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BULLETIN D'INFORMATION SUR LES RESSOURCES GÉNÉTIQUES ANIMALES

BOLETÍN DE INFORMACIÓN SOBRE RECURSOS GENÉTICOS ANIMALES

Food and Agriculture Organization of the United Nations
Organisation des Nations Unies pour l'alimentation et l'agriculture
Organización de las Naciones Unidas para la Agricultura y la Alimentación

UNEP

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Initiative for Domestic Animal Diversity
Initiative pour la Diversité des Animaux Domestiques
Iniciativa para la Diversidad de los Animales Domésticos

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Animal genetic resources information
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Boletín de información sobre recursos genéticos animales

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CONTENTS

	Page
Editorial	i
Contribution to 25th Issue of AGRI from the Founder Editor *J. Hodges*	vii
Past, present and future *J. Boyazoglu*	ix
The state of African cattle genetic resources. I. Classification framework and identification of threatened and extinct breeds *J.E.O. Rege*	1
Characteristics of Munjal sheep *B.P. Kushwaha, Riyazuddin, R. N. Singh & S. Parthasarathy*	27
Conservation of livestock breed diversity *J.S.F. Barker*	33
The development of a system of linear measurements to provide an assessment of type and function of beef cattle *G.L.H. Alderson*	45
A programme for the inventory, characterisation, evaluation, conservation and utilisation of European rabbit (*Oryctolagus cuniculus*) genetic resources *G. Bolet, M. Monnerot , C. Arnal, J. Arnold, D. Bell, G. Bergoglio, U. Besenfelder, S. Bosze, S. Boucher, J.M Brun, N. Chanteloup, M.C. Ducourouble, M. Durand-Tardif, P.J. Esteves, N. Ferrand, G. Hewitt, T. Joly, P.F. Koehl, M. Laube, S. Lechevestrier, M. Lopez, G. Masoero, R. Piccinin, G. Queney, G. Saleil, A. Surridge, W. van der Loo, J. Vanhommerig, J.S. Vicente, G. Virag & J.M. Zimmermann*	57
The Peel-Neck chicken of Belize and Guatemala, Central America *J.G. Mallia*	73
European approaches to conservation of farm animal genetic resources *D.L. Simon*	79
Inbreeding and loss of founder alleles in four variations of a conservation programme using circular mating, for Danish Shorthorn Cattle *M. Trinderup, J.N. Jørgensen & M. Hansen*	101
Advances in the Brazilian animal genetic resources conservation programme *A. da S. Mariante, M. do S. M. Albuquerque, A. A. do Egito & C. McManus*	109
Indexes	125
Editorial policies and procedures	153

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
ORGANISATION DES NATIONS UNIES POUR L'ALIMENTATION ET L'AGRICULTURE
ORGANIZACION DE LAS NACIONES UNIDAS PARA LA AGRICULTURA Y LA ALIMENTACION

UNITED NATIONS ENVIRONMENT PROGRAMME
PROGRAMME DES NATIONS UNIES POUR L'ENVIRONNEMENT
PROGRAMA DE LAS NACIONES UNIDAS PARA EL MEDIO AMBIENTE

Editorial
The state of the world's animal genetic resources ?

Animal genetic resources (AnGR) contribute substantial inputs to and outputs from most food and agriculture production systems, and must be wisely used, developed and conserved, as part of efforts to achieve and sustain world food security and rural development. In view of this importance, and of the increasing pace of change, local, national and regional communities must be empowered to act based upon answers to such key questions as:

- Do we have essential baseline data and other information on the status of animal genetic resources to establish local community, country, regional and global priorities for their effective and efficient management over time?
- Do all communities and countries have the capacity to manage these resources, in an increasingly interdependent world?
- Do we have in place the appropriate methodologies and technologies to best understand, use and develop, conserve and access these resources, in a sustainable manner?
- Are AnGRs capable of increasing production and productivity, or at least productivity alone, whilst also maintaining the levels of product quality demanded by the consuming communitity, identified and deployed to the farmers of each of the full range of important production environments ?
- Do we have sustainable intensification programmes in place for those AnGR currently being used by farmers?
- Do we have an adequate understanding of the status of breeds that are currently not of value to farmers, and of wild relatives of the domesticated animal species, to provide the foundation for an Early Warning System for Animal Genetic Resources at risk of being lost, and to identify opportunities for the future use of these resources?
- Are we in a position to be able to identify situations where an emergency response could be considered to prevent the loss of animal genetic resources at risk?
- Do we have in place at the local, country, regional and global levels sustainable policies for wise use of AnGR?

The answer to these questions collectively seems to be no! This presents a real challenge for all those concerned with agricultural sustainable development and food security; whether they be farmers, researchers, educators, policy makers or administrators; and particularly if they are simply members of the consuming community; even more so if they are tomorrow's decision-makers, our children and theirs!

Through the help of its Member Governments and other national and international organizations, FAO has been assisting countries to establish breed databases, in DAD-IS, and publish two editions of the World Watch List for Domestic Animal Diversity that with analysis provide substantial amount of data on AnGR globally. But this data is far short from providing the information implied in the above questions which is needed for planning and implementing sound and sustainable management of our countryies'AnGR.

The issue of the State of the World's AnGR (SoW-AnGR) now and regularly updating this to monitor AnGR development, is now a topic of discussion by country delegations in FAO governing body sessions. It was an important item on the agenda of the FAO Commission on Genetic Resources for Food and Agriculture that convened during April 1999 with delegations from over 140 countries and organizations. Delegations resolved that FAO should lead and coordinate the development of a country-driven Report on the State of the World's Animal Genetic Resource as funds become available.

The SoW-AnGR Report, will specfically establish essential baseline information in major areas: the state of animal diversity; the state of country capacity to manage animal genetic resources; the state of the art, the available methodologies and technologies to assist farmers, breeders and scientists to better describe, use, develop, conserve and access animal genetic resources, and thereby contribute to global food security and sustainable rural development.

The SoW-AnGR Report will establish the critical baseline data and information required to enable cost-effective AnGR Management activities to be planned and implemented at the local, country, regional and global levels. It will also provide the first reliable global outlook to examine potential future roles for animal genetic resources, and help project likely developments.

Finally, the first SoW-AnGR Report will help stimulate sustainable intensification of food and agriculture production of the broad range of production systems in countries, regions and globally.

The Editors

Editorial
Quel est l' état des ressources génétiques animales dans le monde?

Les ressources génétiques animales (AnGR), contribuent de façon importante autant qu'elles recueillent de la plupart des systèmes de production agricole et alimentaire. Elles doivent donc être utilisées avec précaution et développées et conservées, ceci dans le but d'atteindre et de maintenir la sécurité alimentaire et le développement rural dans le monde. Etant donné cette importance et le déroulement des changements en cours, les communautés au niveau local, national et régional doivent être en mesure d'agir en faisant face aux questions suivantes:

- Avons-nous les données de base essentielles et autres informations nécessaires sur la situation des ressources génétiques animales pour pouvoir établir les priorités, au niveau des communautés, des pays, des régions et au niveau mondial; quelle sera la gestion effective et efficace dans le futur?
- Est-ce que toutes les communautés et les pays possèdent les modalités nécessaires pour gérer ces ressources étant donné une toujours grandissant interdépendence mondiale?
- Avons-nous sur place les methodologies et technologies appropriées pour mieux comprendre, utiliser et développer, conserver et accéder à ces ressources de façon durable?
- Est-ce que les AnGR sont vraiment un moyen pour augmenter la production et la productivité, ou tout au moins seulement la productivité, tout en conservant la qualité des produits demandés par les consommateurs; identifier et déployer ses principes vers les agriculteurs de chacun des secteurs de production les plus importants?
- Avons-nous sur place des programmes d'intensification durables pour ces AnGR utilisées normalement par les agriculteurs?
- Possédons-nous une connaissance adéquate de la situation des races qui actuellement ne sont pas d'intérêt pour les agriculteurs, ainsi que des parents sauvages de ces espèces domestiques, pour jeter les bases pour un Système d'Alerte Rapide pour les AnGR qui sont en risque de disparition, et pour identifier les opportunités d'une utilisation future de ces ressources?
- Sommes-nous en position de pouvoir identifier les situations dans lesquelles une réponse urgente doit être prise en considération pour prévenir la perte de ressources génétiques animales à risque?
- Disposons-nous sur place, au niveau local, de pays, de région et au niveau mondial, de politiques durables pour une utilisation prudente des AnGR?

La réponse à cet ensemble de questions semble être non! Ceci représente un enjeu réel pour tous ceux concernés par le développement agricole durable et la sécurité alimentaire; aussi bien s'il s'agit d'agriculteurs, de chercheurs, d'enseignants, de politiciens ou d'administrateurs, et en particulier s'il s'agit simplement de membres de la société de consommateurs, encore plus si demain ils deviennent les "décideurs"!

A travers l'aide fournie par ses Gouvernements Membres et d'autres organisations nationales et internationales, la FAO a porté son aide aux pays pour établir des bases de données sur les races, DAD-IS, et a publié deux éditions de la Liste Mondiale de Surveillance pour la Diversité des Animaux Domestiques, qui, à travers son analyse, fourni un nombre important de données sur les AnGR au niveau mondial.

Cependant, toutes ces données sont bien loin de répondre aux questions posées précédemment, et qui sont nécessaires pour mettre en oeuvre et plannifier une gestion appropriée et durable des AnGR de nos pays.

La question de l'Etat Mondial des AnGR (SoW-AnGR) aujourd'hui et sa mise à jour régulière pour contrôler le développement des AnGR, est actuellement un thème de discussion durant les séances au sein des délégations des pays membres de la FAO. Il s'agissait d'un des points importants de l'agenda de la Commission pour les Ressources Génétiques pour l'Agriculture et l'Alimentation qui s'est réunie au mois d'avril 1999 avec les délégations provenant de plus de 140 pays et organisations. Les délégations ont conclus que la FAO devrait diriger et coordonner le développement d'un rapport-guide pour les pays sur l'Etat des Ressources Génétiques Animales (SoW) selon la disponibilité de fonds.

Le rapport SoW devra établir spécifiquement les bases d'information essentielles pour les thèmes principaux: la situation de la diversité animale; la situation de chaque pays à gérer les ressources génétiques animales; la situation actuelle, les méthodologies et technologies disponibles pour assister les éleveurs, les améliorateurs et les chercheurs à mieux décrire, utiliser, développer, conserver et accéder aux ressources génétiques animales, et ainsi contribuer à la sécurité alimentaire mondiale et au développement rural durable.

Le rapport SoW-AnGR établira les données guides indispensables et l'information requise pour permettre que les activités de gestion AnGR à plannifier et à mettre en oeuvre au niveau local, de pays, régional et au niveau mondial aient une bonne relation coût/efficacité. Ce rapport représentera aussi la première perspective fiable au niveau mondial pour examiner les futurs rôles potentiels des ressources génétiques animales et pour aider les projets de développement.

Finalement, le premier rapport SoW-AnGR servira à stimuler une intensification durable de la production alimentaire et agricole à large échelle dans les systèmes de production des pays, des régions et au niveau mondial.

Les Editeurs

Editorial
Cual es el estado de los recursos genéticos animales en el mundo?

Los recursos genéticos animales (AnGR) contribuyen en parte importante a los insumos y las producciones de la mayoría de los sistemas agroalimentarios. Deberían ser aprovechados, desarrollados y conservados prudentemente como parte del esfuerzo aunado para conseguir y sostener la seguridad alimentaria mundial y el desarrollo rural. Dada esta importancia, y debido al ritmo creciente de los cambios, las comunidades locales, nacionales y regionales deben tener la facultad para actuar basándose en las respuestas a preguntas clave como:

- Disponemos de datos fundamentales y de información adicional sobre el estado de los recursos genéticos animales para poder establecer prioridades en las comunidades local, nacional, regional y a nivel mundial para su gestión efectiva y eficiente a lo largo del tiempo?
- Todas las comunidades y países, tienen la capacidad de gestionar estos recursos en un mundo cada vez más interdependiente?
- Están puestas en práctica las metodologías y tecnologías apropiadas para entender, aprovechar y desarrollar al máximo los AnGR y para conservar y acceder a los mismos de una manera sostenible?
- Los recursos genéticos animales, son capaces de aumentar la producción y la productividad (o al menos esta última), manteniendo a la vez los niveles de calidad de los productos, exigidos por la comunidad de consumidores, identificados y puestos a disposición de los productores en cada parte del espectro de los medios importantes de producción?
- Existen en la práctica programas sostenibles de intensificación para los recursos genéticos animales utilizados actualmente por los ganaderos?
- Tenemos suficientes conocimientos sobre el estado de las razas que hoy día carecen de valor para los ganaderos, y de las especies salvajes relacionadas con las razas domesticadas, para establecer la base de un Sistema de Alerta para los AnGR en peligro de extinción, y para identificar las oportunidades para el aprovechamiento de dichos recursos en el futuro?
- Estamos preparados para identificar situaciones en las que una respuesta de emergencia sería necesaria para impedir la pérdida de recursos genéticos animales en peligro?
- Se están aplicando, a niveles local, nacional, regional y mundial, políticas sostenibles para un aprovechamiento juicioso de los recursos genéticos animales?

La respuesta global a estas preguntas parece ser negativa, lo cual presenta un verdadero desafío para todos los implicados en el desarrollo agrario sostenible y para la seguridad alimentaria, sean agricultores, ganaderos, investigadores, educadores, políticos o administradores; especialmente si son miembros de la comunidad de consumidores; más aún si son responsables políticos, y sobre todo ¡si de nuestros hijos y los suyos se trata!.

Mediante la ayuda de los Gobiernos de sus estados miembros y otras organizaciones nacionales e internacionales, la FAO ha estado ayudando a países a establecer bases de datos de razas, en DAD-IS, y ha publicado dos ediciones de la Lista Mundial de Vigilancia para la diversidad de animales domésticos, la cual ofrece bastantes datos sobre los recursos genéticos animales en el mundo. Pero estos datos están lejos de proporcionar la información implicada en las preguntas anteriores, necesaria para planificar y poner en práctica una gestión firme y sostenible de los recursos genéticos animales de nuestros países.

La cuestión del Estado Mundial de los Recursos Genéticos Animales (SoW-AnGR) ahora, y su actualización periódica para hacer un seguimiento del desarrollo de AnGR, es actualmente tema de debate durante las sesiones por parte de las delegaciones nacionales de los países miembros de la FAO. Ha sido una cuestión importante en el orden del día de la Comisión de la FAO sobre los Recursos Genéticos para la Alimentación y la Agricultura que se convocó durante el mes de abril de 1999, con delegaciones proveniente de más de 140 países y organizaciones. Las delegaciones decidieron que la FAO debía liderar y coordinar el desarrollo de un informe impulsado por los países sobre el Estado Mundial de los Recursos Genéticos Animales a medida que vaya habiendo disponibilidad de fondos.

El informe SoW-AnGR establecerá específicamente cuál es la información fundamental en zonas principales: el estado de la diversidad animal; la capacidad de un país de gestionar recursos genéticos animales; la situación actual, las metodologías y tecnologías disponibles para ayudar a los ganaderos, mejoradores y científicos para mejor describir, utilizar, desarrollar, conservar y acceder a los recursos genéticos animales y así contribuir a la seguridad alimentaria global y al desarrollo rural sostenible.

El informe SoW-AnGR establecerá los datos fundamentales críticos y la información necesaria para permitir la planificación y puesta en práctica de actividades de gestión de AnGR a niveles local, nacional, regional y global. También proporcionará la primera visión global y fiable para examinar los papeles potenciales para los recursos genéticos animales en el futuro y para ayudar a proyectar posibles desarrollos.

Finalmente, el primer informe SoW-AnGR ayudará a estimular la intensificación sostenible de la producción agroalimentaria en el amplio espectro de sistemas de producción en los países, en las regiones y en el mundo.

Los Editores

Contribution to 25th Issue of AGRI from the Founder Editor

Animal Genetic Resources Information Bulletin (AGRI) was established jointly by FAO and UNEP in 1983 as a new global journal. Funds for the first four years were provided by UNEP while development, editorial and publication tasks were undertaken by FAO.

To understand the reason for the start of AGRI it may be recalled that a mere 15-20 years ago the conservation of domestic animals was a novel idea that, for many people, ran counter to the aims of livestock improvement. The concept of conservation as an important component of agricultural biodiversity surfaced at the first UN Conference on the Environment in Stockholm in 1972 as a result of which UNEP was created.

FAO worked closely with UNEP and in 1980 they convened a Joint FAO/UNEP Member Country Expert Consultation in Rome on "The conservation and management of animal genetic resources" under the independent chair of Dr. Helen Newton-Turner of Australia. This Consultation was not for experts in their own right. Participants were nominated by their governments and came as representatives of the member countries of FAO and UNEP. Thus, the recommendations were directed to FAO and UNEP from the member countries. I represented Canada at this Consultation.

Until that time, the thrust of FAO's support to governments for livestock improvement had been to increase production and productivity. A major component of the FAO and of some government bi-lateral programmes had been the provision of semen from Black and White cattle to developing countries. This practice was later judged to be misplaced from a production point of view and was discontinued. Further, the practice was diluting the gene pools of indigenous cattle.

Little was known about the numbers, condition and genetic parameters of indigenous breeds at that time in either developed or developing countries. Documentation was sparse, often unpublished, poorly classified and inaccessible. The 1980 Consultation recommended that FAO and UNEP should co-finance and that FAO should establish:

1. Classification criteria for endangered breeds;
2. Technical methods and standards for live and cryogenic conservation;
3. Methods of conservation;
4. Regional data and gene banks;
5. Comprehensive documentation of livestock breeds in China and the USSR;
6. Training in conservation methods;
7. A series of technical publications on animal conservation;
8. A Newsletter.

Based upon these recommendations, UNEP provided funds and FAO undertook the tasks by adding them to the existing livestock improvement responsibilities of the Senior Officer for Animal Breeding in the Animal Production and Health Division (AGA) without at that time, it might be added, any increase in human resources. I was appointed to the enlarged position in 1982, thereby becoming the Founder Editor of AGRI and serving until 1990. All the recommendations of the 1980 Consultation were either completed or launched during the 1980s.

The Newsletter was intended to support the increasing number of individuals, NGOs and a few governments throughout the world that were beginning to work on the conservation of animal genetic resources. These people were isolated, frequently lacked technical direction, experience and funds. The Consultation urged that the Newsletter should be sent free of cost to all who were interested. There were two special aims:

1. To provide all those involved in Animal Genetic Resources Conservation and Management with information;
2. To offer a specialized journal for publication of papers on Animal Genetic Resources Conservation and Management, since this topic was often viewed as irrelevant at the time by some of the major animal science journals.

25 issues and 16 years later it seems strange that this major field of animal genetics should have been so late in developing.

The Newsletter was enthusiastically supported from the start by a growing number of contributors and readers and, under the present Editorship, has continued to expand and to contribute meaningfully to the conservation of animal genetic resources. In my view, it has been a significant factor in changing the perspectives of scientists, governments and development practitioners to include both livestock utilization and conservation as essential partners in livestock improvement now and in the future.

Dr. John Hodges
Founder Editor of AGRI

Past, present and future

Is issue 25 of a journal of any particular importance? At least in this case it means 16 years of interactions and some 2 000 pages of inputs. It all started at a time when people interested in the conservation of Animal Genetic Resources (AGR) were *a minute minority*, euphemistically speaking *a species on its way to extinction*. Today, seven years after the Rio de Janeiro Summit, the terms *AGR* and *Biodiversity* are truly *a la mode*.

The extraordinary development of science and technology these past decades was particularly marked by the progress of biotechnologies, the extent of their actual application and the potential and dangers they could introduce in the future. Thus, the many crises we had to address these past couple of years oblige us to renewed attention in the relationship Biosciences-Society. Ethics are now again *news* and questioning the advances of science, the benefits and implications, the successes and the challenges is today integral part of any daily exercise, actions and reactions. In this complex, new but fundamental thinking, biodiversity becomes a master-card.

It is known that indigenous AGRs are well adapted to the marginal regions and extensive difficult grazing territories of the world and are mostly linked to the manufacture and availability of traditional products of animal origin. Their conservation must thus be seen as a mission of local and regional collective interest. They must be fully incorporated as one of the decisive factors of the prevailing livestock production systems.

Having said that and having been directly and actively involved with AGR conservation and use since 1960, I can dare wonder if we have not been in recent years overstating sometimes the *specific importance* of this field of animal agriculture. AGR should be dealt within the overall context of the Animal Production Sector, including Livestock Systems and Global Rural Biodiversity, not as a mystified study field apart.

The Animal Genetic Resources Information Bulletin (AGRI) launched in the early 80s by John Hodges, stopped appearing in the late 80s because of cutbacks in the FAO Regular Programme Budget. As soon as this problem could be solved, around 1991 with UNEP's further meaningful support, it seemed indispensable to resume this publication medium through which colleagues from around the world and in particular those from developing countries could share their information and know-how on farm animal breeds without the constrains of a too sharp formalism. This is also true for the great number of interested people who are not directly concerned with research, such as breed associations, NGOs, INGOs and hobby breeders.

The new AGRI was designed and developed as a support for the circulation of results, reviews, point of views and opinions that a strictly scientific publication would not publish.

It is necessary to underline, at this stage, that this bulletin is one of the most cost-effective venues of its sort and is partially run on a voluntary basis.

There are three distinct periods in AGRI’s life (figure 1). The first one can be called the *birth and first difficult steps* (1983-1987) followed by two years of no activity due to financial constraints and the departure of the founder and first editor, John Hodges. The second period, (1991 to 1995; Co-Editors: Daniel Chupin and Jean Boyazoglu) corresponds to a time of *growth and worldwide*

Figure 1. Number of pages published per year.

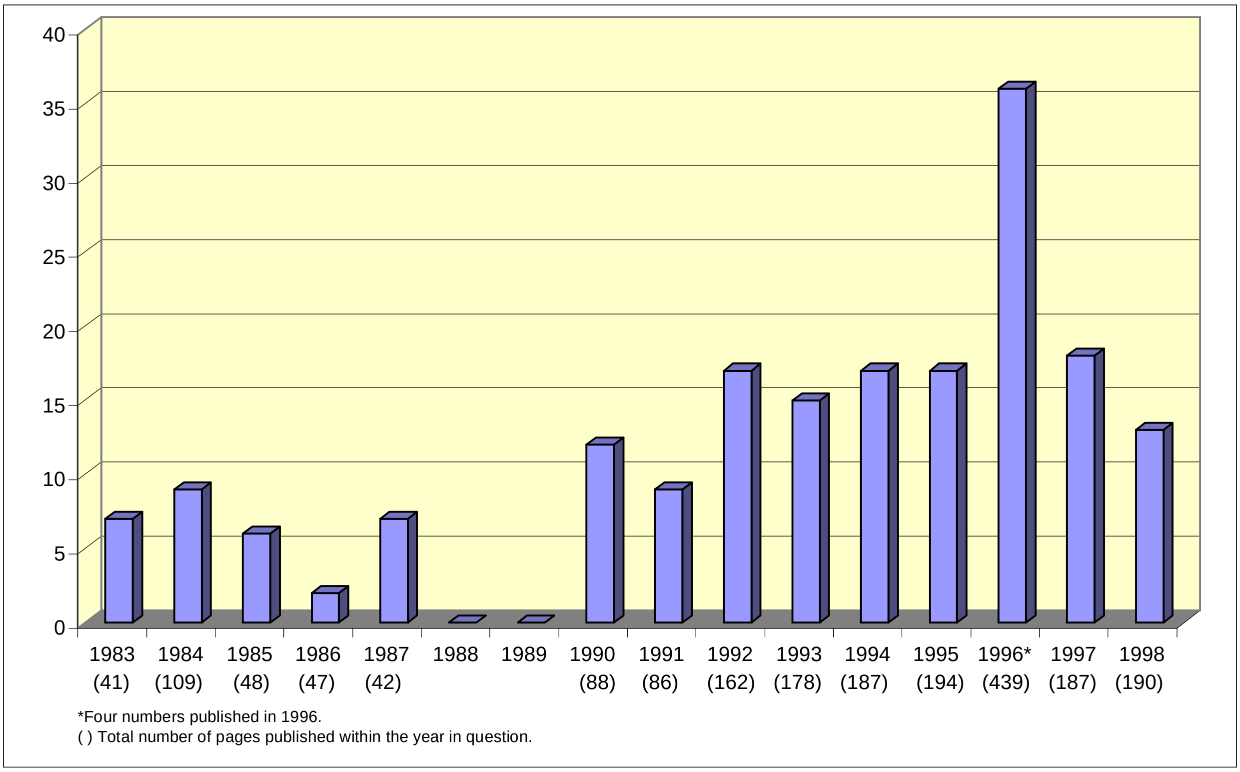


Figure 2. Number of articles published from different regions of the world.

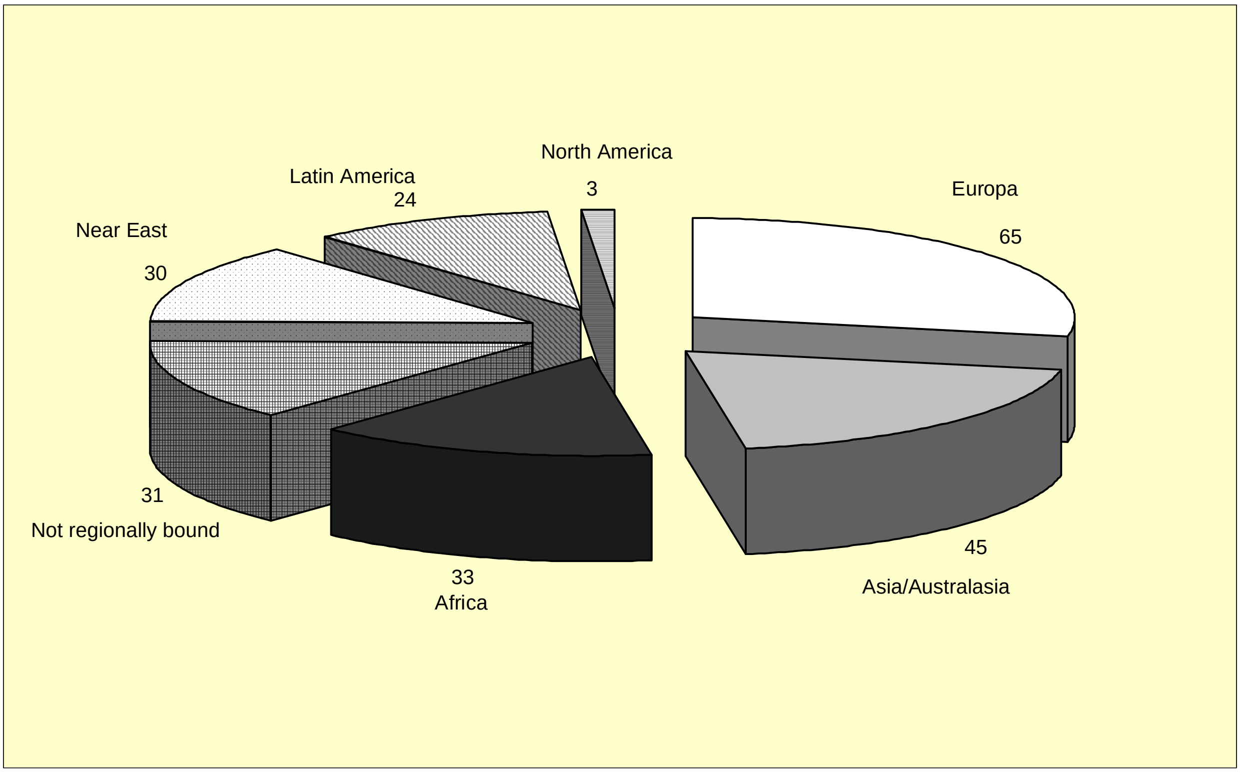
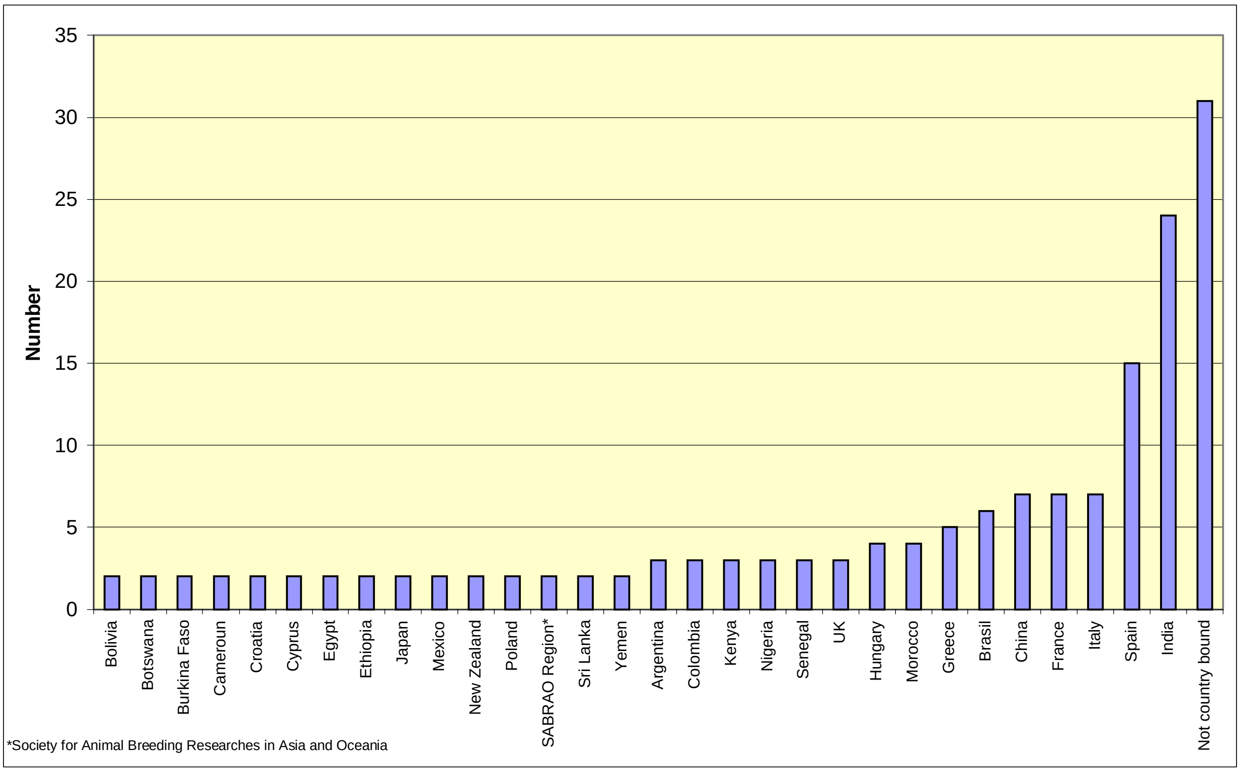


Figure 3. Countries with more than one paper published in AGRI.



recognition of the bulletin's value. The third period (1996 to date; Co-Editors: Salah Galal and Jean Boyazoglu) is one of *enhancing the journal's status, important changes in format and presentation, much more selective choice of the material published and the electronic publication on the Internet and in a CD ROM*. This period also correspond to the development of FAO's Global Strategy. While in the early years we had to struggle to obtain manuscripts, and in many cases had to rewrite them completely to meet linguistic and technical standards and needs, today we can be more discriminative: from 61 papers received since AGRI no. 19, 45 manuscripts were published or accepted for publication, while 5 are pending; thus a rejection rate of around 20%.

We mostly try to publish two issues per year, though there are some exceptions such as the year 1996 with four issues and 439 pages published; we had to find extra funding to meet the need of clearing the backlog of manuscripts. The average number of pages published per issue was around 50 in the 80s, moving up to 100 in the 90s. The issues dated 1990 correspond to the backlog of articles that were received during the 1987-1989 period; they were edited for publication in early 1991.

The 201 articles published in the 25 issues (figure 2) originated from Europe(33%), from Asia/Australasia (24%), from Africa (16%), from Latin America (12%), from Near East (4%) and from North America (2%); the remaining articles (19%) did not concern a specific region of the world. In particular, the geographic origin (country/subregion) of the material analysed in the published papers is given in figure 3 and table 1. The distribution of the articles shows that papers concerning the main ruminants (cattle, sheep and goats) and horses are in the great majority (figure 4) although the interest goes from pigeons to rabbits and from donkeys to yak and buffaloes.

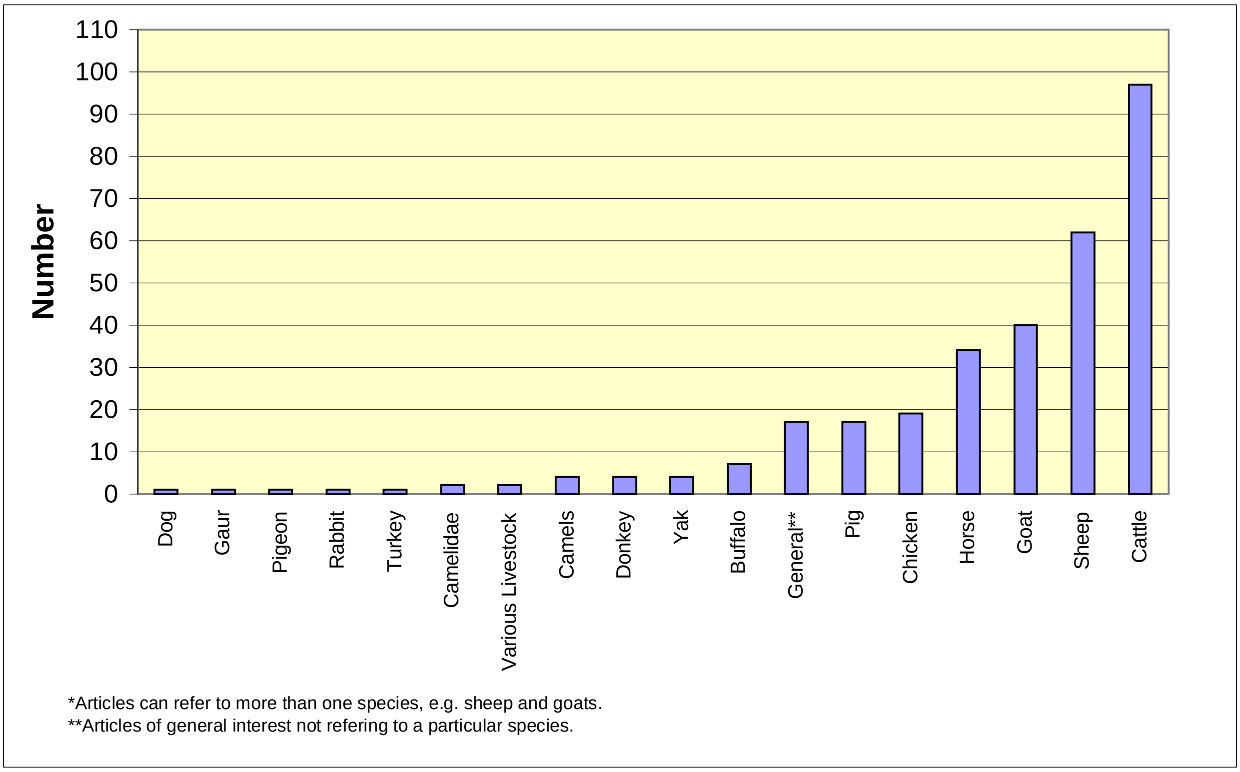
In 1997 we launched a questionnaire (see annex) to update our database and individual circulation list; this excluded libraries and

Table 1. Countries with only one paper published.

Albania	Ivory Coast	Togo	European Nordic Countries*
Algeria	Korea	Uganda	Latin America*
Benin	Latin America	Ukraine	Mediterranean basin*
Bhutan	Malawi	Uruguay	North America*
Bulgaria	Malta	USA	Sub-Saharan francophone countries*
Burundi	Mauritania	USSR (Russia Fed.)	West and Central African countries*
Canada	Peru	Vietnam	
Chad	Russia	Yugoslavia	
Cile	Saudi Arabia	Zanzibar	
Cina	Scandinavia	Central and Eastern European countries*	
Denmark	Somalia	Central Asia*	
Estonia	South Africa	Europe*	
Germany	South America		
Guatemala	Tanzania		

*Papers refering to subregions.

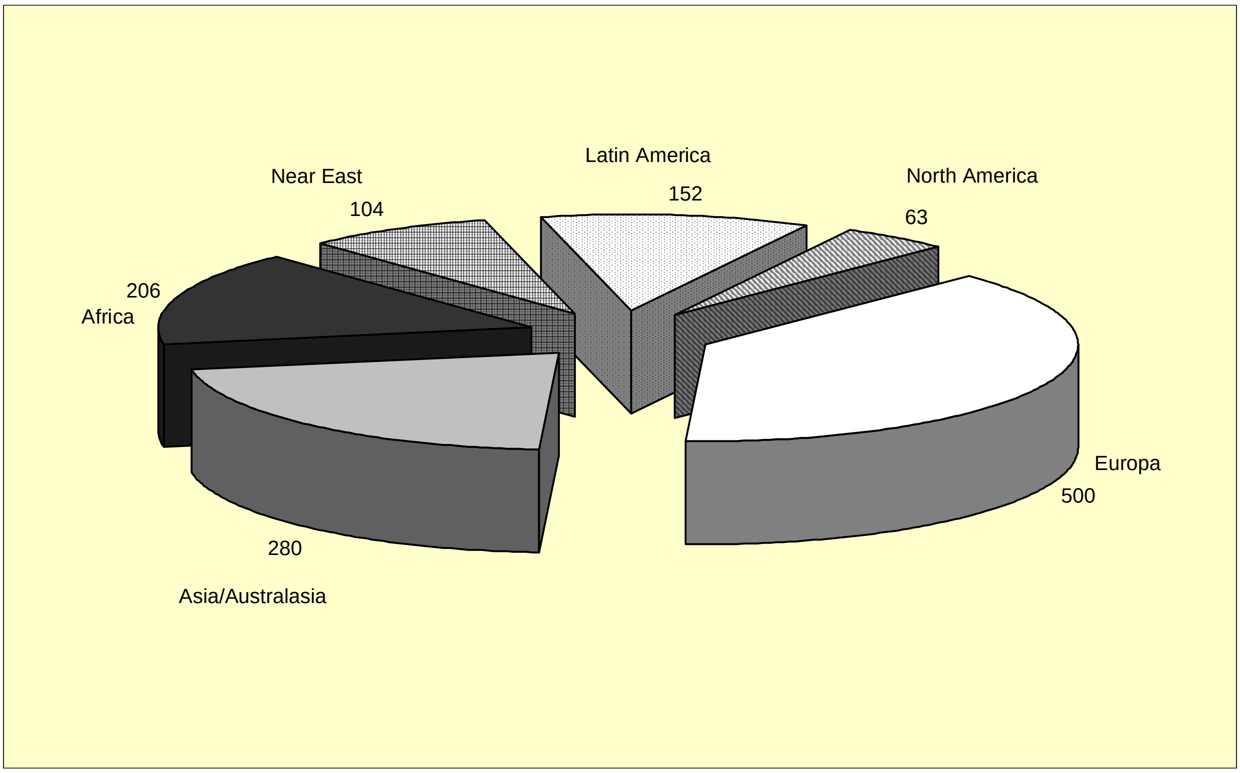
Figure 4. Number of articles published in AGRI, per species.*



institutions. We received 1 305 valid answers with an arbitrary division of 1/2 English, 1/4 French and 1/4 Spanish speaking *readers*. The geographic distribution of the readership that correctly answered the questionnaire (figure 5) was just over 38% from Europe (many from Eastern and Southern Europe), 21% from Asia/Australasia, 16% from Africa, 12% from Latin America, 8% from the Near East; less than 5% of the readership being from North America. Thus, a majority of the individual readers who personally receive AGRI are from less developed countries or countries in transition. Italy (table 2) has the largest national individual readership (136) followed by India (89) and Spain (65). The readers of AGRI are shown to be mainly involved with teaching, training and research (figure 6) while the main *fields* of interest are small ruminants (sheep and goats) and the cattle sector, followed by genetics and breeding (figure 7).

While defending the idea that this bulletin must accept all types of articles giving information on domesticated animal breeds, we realised very soon the need to standardise as much as possible the form and presentation to help the authors present better prepared articles and the readers to have more comprehensible material while giving the minimum necessary information relating to the breeds and line comparisons, within the framework of the locally prevailing production systems. Since the beginning we encouraged authors to include a maximum of photos and graphics which are more explicit than long discourse; maps, even sketchy ones, allowing a better localisation of the population described and its distribution than listing geographic names. This approach was received very favourably as shown by the growing number of interesting manuscripts received for the publication. This allowed to assure the regular publication of AGRI in the

Figure 5. Number of AGRI subscribers in the different regions of the world.*



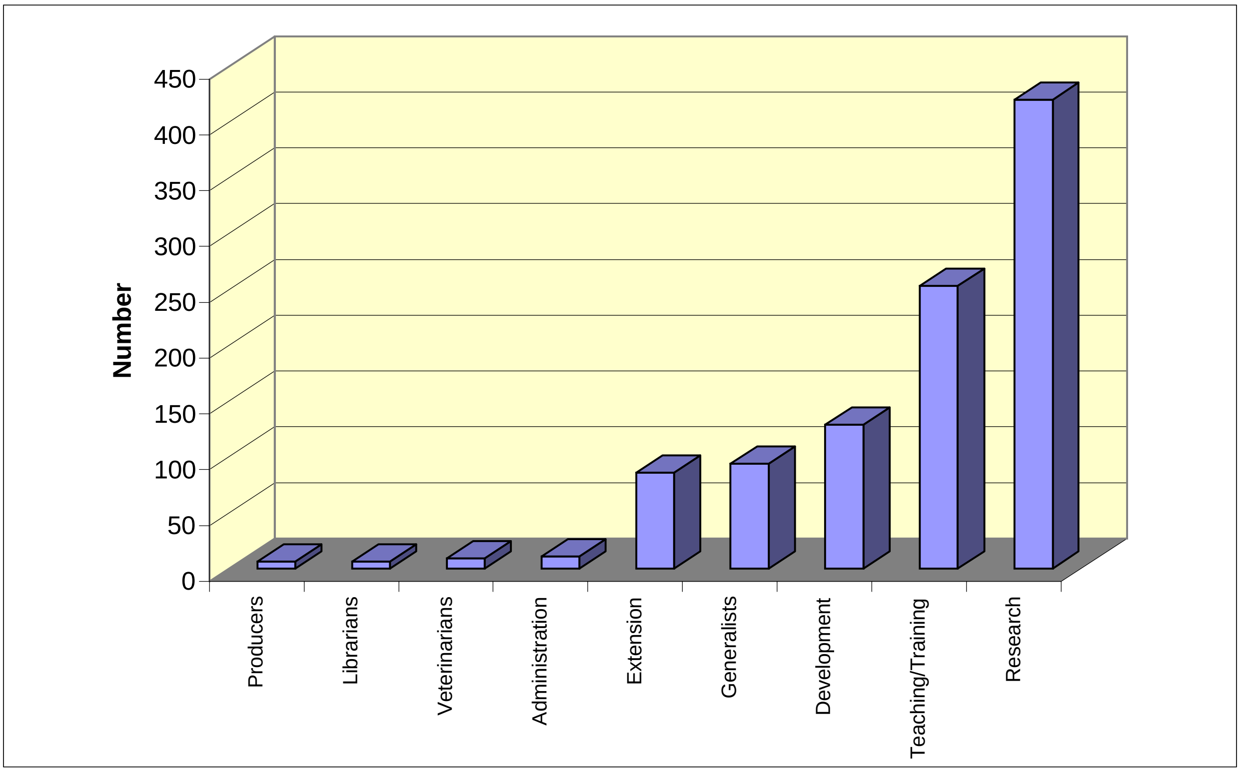
*This figure refers only to those *individual readers* who answered the 1997/1998 questionnaire.

Table 2. Individual country readership distribution of AGRI.

Class	Country
1-5 readers	Albania, Algeria, Angola, Antigua and Barb, Austria, Bahrain, Barbados, Benin, Bermuda, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Bulgaria, Burundi, Cambodia, Cameroon, Cape Verde, Central African, Chad, Taiwan, Congo, Congo, Cook Islands, Costa Rica, Croatia, Cyprus, Czech Republic, Dominican Republic, Ecuador, El Salvador, Equatorial Guinea, Eritrea, Estonia, Falkland Islands, Fiji, Finland, French Guyana, Gambia, Guadeloupe (France), Guam (USA), Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hungary, Iceland, Iran, Islamic Re, Ireland, Israel, Jamaica, Jordan, Kazakhstan, Korea, Kuwait, Kyrgyz Republic, Laos, Latvia, Lebanon, Lesotho, Liberia, Libya, Lithuania, Luxembourg, Macedonia, Madagascar, Maldives, Malta, Mauritania, Mauritius, Moldavia, Mongolia, Mozambique, Myanmar, Namibia, Netherlands Antilles, New Zealand, Nicaragua, Niger, Oman, Papua New Guinea, Puerto Rico (USA, Romania, Russian Federation, Rwanda, Samoa, Saudi Arabia Kingdom, Sierra Leone, Slovakia, Slovenia, Solomon Islands, Sri Lanka, Swaziland, Tanzania, Togo, Trinidad and Tobago, Tunisia, Uganda, Ukraine, United Arab Emirates, Vanuatu, Venezuela, Vietnam, Yemen, Yugoslavia, Zambia
6-10 readers	Argentina, Bangladesh, Burkina Faso, Ivory Coast, Cuba, Denmark, Ethiopia, Ghana, Greece, Iraq, Malawi, Malaysia, Mali, Morocco, Nepal, Norway, Poland, Portugal, South Africa, Syria, Turkey, Uruguay, Zimbabwe
11-15 readers	Colombia, Indonesia, Japan, Kenya, Peru, Senegal, Sudan, Sweden, Thailand
16-20 readers	Australia, Chile, Mexico, Nigeria, Pakistan, Switzerland
21-30 readers	Belgium, Canada, China, Netherlands, Philippines
31-42 readers	Brazil, Egypt, France, Germany, United Kingdom, United States of America
65 readers	Spain
89 readers	India
136 readers	Italy

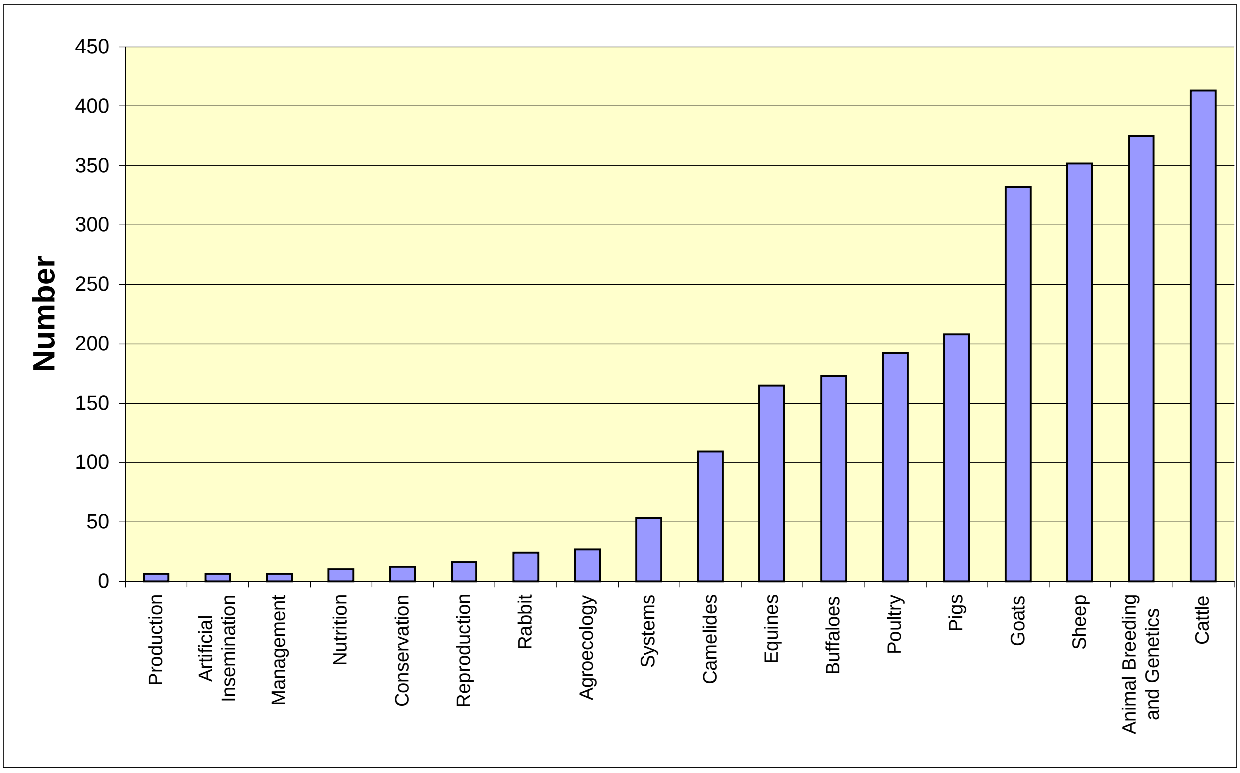
This table refers only to those *individual readers* who answered the 1997/1998 questionnaire, (1305 valid answers received).

Figure 6. Main responsabilities of AGRI readers.*



*Many readers may have two or more responsabilities, e.g. research and teaching.

Figure 7. Main interests of AGRI readers.*



*Many readers may have two or more interests, e.g. sheep and goats or reproduction and pigs.

years 1992-1996 and also considerably increased the number of pages per issue. Evidently the regular flow of AGRI depends and will depend even more in the future on the availability of the necessary funds and the collaboration and voluntary input of all persons involved with the publication.

As the one that has been the longest involved voluntarily with the journal, I should underline that, in my humble opinion, a very important feature of AGRI is that it is one of the few remaining FAO periodicals offered free of cost to all those requesting it in writing, in line with the strong recommendations made by the Country Expert Consultation in 1980. In this respect, the very meaningful financial and moral support of UNEP must be acknowledged. It is important also to refer here to the loyalty of this journal's readership, the great majority of which is in the developing world. The number of answers received (more than 1 500 of which 1 305 correctly filled in) to the 1997-98 questionnaire is an impressive showing of interest in the journal; over 75% of the questionnaires circulated to the global individual readership (some 2 000 addresses) has been duly filled-in and returned!

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• Others (pls. specify) ....

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• Goat • Sheep • Pig • Poultry
Others (specify):...

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The state of African cattle genetic resources I. Classification framework and identification of threatened and extinct breeds

J.E.O. Rege

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Summary

A field and literature survey was conducted to determine the status of cattle genetic resources of sub-Saharan Africa and to identify cattle breeds at risk and those which may have become extinct over the last century. This paper - in two parts - summarises preliminary results of the survey. The survey revealed that sub-Saharan Africa is home to a total of 145 cattle breeds/strains comprising two taurine Longhorns, 15 taurine Shorthorns, 75 zebu *(Bos indicus*), 30 sanga, eight zenga (zebu-sanga), nine breeds derived from interbreeding of indigenous breeds/strains located in close proximity to each other, and six systematically created composite breeds. Out of the 145 breeds identified from the survey, 47 (about 32%) were considered to be at risk of extinction. Risk categories used were: Critical (most severe), Endangered, Vulnerable, and Rare (least severe). Of the breeds identified to be at risk of extinction, six were in the "Rare" category, 10 were "Vulnerable", another 10 were "Endangered" and 15 were in the "Critical" category. A total of 22 breeds (about 13%) previously recognised in the continent have become extinct in the last century. This number excludes some populations which have lost their individual identity due to admixtures involving two or more originally distinct breeds.

Resumen

Se llevó a cabo un estudio bibliográfico y de campo para determinar cuál era el estado de los recursos genéticos ganaderos del Africa subsahariana y para identificar las razas ganaderas en peligro así como aquellas que se hayan podido extinguir durante el último siglo. Este artículo, dividido en dos partes, resume los resultados preliminares del estudio. El estudio reveló que el Africa subsahariana alberga un total de 145 razas bovinas/estirpes, comprendiendo dos razas taurinas Longhorn, 15 Shorthorn, 75 zebu (*Bos indicus*), 30 sanga, 8 zenga (zebu-sanga), 9 razas derivadas de cruzamientos entre razas autóctonas y estirpes estrechamente relacionados y 6 razas compuestas creadas de forma sistemática.
De los 145 razas identificadas en el estudio, 47 (alrededor del 32%) se consideraron en peligro de extinción, las categorías de riesgo utilizadas siendo las siguientes: crítica (más severa), en peligro, vulnerable, y rara (menos severa). De las razas identificadas como en peligro de extinción, seis se encontraban en la categoría "rara", 10 eran "vulnerables", otras 10 estaban "amenazadas" y 15 estaban en la categoría "crítica". Un total de 22 razas (alrededor del 13%) previamente reconocidas en el continente se han extinguido en el último siglo. Esta cifra excluye algunas poblaciones que han perdido su identidad individual debido a mezclas entre dos razas originalmente distintas.

Key Words: *Breed classification, Cattle, Endangered breeds, Extinct breeds, Phenotypic diversity, Sub-Saharan Africa.*

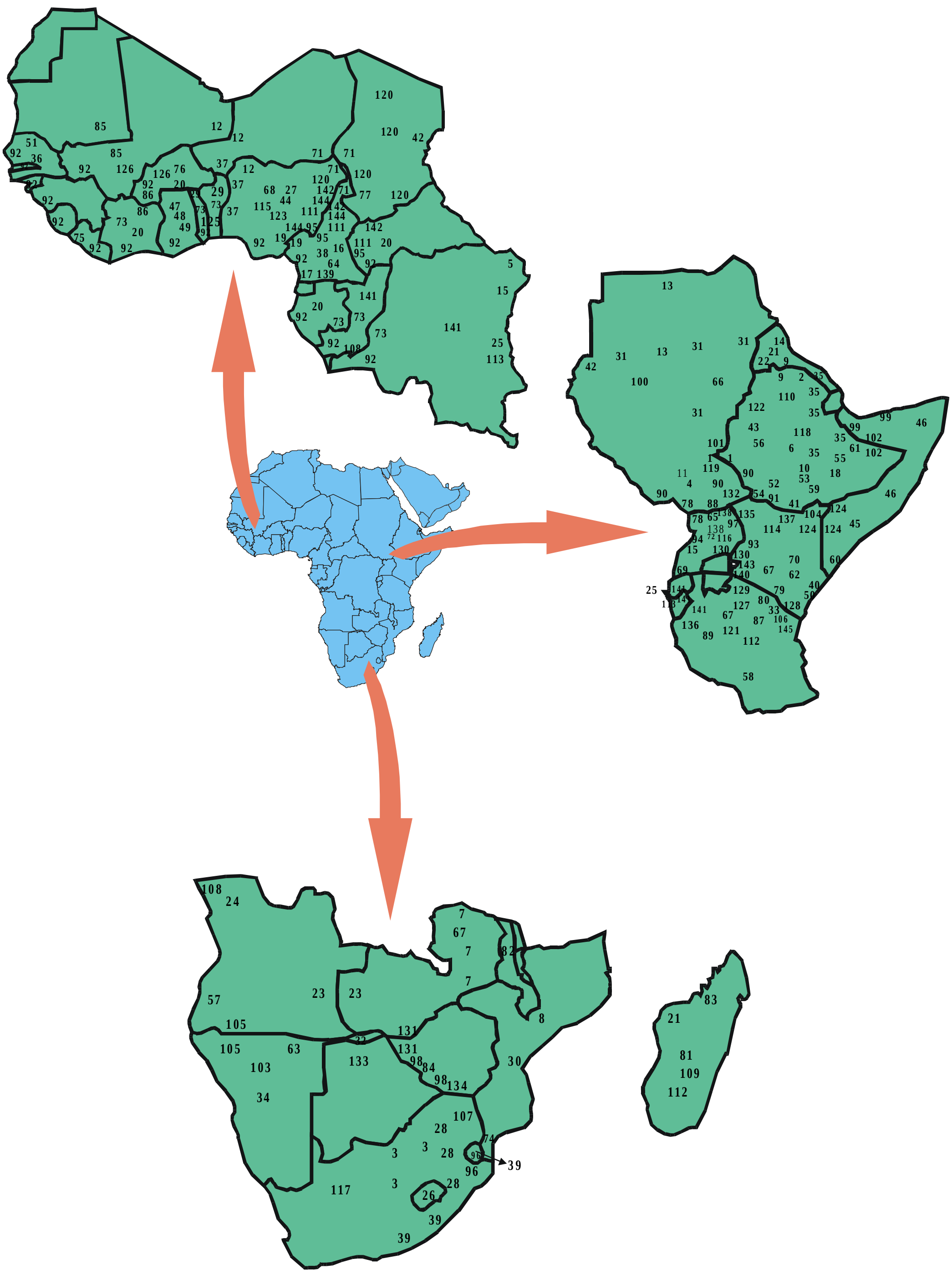

Figure 1. Distribution of cattle breeds in some African countries

Introduction

The origins of indigenous cattle of Africa still remain uncertain despite available archaeological, anthropological and historical evidence (Epstein and Mason, 1984; Blench, 1993). It is generally accepted that the African cattle populations arose from three main phases of introduction from Asia through the Nile valley in Egypt or via the Horn of Africa.

Subsequent migrations led to dense populations of cattle in the East African highlands, around the present-day Ethiopia

List of breed codes reported in figure 1

1.Abigar
2.Adwa
3.Afrikaner
4.Aliab Dinka
5.Alur (Nioka, Blukwa)
6.Ambo
7.Angoni
8.Angonia (Angone)
9.Arado
10.Arsi
11.Aweli Dinka
12.Azaouak (Tuareg)
13.Baggara
14.Baherie
15.Bahima
16.Bakosi
17.Bakweri
18.Bale
19.Banyo
20.Baoulé
21.Baria
22.Barka
23.Barotse
24.Barra do Cuanzo
25.Bashi
26.Basuto
27.Biu
28.Bonsmara
29.Borgou
30.Bovines of Tete
31.Butana
32.Caprivi
33.Chagga (Wachagga)
34.Damara (Herero)
35.Danakil
36.Djakore
37.Djelli (Diali)
38.Doayo (Namichi)
39.Drakensberger
40.Duruma
41.Ethiopian Boran (Borana)
42.Fellata (Bororo)
43.Fogera
44.Forest Muturu
45.Garre (Gherra)
46.Gasara
47.Ghana "sanga"
48.Ghana Dwarf Muturu
49.Ghana Shorthorn
50.Giriama
51.Gobra
52.Goffa
53.Guraghe
54.Hammer
55.Harar
56.Horro
57.Humbi
58.Iringa Red
59.Jem-Jem
60.Jiddu
61.Jijiga
62.Kamba
63.Kaokoveld
64.Kapsiki
65.Karamajong zebu
66.Kenana
67.Kenya (Improved) Boran
68.Keteku
69.Kigezi
70.Kikuyu
71.Kuri
72.Kyoga
73.Lagune
74.Landim
75.Liberia Dwarf Muturu
76.Lobi
77.Logone
78.Lugware
79.Maasai (Kenya)
80.Maasai (Tanzania)
81.Madagascar zebu
82.Malawi Zebu
83.Manjan'i Boina
84.Mashona
85.Maure
86.Méré
87.Mkalama Dun
88.Mongolla
89.Mpwapwa
90.Murle
91.Mursi
92.N'Dama
93.Nandi
94.Nganda
95.Ngaundere
96.Nguni
97.Nkedi
98.Nkone
99.North Somali Zebu
100.Nuba Mountain Zebu
101.Nuer
102.Ogaden
103.Okavango
104.Orma Boran
105.Ovambo
106.Pare
107.Pedi
108.Porto-Amboim
109.Rana (Omby Rana)
110.Raya-Azebo
111.Red Fulani
112.Renitelo
113.Ruzizi
114.Sabmuru
115.Savanna Muturu
116.Serere
117.Shangan
118.Sheko
119.Shilluk
120.Shuwa
121.Singida White
122.Smada
123.Sokoto
124.Somali Boran
125.Somba
126.Sudanese Fulani (Peul Zebu)
127.Sukuma (Tinde)
128.Taita
129.Tarime (Shashi)
130.Teso
131.Tonga
132.Toposa
133.Tswana
134.Tuli
135.Turkana
136.Ugogo Grey
137.Unimproved Boran (Borana)
138.Usuk
139.Wakwa
140.Watende
141.Watusi
142.White Fulani
143.Winam (Kavirondo)
144.Yola
145.Zanzibar Zebu

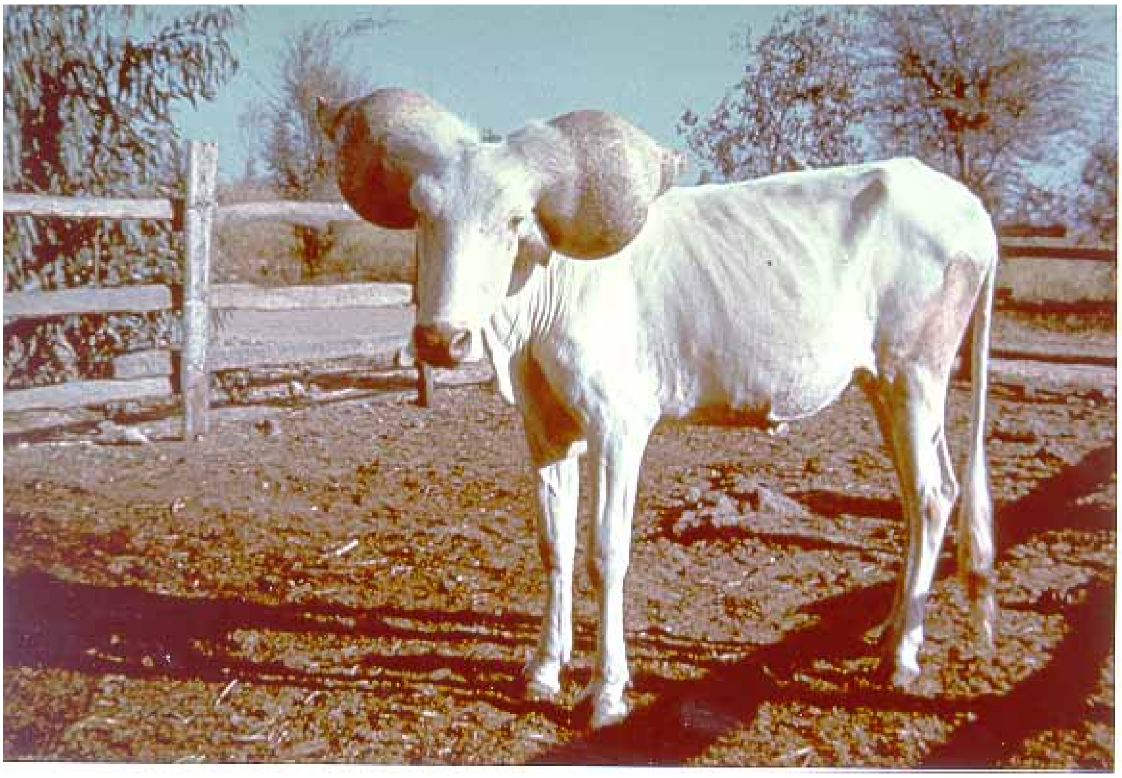

Figure 2. Kuri cattle.

and Kenya. The humpless Longhorns arrived in the continent approximately 5000 BC, followed by the humpless Shorthorns around 2500 BC. Humpless Shorthorn cattle were historically distributed in almost all ecological zones. Isolated populations were recorded in Sudan and Central Tanzania in historical times and remnant populations still exist in Ethiopia. The humped zebu first arrived about 1500 BC and later in large numbers around 670 AD (Eptsein, 1971). The first zebu cattle in Ethiopia are thought to have been brought through Somalia by Semitic people from Arabia, and their subsequent interbreeding with the taurine Longhorns are considered to have produced the present-day sanga cattle, although recent (unpublished) evidence from ILRI work questions the "crossbred origin" of the sanga. The second introduction of zebu cattle led to a major replacement of sanga cattle from most parts of eastern Africa, emergence of intermediate zebu-sanga breeds in some cases, and separate evolution into different strains in the diverse ecological zones. The zebu cattle further spread westwards and southwards to become the major group of cattle in the region bordered by latitude 20°N in northern Sudan, in the north, the western rain-forest barrier in the west and the Zambezi river, latitude 15°S, in the south.

Present-day African cattle can be classified into four broad categories: the humpless *Bos taurus,* widely distributed in West and Central Africa; the humped *Bos indicus* (zebu), distributed widely in eastern and the dry parts of West Africa; the sanga, found mainly in eastern and southern Africa; and sanga x zebu types ("zenga") found in eastern Africa. The taurine (humpless) type has two groups, Longhorns (*B. taurus longifrons*) and Shorthorns (*B. taurus brachyceros*), both of which are restricted to West and Central Africa.

In addition to the four broad groups of African cattle, there are more recent derivatives that have resulted either as a consequence of close proximity of two or more indigenous populations, sometimes accelerated by deliberate crossing (e.g. the Borgou, Méré and Ghana Sanga of West

Africa), or as a product of efforts to create composite commercial breeds (e.g. the Bonsmara of South Africa and the Mpwapwa of Tanzania).

There is very little information on the diversity in indigenous African livestock populations, both at phenotypic and genetic levels. Indeed, not even the number of breeds of the various species is known. Working estimates are: 100-150 indigenous cattle, 50-60 sheep and 45-50 goat breeds in sub Saharan Africa (Rege, 1998). Additionally, with very few exceptions, there is no data on the population sizes of the different breeds and their status, i.e. whether their numbers are decreasing, increasing or stable.

About the Survey

Starting in 1992, the International Livestock Centre for Africa (ILCA), now the International Livestock Research Institute (ILRI), initiated activities aimed at determining the status of, and compiling information on characteristics of, indigenous African domestic ruminant livestock, specifically cattle, sheep and goats. These activities consisted of:

1) sending out mail questionnaires to scientists in national programmes;
2) field visits to assess the status of individual breeds/populations identified from questionnaires;
3) requests for specific information from collaborating scientists;
4) conduct of rapid surveys in selected countries or of selected breeds/populations within a country; and
5) review of literature, especially the non-conventional (grey) publications such as annual reports, proceedings of national meetings (conferences, seminars), research project reports, etc.

In addition to these sources, a substantial amount of information was obtained from field expeditions conducted during a continent-wide exercise to collect blood samples for molecular characterisation, to quantify between- and within-population genetic diversity at the DNA level, which is part of ILRI's overall programme on animal genetic resources. Field visits included interviews with government officials, national scientists and farmers. The aim of the interviews was to obtain, for each breed/population, indications of:

1) major uses;
2) trends (decreasing, increasing or stable) as perceived by local communities, extension personnel and scientists;
3) possible reasons for the perceived trends;
4) phenotypic description of the breed; and
5) levels of performance, where available.

Whereas the information on uses, trends and determinants of trends, as well as breed description, was mainly obtained from field visits and, to a lesser extent, mail questionnaires, most of the quantitative data on performance was obtained from comprehensive reviews of literature. Data on physical measurements (e.g. withers height) were, in a few cases, obtained by measuring representative animals on-farm or on-station during the field visits or through collaboration with national scientists.

This survey represents a first attempt to assess the status of the ruminant genetic resources of sub-Saharan Africa. It does not constitute the level of assessment required to make decisions on conservation and use. However, it provides a basis for additional, targeted surveys. As this was a very broad-brush survey, the information is incomplete, and may even contradict facts unknown to us. We are aware of this but feel the publication of these results will provoke action, particularly at national levels, that will help improve the information base on domestic African breeds/strains. In the meantime, efforts are underway to conduct in-depth breed surveys in pilot countries. One such survey, in Ghana, is already completed and will be published shortly. Additionally, activities on molecular characterisation of African cattle are well underway. Similar studies have also been initiated for sheep and goats.

Figure 1 shows the geographic distribution of cattle breeds in some African countries

Breed Groups and Clusters

As has been alluded to, the survey recognised four broad categories of African cattle: the humpless Bos taurus; the humped Bos indicus or zebu; the sanga; the zenga (sanga x zebu derivatives). Fifth and sixth categories included were the "recent derivatives" created from interbreeding amongst indigenous breeds, and the composite breeds developed from systematic crossing of two or more breeds for specific purposes. The taurine category was further subdivided into two groups – the Longhorns and the Shorthorns - while the zebu and the sanga were divided into several groups and clusters. A group is defined here as a collection of breeds or strains considered to have a common ancestry but not necessarily inhabiting the same geographical area. Cluster, on the other hand, is used to refer to a collection of breeds or strains which belong to the same category and, usually, group, and occupy the same geographical area e.g. a country and/or a defined ecozone within one or more countries. Thus, the sub-category "Small East African Zebu" was divided into groups represented by the Abyssinian Shorthorned Zebu, The Somali Zebu, The Teso Zebu, etc. Examples of clusters were the Kenya cluster of zebus, the Tanzania cluster of zebus and the Ovambo and southwestern cluster of sangas. Although the motivation behind the "clustering" was purely presentational convenience, an attempt was made to lump together only those breeds and strains which, because of geographical proximity have had a high likelihood of interbreeding and hence may have more common genetic background than other populations with similar evolutionary history but which have been more isolated. The term group is also used to refer to such broad categories as the humpless Longhorn and the humpless Shorthorn, members of which are considered to be genetically closely related and have not undergone the same differentiation as seen in the zebu or, to some extent, the sanga.

This paper, the first in a two-part series, provides a framework for the classification of African cattle breeds/strains on the bases of historical evidence, phenotypic appearance and geographical location, and identifies populations that may be threatened with extinction and those which may have become extinct in the last 100 years or so. The second paper (Rege and Tawah, 1999) describes the physical characteristics and status of each of the existing breeds in terms of breed development as well as their distribution, main uses and known or speculated evolutionary relationships among breeds.

Figures from 2 to 5 show some cattle breeds.

Classification of Breeds

The taurine cattle

The humpless Shorthorns and Longhorns of West and Central Africa have lived in their present niches for several millenia. The stringency of this environment has supposedly contributed to their small size and to the "low productivity" of these breeds compared to most zebus found in the more arid areas of the tropics. Nonetheless, they have acquired a hardiness to the harsh climatic conditions and resistance to the various diseases endemic to their environments. Notable among these adaptations is their tolerance to trypanosomosis, the major disease limiting introduction of non-native livestock into the vast humid and sub-humid areas of West and Central Africa. Aboagye *et al.* (1994) and Rege *et al.* (1994a; b; c) have reviewed the distribution and important characteristics of the Shorthorn cattle while ILCA (1979) summarised the attributes of the major trypanotolerant populations of West and Central Africa.

Table 1 summarises the classification of the humpless cattle of Africa. There are two humpless Longhorn breeds, the N'Dama and the Kuri, both found in West Africa and 14 humpless Shorthorn breeds widely distributed in the humid and sub-humid zones

Table 1. Humpless cattle breeds of sub-Saharan Africa.

Group and Breed/Strain	Location/Country	Estimated[a] Population	Mature weight (kg) Male	Mature weight (kg) Female	Withers height (cm) Male	Withers height (cm) Female	Main uses (In order of importance)
1. Humpless Longhorns							
1. N'Dama	All coastal countries of West and Central Africa, plus Mali, B. Faso and C.A. Republic	4 863 000	220-360	180-300	95-120	90-115	Meat; Work; Manure
2. Kuri	Chad; Niger; Nigeria; Cameroon	110 000	500-750	360-450	140-180	126-145	Meat; Milk; Work
2. Humpless Shorthorns (West and Central Africa)							
3. Ghana Shorthorn		738 000	190-395	163-280	105-117	99-110	Meat; Work; Milk
4. Baoulé	Central African Republic; Ivory Coast, Gabon, B. Faso	1 082 000	160-300	150-240	100-106	90-103	Milk; Meat
5. Lobi	Burkina Faso	490 000					Meat; Milk
6. Savanna Muturu	Nigeria	58 000		150-225			Meat
7. Liberia Dwarf Muturu	Liberia	5 500			86-95	82-94	Meat
8. Bakweri	Cameroon	1 300					Meat; Rituals
9. Somba	Benin; Togo	216 000	150-215	115-185	89-106	85-103	Meat; Milk; Rituals
10. Doayo (Namchi)	Cameroon	7 000			100-110	97-106	Meat; Rituals
11. Kapsiki	Cameroon	3 300			105-117	100-109	Meat; Rituals
12. Ghana Dwarf Muturu	Ghana	100					Meat
13. Bakosi	Cameroon	1 300					Meat; Rituals
14. Lagune	Benin; Congo; Ivory Coast, Gabon; Togo; Zaire	65 700	180-280	165-262	89-106	85-103	Meat; Manure
15. Logone	Chad	NA					Meat
16. Forest Muturu	Nigeria	40 000			85-95	83-93	Meat; Rituals
3. Humpless Shorthorns (Eastern Africa)							
17. Sheko	Ethiopia	31 000					Meat; Work

[a]Latest available estimate; if multiple in same year, highest estimate used; combines estimates from different countries, if applicable.

Table 2. Zebu cattle breeds of sub-Saharan Africa.

Group and Breed/Strain	Location/Country	Estimated[a] population	Mature weight (kg) Male	Mature weight (kg) Female	Withers height (cm) Male	Withers height (cm) Female	Main uses (in order of importance)
1. Large East African Zebu							
1. Ethiopian Boran (Borana)	Ethiopia	1 896 000	300-385	300-350			Milk; Meat
2. Kenya (Improved) Boran	Kenya, Tanzania, Zambia	580 570	550-850	400-550			Meat; Milk; Work
3. Unimproved Boran (Borana)	Kenya	1 882 000	255-395	250-355			Milk; Meat
4. Orma Boran	Kenya	547 000					Milk; Meat
5. Somali Boran	Somalia	NA	295-410	230-355			Milk; Meat
6. Karamajong zebu	Uganda	510 000	320-490	300-410			Milk; Meat
7. Toposa	Sudan	398 000	350-600	250-390	130-147	120-133	Milk; Meat; Work
8. Murle	Sudan, Ethiopia	NA	300-410	220-320	128-134	100-122	Milk; Meat; Work
9. Butana	Sudan	258 000	395-600	300-440	131-149	123-139	Milk; Meat
10. Kenana	Sudan	1 670 000	400-610	300-435	132-148	124-138	Milk; Meat
11. Baggara	Sudan	3 270 000	300-600	230-450			Meat; Milk; Work
12. Barka	Eritrea	850 000	335-490	295-415	122-138	120-133	Milk; Meat
13. Turkana	Kenya	621 750					Milk; Meat
2. Small East-African Zebu							
2.1 Abyssinian Shorthorned Zebu							
14. Arsi	Ethiopia	2 012 000					Work; Meat; Milk
15. Adwa	Ethiopia	NA					Work; Meat; Milk
16. Ambo	Ethiopia	NA					Work; Meat; Milk
17. Bale	Ethiopia	738 000					Work; Meat; Milk
18. Goffa	Ethiopia	NA					Work; Milk; Meat

Continued ....

.... *Table 2.*

Group and Breed/Strain	Location/Country	Estimated[a] population	Mature weight (kg) Male	Mature weight (kg) Female	Withers height (cm) Male	Withers height (cm) Female	Main uses (in order of importance)
19. Guraghe	Ethiopia	NA					Work; Meat; Milk
20. Harar	Ethiopia	NA					Work; Meat; Milk
21. Jem-Jem	Ethiopia	434 000					Work; Meat; Milk
22. Smada	Ethiopia	NA					Work; Meat; Milk
23. Mursi	Ethiopia	NA					Milk; Meat; Work
24. Hammer	Ethiopia	NA					Milk; Work; Meat
25. Jijiga	Ethiopia	100 000					Work; Milk; Meat
26. Ogaden	Ethiopia; Somalia	NA					Milk; Meat; Work
2.2 *The cluster of southern Sudan and Vicinity*							
27. Lugware	Uganda, D.R. Congo	196 200	295-355	230-260	102-111	98-109	Work; Meat; Milk
28. Mongolla	Sudan	240 000		130-225	101-110	100-105	Milk; Meat
29. Nkedi	Uganda	752 000	240-450	270-325	102-121	99-107	Work; Milk; Meat
30. Nuba Mountain Zebu	Sudan	44 000	200-225	175-225			Meat (for ceremonies)
2.3 *The «Somali» group*							
31. Garre (Gherra)	Somalia	NA	290-340	265-305	115-133	100-120	Milk; Meat
32. Gasara	Somalia	NA	205-295	200-230	102-129	101-115	Milk; Meat
33. North Somali Zebu	Somalia	NA					Milk; Work
34. Baherie	Eritrea	10 000	190-285	170-220	109-124	98-120	Milk; Meat
2.4 *The Kenya cluster*							
35. Kikuyu	Kenya	89 500					Meat
36. Taita	Kenya	NA	194-405	125-360	90-130	94-122	Meat; Milk; Work
37. Giriama	Kenya	NA					Meat; Milk; Work
38. Duruma	Kenya	NA					Meat; Milk; Work

Continued ....

.... *Table 2.*

Group and Breed/Strain	Location/Country	Estimated[a] population	Mature weight (kg) Male	Mature weight (kg) Female	Withers height (cm) Male	Withers height (cm) Female	Main uses (in order of importance)
39. Kamba	Kenya	897 000					Meat; Milk; Work
40. Maasai	Kenya	1 398 000	300-445	275-385	118-140	110-135	Milk; Meat
41. Winam (Kavirondo)	Kenya	2 110 000	215-410	195-365	95-132	94-125	Milk; Work; Meat
42. Nandi	Kenya	389 000	215-420	200-320	118-122	110-119	Milk; Work; Meat
43. Samburu	Kenya	19 000					Milk; Meat
44. Watende	Kenya	NA					Milk; Meat; Work
2.5 The Teso group							
45. Teso	Kenya, Uganda	NA					Milk; Meat; Work
46. Usuk	Uganda	NA					Milk; Meat; Work
47. Kyoga	Uganda	NA					Milk; Meat; Work
48. Serere	Uganda	NA					Milk; Meat; Work
2.6 The Tanzania cluster							
2.6.1 Tanganyika Shorthorned group							
49. Iringa Red	Tanzania (Mainland)	NA					Milk; Meat
50. Maasai	Tanzania (Mainland)	100 000					Milk; Meat
51. Ugogo Grey	Tanzania (Mainland)	100 000					Milk; Meat
52. Mkalama Dun	Tanzania (Mainland)	1 000					Milk; Meat; Work
53. Singida White	Tanzania (Mainland)	5 000					Milk; Meat; Work
54. Pare	Tanzania (Mainland)	1 000					Milk; Meat; Work

Continued ....

.... *Table 2.*

Group and Breed/Strain	Location/Country	Estimated[a] population	Mature weight (kg) Male	Mature weight (kg) Female	Withers height (cm) Male	Withers height (cm) Female	Main uses (in order of importance)
55. Tarime (Shashi)	Tanzania (Mainland)	100 000	160-210	150-190			Milk; Meat; Work
56. Chagga (Wachagga)	Tanzania (Mainland)	1 000	170-240	155-190			Milk; Meat; Work
2.6.2 Zanzibar group							
57. Zanzibar Zebu	Tanzania (Zanzibar & Pemba)		250-350	190-300			Milk; Work; Meat
2.7 The Angoni group							
58. Angoni	Zambia	300 000	270-730	180-480	122-127	119-122	Meat; Work; Milk
59. Malawi Zebu	Malawi	796 700		265-280			Meat; Work; Milk
60. Angonia (Angone)	Mozambique	64 400	265-730	175-470	121-125	110-120	Meat; Work; Milk
2.8 The Madagascar group							
61. Madagascar zebu	Madagascar	7 000 000	350-450	250-350	117-140	110-135	Meat; Milk; Work
62. Baria	Madagascar	500					Not used (wild)
3. West African Zebu							
3.1 Gudali Group							
3.1.1 The Sokoto sub-group							
63. Sokoto	Nigeria	4 352 000	495-660	240-355	130-138	116-132	Milk; Meat; Work
3.1.2 The Adamawa sub-group							
64. Ngaundere	Cameroon; Nigeria; C. Africa Republic	999 000	400-565	330-410	132-136		Milk; Meat; Work
65. Banyo	Cameroon; Nigeria	NA	300-410	350-365			Milk; Meat; Work

Continued ....

.... *Tablew 2.*

Group and Breed/Strain	Location/Country	Estimated[a] Population	Mature weight (kg) Male	Mature weight (kg) Female	Withers height (cm) Male	Withers height (cm) Female	Main uses (in order of importance)
66. Yola	Cameroon; Nigeria	NA	350-355	315-340			Milk; Meat; Work
3.2 Fulani Group							
67. Gobra	Senegal	1 300 000	300-350	250-300	130-144	124-140	Milk; Meat; Work
68. Sudanese Fulani (Peul Zebu)	Mali, B. Faso	5 616 000	280-345	248-300	120-138	115-126	Milk; Work; Meat
69. White Fulani	Nigeria; Cameroon; C. Africa Republic	9 645 000	425-665	250-380	130-152	1180138	Milk; Meat; Work; Manure
70. Red Fulani	Nigeria, Cameroon; C. Africa. Rep.	4 924 000					Milk; Meat; Work; Manure
71. Fellata (Bororo)	Chad; Sudan	50 000 in Sudan	400-450	255-410			Milk; Meat; Work
72. Djelli (Diali)	Niger; Nigeria	NA					Milk; Meat; Work
3.3 Other West African Zebu							
73. Azaouak (Tuareg)	Mali; Nigeria; Niger	506 000	350-500	300-410	128-135	122-130	Meat; Work; Milk
74. Shuwa	Chad; Nigeria; Cameroon	4 554 000	350-475	250-300	135-140	125-128	Work; Milk; Meat;
75. Maure	Mauritania; Mali	673 000	250-700	250-350	125-140	110-128	Milk; Meat; Work

NA = Not available.

[a]Latest available estimate; if multiple in same year, highest estimate used; combines estimates from different countries, if applicable.

Figure 3. Raya Azebo cattle.

of West and Central Africa. In addition there is one humpless Shorthorn breed in eastern Africa: The Sheko of Ethiopia.

The zebu cattle

Although zebu cattle are trypano-susceptible, in the absence of tsetse fly the large size and high production levels of many zebu breeds give them a competitive advantage over the trypanotolerant N'Dama Longhorn and Shorthorns (Rege *et al.*, 1994a;b). The zebu breeds or strains are abundant in the continent and exhibit a high level of resistance to harsh environmental conditions, making them the only type of cattle that can survive over a large part of Africa.

The zebu is the largest single cattle type in Africa. It is represented by some 75 breeds (Table 2). The highest concentration of the zebu is in eastern Africa and neighbouring countries in south-central Africa which, together, have 61 breeds. West Africa has only 13 zebu breeds, principally inhabiting the dry savanna and sahelian belts. The East African Zebu can be divided into two major sub-groups - the "Large" and the "Small" East African Zebu. The former has some 13 breeds, all restricted to the relatively drier parts of Sudan, Eritrea, Ethiopia, Somalia, Kenya, Tanzania and Uganda. The 49 Small East African zebu breeds are also principally found in the same countries as their "Large" counterparts. However, a small number inhabit south-central Africa (Zambia, Malawi, Mozambique) and Madagascar. Other than Zaire, the eastern border of which is inhabited by "spill-over" zebu from eastern Africa, the humid zone of Central Africa is devoid of zebu.

The Small East African zebu is further sub-divided into several *groups* or *clusters*: The Abyssinian Shorthorned Zebu (represented by 13 breeds/strains); the Cluster of southern Sudan and vicinity (4); the Somali group (4); the Kenya cluster (10); the Teso group (4); the Tanzania cluster consisting of the Tanganyika

Table 3. The sanga cattle breeds of sub-Saharan Africa.

Group and Breed/Strain	Location/Country	Estimated[a] Population	Mature weight (kg) Male	Mature weight (kg) Female	Withers height (cm) Male	Withers height (cm) Female	Main uses (in order of importance)
1. The sanga of eastern Africa							
1.1 The Nilotic group							
1. Abigar	Ethiopia	548 600					Milk; Meat; Work
2. Aliab Dinka	Sudan	NA					Milk; Meat
3. Aweil Dinka	Sudan	NA					Milk; Meat
4. Nuer	Sudan	NA					Milk; Meat
5. Shilluk	Sudan	NA					Milk; Meat
1.2 The Abyssinian sanga							
6. Danakil	Ethiopia, Eritrea	680 500	250-380	200-305	130-145	120-125	Milk; Meat; Work
7. Raya-Azebo	Ethiopia	521 000					Work; Milk; Meat
1.3 The Ankole group							
8.Watusi	Uganda; Rwanda; Burundi; Tanzania; D.R.C	1 600 000	350-425	290-350	132-135	110-127	Milk; Meat; Work
9. Bahima	Uganda; D.R.C.	*					Milk; Meat; Work
10. Kigezi	Uganda	*	220-380	200-330	112-132	108-120	Milk; Meat; Work
11. Bashi	D.R.C.	*	235-400	220-340	115-135	110-124	Milk; Meat; Work
12. Ruzizi	DRC; Rwanda; Burundi	*					Milk; Meat; Work
2. The sanga of southern Africa							
2.1 The Shona group							
13. Mashona	Zimbabwe	500 000	350-635	260-410			Meat; Work
2.2 The Nguni group							
14. Nguni	S. Africa; Swaziland	2 156 000	400-680	225-450			Meat; Work; Milk

.... *Continued...*

.... *Table 3.*

Group and Breed/Strain	Location/Country	Estimated[a] Population	Mature weight (kg) Male	Female	Withers height (cm) Male	Female	Main uses (in order of importance)
15. Nkone	Zimbabwe	400		300-450			Meat; Milk
16. Pedi	S. Africa	400					Meat; Work; Milk
17. Shangan	S. Africa	600					Meat; Work; Milk
18. Landim	Mozambique	536 400					Meat; Work; Milk
2.3 *The Zambia/Angola cluster*							
19. Tonga	Zambia	993 000	485-530	310-495	118-130		Milk; Meat; Work
20. Porto–Amboim	Angola	NA	400-530	350-425	120-140	118-129	Meat
2.4 *Ovambo and south-western cluster*		NA					
21. Ovambo	Namibia	NA					Meat; Work; Milk
22. Kaokoveld	Namibia	NA					Meat; Work; Milk
23. Okavango	Namibia	NA					Meat; Work; Milk
24. Caprivi	Namibia	NA					Meat; Work; Milk
25. Humbi	Angola	NA					Meat; Work; Milk
2.5 *The Setswana group*							
26. Barotse	Zambia; Angola	793 000	255-700	240-455	120-137	114-129	Milk; Meat; Work
27. Damara (Herero)	Namibia	NA					Milk; Work; Meat
28. Tswana	Botswana	1 395 000	310-520	290-420	140	131	Meat; Work; Milk
29. Tuli	Zimbabwe	3 300	450-820	360-570			Meat
2.6 *The Afrikaner group*							
30. Afrikaner	South Africa	302 000	450-950	360-555	130-150	128-140	Meat; Work

NA = Not available.
[1]Possibly included in Watusi population figure.
[a]Latest available estimate; if multiple in same year, highest estimate used; combines estimates from different countries, if applicable.

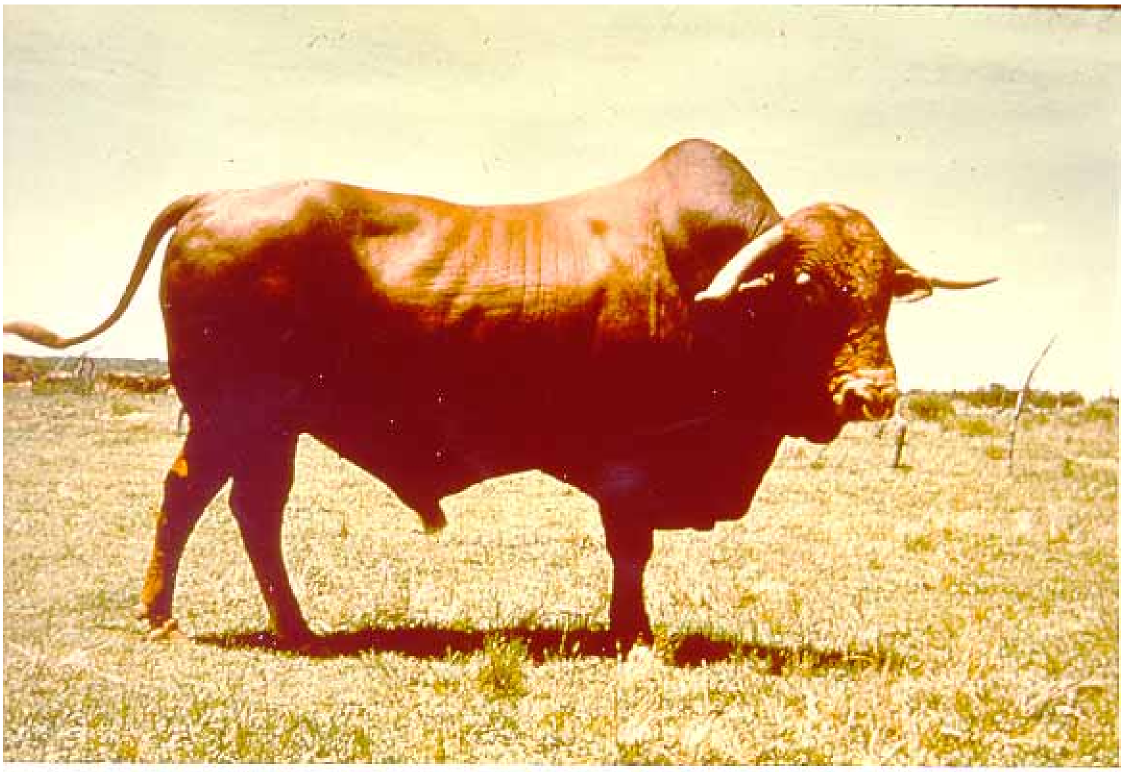

Figure 4. Afrikaner cattle.

group (8) and the Zanzibar Zebu (1); the Angoni group (3); and the Madagascar group (2).

The West African zebu consists of two main groups: The Gudali group represented by two sub-groups (Sokoto with only one breed, and Adamawa with 3 breeds/strains); and the Fulani group (with 6 breeds/strains). In addition, there are three other zebu breeds in West Africa, the Azoauak, Shuwa and Maure, which do not belong to either the Gudali or the Fulani groups.

The sanga cattle

Table 3 summarises the sanga cattle breeds/strains of Africa. There are 30 sanga breeds/strains sub-divided on the basis of location into the sanga of eastern (12 breeds/strains) and sanga of southern (18) Africa. The sanga of eastern Africa consist of three groups: Nilotic sanga of southern Sudan and south-western Ethiopia; the Abyssinian sanga of Ethiopia and Eritrea; and the Ankole group with representatives in Uganda, Rwanda, Burundi, Tanzania and Democratic Republic of Congo (former Zaire).

The sanga of southern Africa are represented by six groups or clusters: the Shona represented by the *Mashona* of Zimbabwe; the Nguni group (5 breeds/strains); the Zambia/Angola cluster (2); the Ovambo and south-western cluster (5); the Setswana group (4); and the Afrikaner group represented only by the *Afrikaner* breed.

The zenga cattle

Several breeds have supposedly resulted from crossbreeding between the zebu and sanga populations in the East African highlands where large concentrations of zebu (arriving from Asia) initially occurred, providing opportunity for admixture with sanga cattle, then already resident there. The resulting breeds have been classified into a separate category. The name "*zenga*" is suggested for this category. Exclusively located in eastern

Africa, some members are found in predominantly zebu habitat, others in sanga habitat. Indeed, the location of the zenga forms a natural division between the "zebu country" in the north and the predominantly "sanga country" in the south. Members of the zenga - a total of eight - are: the *Arado*, *Fogera*, and *Horro* (of Ethiopia); *Jiddu* (southern Somalia); *Alur,* also called *Nioka* (*Nyoka*) or *Blukwa* cattle (Democratic Republic of Congo); *Nganda* (Uganda); *Sukuma* (Tanzania); and *Bovines of Tete* (Mozambique). The zenga cattle are summarised in Table 4.

Recent derivatives

There are several cattle breeds which have been formed as a result of the 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 attributes. A good example of the process, but one which has not produced a recognised, distinct breed or strain, is the crossbreeding between the Kuri and zebu of the Lake Chad Basin (see Tawah *et al*, 1997) to produce a draught animal. Table 4 summarises breeds/strains in this category.

Commercial composites

Sub-Saharan Africa is home to, at least, six commercial composite breeds with varying proportions of exotic blood. Unfortunately, only two of them - the *Drakensberger* and the *Bonsmara,* both of South Africa - are secure in terms of numbers and existence of

Figure 5. Ankole cattle.

Table 4. Zenga (zebu-sanga) cattle, recent derivatives and synthetic breeds.

Group and Breed/Strain	Location/Country	Estimated[a] Population	Mature weight (kg) Male	Mature weight (kg) Female	Withers height (cm) Male	Withers height (cm) Female	Main uses (in order of importance)
1. Zenga (zebu x sanga) cattle							
1. Arado	Eritrea; Ethiopia	510 000	205-430	192-350	117-144	93-126	Work; Milk; Meat
2. Fogera	Ethiopia	86 800			110-145	100-121	Work; Milk; Meat
3. Horro	Ethiopia	3 286 000	320-480	210-400			Work; Milk; Meat
4. Jiddu	Somalia	NA	340-590	325-430	109-133	108-124	Milk; Meat
5. Alur (Nioka, Blukwa)	D.R.C.	NA	290-550	225-380	110-131	108-122	Milk; Meat; Work
6. Nganda	Uganda	1 365 000	280-420	200-340	115-124	115-122	Milk; Meat; Work
7. Sukuma (Tinde)	Tanzania	100 000	230-410	210-370	94-132	93-127	Milk; Meat
8. Bovines of Tete	Mozambique	NA					Meat; Milk; Work
2. Recent derivatives							
1. Borgou	Benin; Togo	428 000	190-330	180-295			Meat; Work; Manure
2. Méré	B. Faso; Cote d'Ivoire	693 000					Meat; Work; Manure
3. Ghana «sanga»	Ghana	124 000					Milk; Meat; Work; Manure
4. Keteku	Nigeria	293 000					Meat; Work; Manure
5. Djakore	Senegal	350 000					Milk; Meat; Work; Manure
6. Biu	Nigeria	NA					Meat; Work; Manure
7. Basuto	Lesotho	NA					Work; Meat; Milk
8. Barra do Cuanzo	Angola	NA	370-620	360-500			Meat; Work; Milk
9. Rana (Omby Rana)	Madagascar	40 000-85 000					Milk; Meat

.... *Continued*

.... *Table 4.*

Group and Breed/Strain	Location/Country	Estimated[a] Population	Mature weight (kg) Male	Mature weight (kg) Female	Withers height (cm) Male	Withers height (cm) Female	Main uses (in order of importance)
3. *Systematic synthetics/composites*							
1. Drakensberger	South Africa; Swaziland	149 000					Meat; Work; Milk
2. Bonsmara	South Africa	143 000					Meat
3. Renitelo	Madagascar	2 000-3 000	420-655	305-450			Meat; Work
4. Manjan'i Boina	Madagascar	200					Milk
5. Mpwapwa	Tanzania	1 500	360-620	290-455			Milk
6. Wakwa	Cameroon	NA					Meat

NA = Not available.
[a]Latest available estimate; if multiple in same year, highest estimate used; combines estimates from different countries, if applicable.

programmes for genetic improvement. The other four are the *Mangan'i Boina* of Madagascar (a synthetic dairy breed), the *Renitelo*, also of Madagascar (beef), the *Mpwapwa* of Tanzania (dairy) and the *Wakwa* of Cameroon (beef). Details of these breeds are discussed in the second paper (Rege and Tawah, 1999).

Breeds at Risk

As has been alluded to, one of the objectives of the survey was to establish the status of sub-Saharan African cattle breeds and to identify those which are at risk as well as those which may have become extinct in the recent past. In the absence of time-trend census data, it was not possible to provide quantitative information on trends. However, the study results, mainly qualitative, together with an assessment of pressures currently affecting breeds, were used to draw conclusions regarding possible threat categories of different breeds considered to be at risk. A total of 47 (32%) breeds/strains were identified to be at risk (Table 5). Four risk categories were defined according to FAO (1992): Critical (most threatened), Endangered, Vulnerable, and Rare (least threatened). Out of the 47 breeds at risk, 15 (Pare, Mkalama Dun and Chagga of Tanzania; Bakweri, Kapsiki, Bakosi and Wakwa of Cameroon; Ghana Dwarf Muturu or Shorthorn; Nkone of Zimbabwe; Pedi and Shangan of South Africa; Renitelo and Baria of Madagascar; and Sengologa and Seshaga of Botswana) were classified in the "Critical" category, 10 were "Endangered", another 10 were "Vulnerable" and six were "Rare" (Table 5). The remaining six could not be definitively classified: Five were classified as lying somewhere between "Rare" and "Vulnerable" and one between "Endangered" and "Vulnerable".

Extinct Breeds

Starting with the 145 breeds identified in this survey and working backwards, a review of old literature dating as far back as 1902 was

Table 5. Breeds of sub-Saharan African cattle considered at risk.

Risk status	Breed/strain	Principal location	Main causes of threat*
Rare	Sekgatla	Botswana	Interbreeding with "Tswana"; Crossbreeding with Afrikaner
	Basuto	Lesotho	Crossbreeding
	Jiddu	Somalia	Neglect; Conflict
	Bovines of Tete	Mozambique	Conflict; Crossbreeding
	Biu	Nigeria	Interbreeding
	6. Manjan'i Boina	Madagascar	Early stage of breed development
Rare/Vulnerable	Dongola	Northern Sudan	Interbreeding with Red Butana
	Shendi	Northern Sudan	Interbreeding with Red Butana
	Bambawa	Sudan (near Eritrea border)	Interbreeding with Red Butana
	Ingessana	Sudan-Ethiopia border	Conflict; interbreeding
	Kuri	Lake Chad Basin	Reduction in habitat; Crossbreeding; Conflict
Vulnerable	Kyoga	Uganda	Conflict; interbreeding
	Usuk	Uganda	Conflict; interbreeding
	Singida White	Tanzania	Interbreeding with neighbouring breeds
	Tarime (Shashi)	Tanzania	Interbreeding with neighbouring breeds
	Watusi	Rwanda, Burundi	Conflict, crossbreeding/interbreeding
	Bahima	Uganda	Conflict, crossbreeding/interbreeding
	Bashi	D.R. Congo	Conflict, crossbreeding/interbreeding
	Ruzizi	Burundi	Conflict, crossbreeding/interbreeding
	Landim	Mozambique	Conflict, Crossbreeding, Replacement
	Rana	Madagascar	Continued, unsystematic crossbreeding
Vulnerable/Endangered	Nigerian Forest Muturu	Nigeria	Neglect; Replacement

.... *Continued*

.... *Table 5.*

Risk status	Breed/strain	Principal location	Main causes of threat*
Endangered	Serere	Uganda	Conflict; interbreeding
	Watende	Kenya	Interbreeding with neighbouring breeds/strains
	Iringa Red	Tanzania	Interbreeding with Ugogo Grey
	Sheko	Ethiopia	Interbreeding with zebus
	Kikuyu Zebu	Kenya	Neglect; Crossbreeding
	Liberian Dwarf Muturu	Liberia	Neglect; Replacement; Conflict
	Logone	Chad	Neglect
	Doayo (Namchi)	Cameroon	Neglect
	Damara (Herero)	Namibia	Neglect; Crossbreeding, Replacement
	Mpwapwa	Tanzania	Absence of sustained dev. Programme
Critical	Pare	Tanzania	Interbreeding
	Mklama Dun	Tanzania	Interbreeding
	Chagga (Wachagga)	Tanzania	Crossbreeding and interbreeding
	Bakweri	Cameroon	Neglect
	Kapsiki	Cameroon	Neglect
	Bakosi	Cameroon	Neglect
	Ghana Dwarf Muturu/Shorthorn	Ghana	Neglect
	Nkone	Zimbabwe	Neglect
	Pedi	S. Africa	Interbreeding; Replacement
	Shangan	S. Africa	Interbreeding; Replacement
	Sengologa	Botswana	Interbreeding with "Tswana"; Neglect
	Seshaga	Botswana	Interbreeding with "Tswana"; Neglect
	Renitelo	Madagascar	Interbreeding; Dermatophilosis
	Baria	Madagascar	Neglect; Lives in the wild
	Wakwa	Cameroon	Absence of sustained dev. programme

*Crossbreeding as used here involves exotics; interbreeding involves other (neighbouring) indigenous breeds.

Table 6. Breeds of sub-Saharan African cattle considered to be extinct.

Breed/strain	Class	Location	Last Report	Reference
1. Nuba (Delami or Koalib) Shorthorn	Humpless shorthorn	Sudan	1900s	Epstein (1971)
2. Gimira («Kuri»)	Humpless Longhorn	Ethiopia	1929	Encyclopadeia Brittanica (1929)
3. Karagwe Shorthorn	Humpless Shorthorn	Uganda?	1927	Stuhlmann (1927)
4. Sesse Shorthorn	Humpless Shorthorn	Sesse Islands, L. Victoria	1909	Epstein (1971)
5. Kigezi Shorthorn	Humpless Shorthorn	Uganda	1920s	Ford and Hall (1947)
6. Socotra Shorthorn	Humpless Shorthorn	Socotra Islands, Off Horn of Africa	1960s	Payne (1964)
7. Unguja (Pemba or Mafia) Shorthorn	Humpless Shorthorn	Pemba, Mafia Islands	1920s	Payne (1964)
8. Manjaca	Humpless Shorthorn	Guinea Bissau	1980s	IICA (1992)
9. Bimal	Zebu	Somalia	1955	Rosetti and Congiu (1955)
10. Singhi	Zebu	Somalia	1953	Bozzi and Triulzi (1953)
11. Baria (not Madagascar Baria)	Zebu (zenga?)	Eritrea	1929	Marchi (1929)
12. Ugogo	Zebu	Tanzania	1920s	McCall (1928)
13. Senegambia Shorthorn	Humpless Shorthorn	The Gambia; Southern Senegal (Casamance)	1950s	Mason (1951); Epstein (1971)
14. Arussi-Galla	Sanga	Ethiopia	1900s	Lydekker (1912)
15. Ugoi	Sanga	Tanzania	1850s	Burton (1961)
16. Ngami (Botawana)	Sanga	Botswana	1900s	Lydekker (1912), Curson (1934)
17. Nama	Sanga	Botswana	1906	Groenewald and Curson (1933)
18. Bolowana	Sanga (?)	South Africa	Late 1890s	Thompson (1932)
19. Sakalava	Sanga (?)	Madagascar	Late 1890s	Keller (1898); Lydekker (1912); Murdock (1959)
20. Hottentot	Sanga (?)	S. Africa	Late 1800s/Early 1900s	Kolb (1719); Smith (1827); Jones (1955); Martinho (1955)
21. Wadai Dinka	Sanga	D.R. Congo	1936	Curson and Thornton (1936)
22. Mbulu	Zebu	Tanzania	1953	Jeffreys (1953)

done. Each breed or population appearing in the old literature was followed progressively in subsequent publications. Of the breeds that could not be found in more recent literature, a large number was due to change in breed names over the years. However, some breeds which existed previously could not be found in recent literature under any name. To determine what may have happened to these "missing" breeds or strains, clarification was sought from the locations at which they were last reported. This process resolved some of the anomalies and helped to identify those populations which, on the basis of information available, had ceased to exist. Some of these were on record in the countries concerned as officially extinct while the rest could only be considered to be extinct because local officials and communities could not recall their previous existence or were certain that they had, through the years, disappeared as a result of one reason or another. A total of 22 breeds which existed at some point during this (20th) century could not be located and were considered extinct (Table 6). Of the extinct breeds, only one (*Gimira* of Ethiopia) was a humpless Longhorn, eight were humpless Shorthorns, four were zebu (one of them – the Baria of Eritrea – may have been a zenga), while the remaining seven were sanga, although the classification of three of these, Bolowana, Sakalava and Hottentot, as sanga was not certain.

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