Bukwa)	Tugware and Nkedi, and various strains of Ankole.	Eastern D.R. Congo: Upper Ituri covering Nioka-Mahagi-Djugu area.	Hump small to medium. Body compact; moderate sized dewlap; horns short to medium-long (shorter than Ankole's); More Bahima- than zebu- looking; colours: red, red-pied, brown and black. Used for milk, but also for meat.
8. Bovines of Tete	Angonia and Landim.	Mozambique: narrow coastal strip between L. Malawi and Indian Ocean.	Thought to have level of tolerance to trypanosomiasis. Used mainly for meat, but also milk and work.

Table 2. Commercial composite breeds of sub-Saharan Africa.

Breed	Composition	Country	When initiated	Registered	Characteristics, uses and status
1. Bonsmara	5/8 Afrikaner, 3/16 Hereford, 3/16 Shorthorn (European).	S. Africa	1920s through 1930s Recognised 1964.	Yes (1972)	Beef breed adapted to hot climate; resistant to sun, heat and ticks. Breed improvement programme exists; population size: 143 000 (1998).
2. Drakensberger	Friesian, Afrikaner, Basuto, "Zulu cattle", and "Black sanga"-unknown proportions.	S. Africa	Early 1900s; Recognised 1947.	Yes (1977)	Beef breed; also good work animal: also milked by some. Adapted to extremely hot climate; sleek, shiny, black coat. Breed improvement programme exists; population size: 149 000 (1998).
3. Maojan'i Boina	Madagascar Zebu and Brune des Alpes-unknown proportions	Madagascar	1980s.	No	Dairy breed created for the hot coastal climate of Mahajanga province, still in early stage of breed formation; Population size: 200 (1998).
4. Mpwapwa	35% Red Sindhi, 20% Sahiwal, 20% Tanganyika Zebu, 10% Boran, 5% Ankole, 10% *Bos taurus* (mainly Ayrshire).	Tanzania	1958 (based on crossbreeding work started in 1930s).	No	Dual purpose (beef & milk) with only moderate milk production; created for dry areas of Central Tanzania. No sustained programme, no on-going multiplication. Breed is at risk. Population size: 1 000-1 500 (1997). No "purebreds" left on farms.
5. Renitelo	50% Limousin, 25% Afrikaner, 25% Madagascar Zebu. ("Renitelo" means "three mothers").	Madagascar	1951 (based on crossbreeding work started in 1946).	No, but recognised as breed in 1965.	Beef animal created for Madagascar conditions. Produces "2 times more beef" than Madagascar Zebu. No breed development programme. Interest previously waned, renewed Government interest in 1992. Population size: 2 000-3 000 (1997).
6. Wakwa	1/2 Brahman, 1/2 Ngaundere Gudali.	Cameroon	1953	No	Beef animal created for low to medium input systems. Was popular but numbers failed to meet farmer demand. No programme to further multiply and develop breed. Population size: from 500 (in 1970s) to less than 100 (in 1987) on station. No "purebreds" left on farms.

Figure 5. Lagune cattle breed.

comprises the Drakensberg cattle, remnants of the original Basuto, Afrikaner and Friesian cattle introduced subsequent to the rinderpest plague.

Rana

Rana is derived from crossbreeding between the Madagascar Zebu and bulls first imported from France in 1840. The sire breeds were Bordeaux, Gascony, Garonne, Breton Black Pied and Normande. Although the initial crossbreeding was rather unsystematic, subsequent interbreeding over generations and the pursuit of similar breeding objectives, produced a more or less uniform population of dairy cattle known as *Rana* or *Omby Rana*. However, as a result of additional importations of Normande cattle between 1926 and 1930 followed by extensive and rather indiscriminate crossbreeding to improve milk yield, most of the animals around Tananarive became more "Normande-like". Moreover, from 1945 onwards Friesians were introduced into Madagascar in an attempt to further improve milk production. More recently, Norwegian Red has also been imported. These breeds have been used on both Rana, Normande-Rana crosses and the local zebus and have produced a wide range of genotypes. Although the Friesian was generally much less adapted (than Normande) and did not survive well, except on the higher altitude areas, the combined impact of the Friesian, the Normande and more recently introduced exotic breeds has been a serious dilution of the Rana as it was known in the early 1900s. Today the estimated population of the Rana is some

40 000 to 85 000, but even this liberal estimate includes a rather large number of "recent crossbreds". A "true Rana" is fine-bodied and has more of a dairy conformation than the zebu. Milk yield is 4-9kg a day in a 5-8 month lactation. A yield of 2 850kg has been recorded in a lactation of 295 days.

Barra do Cuanzo

The *Barra do Cuanzo* of Angola is an improved breed with apparently good beef characteristics. It is thought to have descended from Porto-Amboim or Barotse cattle. The breed is primarily owned by European farmers in the Cuanzo district, in the coastal plains south of Luanda. It is considered that the breed contains blood infusions from European breed, particularly the Charolais.

Commercial composites

The breed composition, characteristics and the status of development of the six composite breeds of sub-Saharan Africa are summarised in table 2.

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References

Aboagye, G.S., Tawah, C.L. & Rege, J.E.O. 1994. Shorthorn cattle of West and Central Africa III. Physical, adaptive and special genetic characteristics. World Anim. Rev. 78(1) 22-32.

Bettini, T.M. 1941. L'Allevamento del bestiame in Migiurtinia. Agricoltura Colon No. 35(4 and 6), pp. 26.

Epstein, H. 1971. The origin of the domestic animals of Africa Vol. 1 New York, USA, Africana Publishing Corporation.

Giuliani, R. 1936. L'allevamento del bestiame nell'Africa orientale. Riv. Zootec. 13: 353.

ILCA. 1992. Domestic Animal Genetic Resources Information Database (DAGRID). International Livestock Research Institute (ILRI), Animal Genetic Resources Project, Addis Ababa, Ethiopia.

Mason, I.L. & Maule, J.P. 1960. The indigenous livestock of Eastern and Southern Africa. Technical Communication No. 14, CAB, Farnham Royal, Bucks, England, pp. 151.

Osterhoff, D.R. 1975. Haemoglobin types in African cattle. J.S. Afr. Vet. Assn. 46(2): 185-189.

Rege, J.E.O. 1999. The state of African cattle genetic resources I. Sanga, zenga, recent derivatives, threatened and extinct breeds. Animal Genetic Resources Information (FAO) 25: 1-25.

Rege, J.E.O., Aboagye, G.S. & Tawah, L.C. 1994a. Shorthorn cattle of West and Central Africa I. Origin, distribution, classification and population statistics. World Anim. Rev. (FAO) 78(1): 2-13.

Rege, J.E.O., Aboagye, G.S. & Tawah, C.L. 1994b. Shorthorn cattle of West and Central Africa II. Ecological settings, utility, management and production systems. World Animal Rev. (FAO) 78(1): 14-21.

Rege, J.E.O., Aboagye, G.S. & Tawah, C.L. 1994c. Shorthorn cattle of West and Central Africa III. Production characteristics. World Animal Rev. (FAO) 78(1): 33-48.

Ross, J.G. 1958. A classification of Zebu cattle types in Teso district, Eastern Province, Uganda. Emp. J. Exp. Agric. 26: 298-308.

Tawah, C.L. & Rege, J.E.O. 1996a. White Fulani cattle of West and Central Africa. Animal Genetic Resources Information 17: 137-158.

Tawah, C.L. & Rege, J.E.O. 1996b. Gudali cattle of West and Central Africa. Animal Genetic Resources Information (FAO) 17: 159-178.

Tawah, C.L. Rege, J.E.O. & Aboagye, G.S. 1997. A close look at a rare African breed-the Kuri cattle of Lake Chad Basin: origin, distribution, production and adaptive characteristics. S. African J. Anim. Sci. 27(2): 31-40.