A COORDINATED EFFORT TO IMPROVE AND PRESERVE ANIMAL GERMPLASM IN EASTERN AND SOUTHERN AFRICA

By

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The Southern African Centre for Cooperation in Agricultural Research and Training (SACCAR) was established with donor assistance in 1984 with the following objectives:

- To promote cooperation in agricultural research among the national agricultural research systems of the SADCC member states;
- To strengthen national agricultural research systems and capabilities;
- To generate new technology needed by farmers to raise the productivity of food and non-food crops, livestock, fisheries, forestry and wildlife through regional collaborative projects and inter-country liaison;
- To coordinate SADCC regional agricultural research projects and programmes;
- To promote and disseminate available technology;
- To facilitate the exchange of information on new and old technologies among the SADCC national agricultural research systems;
- To promote and implement studies on problems common to all or to several member states and initiate cooperative research to overcome them;
- To provide any other such regional support services and functions as may be necessary to assist and inform national and regional research activities.

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SYNOPSIS

Over much of Africa, indigenous domesticated animals have for long played a central role in the life support, economy and cultural patterns of its people through the food, fibre, skins, farm power and manure they provide.

Over the millennia, these animals have become highly adapted to the often harsh environments in which they are found, and in the East and Southern African region in particular, to the frequent periods of drought and the presence there of major pests and diseases.

But despite this high degree of adaptation, the indigenous livestock of the region have been largely neglected as serious subjects for improvement through breeding. Instead, breeding work has mainly concentrated on exotic breeds imported for pure breeding or for indiscriminate cross-breeding.

Unquestionably, the indigenous livestock of Africa constitute an invaluable gene pool that should play its full part in developing the high yielding breeds of the future. Investigations have already demonstrated significant variation on which programmes of continous selection could be based, as in the examples of the Boran breed for beef and the Blackheaded Persian sheep for mutton.

The Southern African Development Coordination Conference (SADCC), an association of the ten majority ruled Southern African states, has recently developed a regional project for the conservation

of crop and forest seeds, based on a central regional genebank supported by a network of national genebanks in each of the SADCC member states.

The project also includes the establishment of National Plant Genetic Resources Committees to plan and initiate activities at national and regional levels to explore and collect, characterize, evaluate, rejuvenate, multiply and document the indigenous and exotic plant genetic resources of the region, to exchange germplasm for breeding purposes and general information on the subject, and for network activities in general.

It is anticipated that these developments will be accompanied over time by a horizontal extension in the region of the disciplines involved in the conservation and improvement of plant genetic resources.

It is now being recommended that because of the growing risk of losing indigenous breeds and types of livestock through disappearance, erosion and dilution, a regional project for the conservation and improvement of animal germplasm, similar in many ways to that initiated for plant germplasm in the SADCC region, should also be developed.

An FAO Expert consultation on Animal Genetic Resources Conservation and Management in 1981 recommended the development of such projects at regional and national levels. At national level the activities recommended were: evaluation, genetic improvement, monitoring and conservation. At regional level the activities were: evaluation, monitoring, networking (including information services), and development, including the establishment of breed organisations and of regional semen and embryo banks. There were also to be activities at inter-regional and international

levels mainly in the area of exchange of information on progress related to the activities at national and regional levels.

In the present paper, it is argued that action must first be initiated and developed at national level. Only on this basis will it be possible to develop the effective and vigorous region-wide cooperation needed to reinforce and support activities at the national level and provide an adequate basis for regional collaboration and exchange of information and germplasm.

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INTRODUCTION

It is encouraging and pleasing to note that disciplines such as Chemistry which are expected to contribute to people's knowledge on the activities at cellular and molecular levels (traditional activities), have in recent years been interested in looking for ways of solving international problems such as poor food security situations which lead to hunger and malnutrition in many developing countries. Chemistry can be used in generating technologies needed in making agriculture more productive and sustainable. The sponsors of this seminar namely, the African Academy of Sciences, the International Union of Pure and Applied Chemistry and the American Chemical Society must be congratulated for organising this seminar at this point in time. The seminar is very timely because Africa is facing a big problem of declining agricultural productivity while at the same time the growth of human population is rising. Since in the majority of African countries agriculture continues to be the mainstay of their economies and is the source of employment for a very high percentage of the work force, ways must be found to make it more productive. Livestock production contributes to food security, gainful employment and cash incomes of farmers as well as generating foreign exchange earnings to most countries in the Eastern and Southern Africa. However, it is only a few breed types of indigenous livestock that have been utilised. The rest of the livestock are disappearing due to either negligence or indiscriminate crossbreeding with exotic livestock. It is known that livestock breeds and types that are indigenous to the region have through centuries

of natural selection attained an ability to survive in environments that are prone to drought, flooding, and have high incidences of internal and external parasites. In this paper proposals on how to improve and conserve this natural resource and how to share knowledge in the region on potential productivity of each of the indigenous species and types of livestock will be given.

Role of Livestock

Animal agriculture contributes to human well-being in the areas of human nutrition, protective cover, draught power, food reserve, manure, and cash reserve (Table 1). They are producers of protein rich products such as milk meat and eggs. The Food and Agriculture Organisation of the United Nations (FAO) has estimated that draught animal power contributes 75 percent of the farm traction power in Africa, the Far East, the Near East and Latin America. These animals are cheaper to acquire and maintain than tractors because they can survive on low quality roughages and are adapted to variable and marginal planes of nutrition. Crop based agricultural production systems in the region have varying degrees of vulnerability especially to hostile climate characterized by low and erattic rainfall. Livestock do serve as food reserve, and if sold, as cash reserve. They are living banks to draw upon to finance on-farm and off-farm investments. They have also religious and cultural roles. A high off-take (sale or slaughter) of livestock first before commencement of major festivals or before start of school year show how important these animals are in this aspect of meeting human, cultural, religious and cash needs. Table 2 shows livestock numbers in selected countries in Eastern and Southern Africa. They form a large resource which should be developed and utilised much more than it has been hither-to-fore.

The region has large tracks of land which are used for grazing only (Table 3). Livestock can be used in natural resources management systems such as grazing under trees and harvesting fodder trees planted between crop fields. Animal manure can be regarded as a form of recycling minerals mined by crops back into the soil. The contribution of livestock to the gross domestic product varies from country to country. FAO has reported that it is about 20% in Africa on the average. The demand for food is increasing more rapidly for livestock than for staples. As incomes rise, people tend to eat more high quality food and relatively less staple food. Consequently, the region has not been able to meet the rising demand for animal products. The gap between demand and supply for animal products has been met by imports forcing countries to spend foreign currency reserves which would have been used for the input of other items such as human and animal drugs or heavy machinery which cannot be cheaply produced locally.

Table 1. Livestock Contributions to Human Well-being 1

Food:	meat, milk, eggs
Fiber and Skins:	wool, hair, hides and pelts
Traction:	power for crop production, irrigation pumping, threshing, and transport
Animal Wasters:	fertilizer, heating fuel, methane gas production, feed, construction material
Storage:	storage of food supply or capital and seasonal excess of feeds
Weed Control:	biological control of brush, plants and weeds along roadsides and waterways
Cultural:	security and self-esteem-revered symbols
Sports/Recreation:	competition, exhibition, hunting and companion animals

1. Source: Knipscheer, L. 1986. Importance of livestock in the economies of countries in the developing world. Heifer International. Arkansas, USA.

Table 2. Livestock Numbers in selected countries in Eastern and Southern Africa 1

Country x 100 Head	Horse	Mules	Donkeys	Sheep	Cattle	Goats	Poultry	Pigs	Buffaloes	Camels
Africa	3533	2227	11566	176841	191746	161535	772	11987	2600	13168
Angola	1	-	5	3300	255	965	6	470		
Botswana	24	4	143	2720	210	1000	1	8		
Ethiopia	1590	1480	3920	26300	23550	17280	56	19		1040
Kenya	2		9000	7100	8500		21	93		620
Lesotho	108	1	108	520	1420	1010	1	65		
Malawi		1	930	180	690	8	240			
Mozambique			20	1340	116	365	20	150		
Somalia	1	23	25	3800	10100	16200	3	10		5800
Sudan	20	1	650	22389	20600	15581	30	-		2800
Swaziland	2		15	620	38	315	1	20		
Tanzania		170		14300	4300	6500	28	180		
Uganda			17	5100	1700	3300	19	250		
Zambia			1	2770	46	240	14	214		
Zimbabwe	221		99	4800	550	1550	9	170		

1. Statistics obtained from FAO Production Yearbook 1986.

Table 3. Land Use in selected Eastern and Southern Africa in 1985 [1]

Country	Total Land Area	Arable and Permanent x 100 HA	Perm Pasture	Forest Wood	Permanent Pasture % of Total Land Area
Angola	124670	3500	29000	5331	23.26
Botswana	56673	1360	44000	962	77.64
Ethiopia	110100	13930	45150	27600	41.00
Kenya	56969	2370	3800	3710	6.67
Lesotho	3035	300	2000		65.90
Somalia	62734	1071	28850	900	45.99
Sudan	237600	2478	56000	47390	23.57
Swaziland	1720	180	1090	104	63.37
Tanzania	88604	5190	35000	42665	39.50
Uganda	19971	6600	5000	5810	25.04
Zambia	74072	5188	35000	29390	47.25
Zimbabwe	38667	2734	4856	23810	12.56
Malawi	9408	2376	1840	4520	19.56
Mozambique	78409	3090	44000	15090	56.12

1 Source: FAO Production Yearbook 1986.

The East and Southern Africa region contains a unique collection of indigenous types of horses, donkeys, cattle, sheep, goats, poultry and to a lesser extent also of pigs (Table 4). Because it takes some years to improve livestock through selection, the tendency has been to import exotic breeds mainly for cross-breeding purposes. Breeds that have been created on recent years in this way include the improved Boran, Tuli and Mpwapwa breeds of cattle, the Dorper sheep and various strains of horses, goats, poultry and pigs.

Indigenous breeds and types are uniquely adapted to the region and are able to survive the extremes of drought, diseases such as trypanosomiasis, East Coast Fever and others, as well as the frequent attacks by tsetse flies, ticks, stromoxys and other pests that are endemic to the region.

Indiscriminate crossing of indigenous with exotic animals can result in dilution of the local gene pool, leading to loss of the genes that confer adaption to the regional environments and resistance to the pests and diseases. There is therefore great need to conserve the indigenous breeds and types in numbers adequate to serve the needs of future livestock improvement programmes.

Table 4 Cattle types and breeds indigenous to East and Southern Africa

GROUP I SANGA

1. NILOTIC
2. DANAKIL
3. ANKOLE
4. BAROTSE
5. TONGA
6. MASHONA
7. MATEBELE
8. TSWANA
9. TULI
10. OVAMBO
11. ANGOLAN
12. NGUNI
13. BASUTO
14. AFRICANDER

GROUP II ZEBU

1. NORTH SUDAN ZEBU
2. NUBA MOUNTAIN
3. ABYSSINIAN
4. SMALL ZEBUS OF THE SOMALILANDS
5. BORAN
6. KARAMAJONG GROUP
7. SMALL EAST AFRICAN ZEBU
8. ANGONI
9. MADAGASCAR ZEBU

GROUP III INTERMEDIATE

1. ARADO
2. TUNI OR JIDDU
3. NGANDA GROUP
4. ALUR
5. SUKUMA

1 Classification by Mason and Maule in: The Indigenous Livestock of Eastern and Southern Africa. 1960.

Table 5. Sheep Breeds and Types indigenous to East and Southern Africa 1

GROUP 1 THIN-TAILED

1. NORTHERN SUDAN
2. WEST AFRICAN
3. DONGOLA
4. ARRIT
5. SOUTHERN SUDAN
6. CONGO LONG-LEGGED
7. CONGO DWARF
8. ANGOLA THIN-TAILED

GROUP II FAT-TAILED

1. ABYSSINIAN
2. ARAB (SOMALILAND)
3. MASAI
4. EAST AFRICAN BLACKHEADED
5. EAST AFRICAN LONG-TAILED
6. RHODESIAN
7. TSWANA
8. MONDOMBERS
9. NGUNI
10. AFRICANDER

11 MADAGASCAR

GROUP III FAT-RUMPED

1. SOMALI
2. BLACKHEADED PERSIAN
3. BLACKHEADED PERSIAN DERIVATIVES

1 Classification by Mason and Maule in: The Indigenous Livestock of Eastern and Southern Africa. 1960.

Table 6. Goat Breeds and Types indigenous to Eastern and Southern Africa 1

GROUP I LONG-EARED

1. SUDANESE NUBIAN
2. SUDANESE DESERT
3. BENADIR
    a. Bimal
    b. Garre
    c. Tuni
4. SOUTHERN AFRICA
    a. Boer
    b. Northern Rhodesia
    c. Southern Rhodesia
    d. Bechuanaland
    e. Pafuri (Mozambique)
    f. Swazi
    g. Zulu
    h. Angola
    i. South West Africa
5. MADAGASCAR

GROUP II SHORT-EARED

1. SOUTHERN SUDAN
2. ERITREAN AND ABYSSINIAN
    a. Galla-Sidamo
    b. Arusi-Bale
    c. Danakil
3. SOMALI
    a. Abgal
    b. Ogaden
    c. Somaliland Protectorate
    d. Kenya
4. ARAB (SOMALILAND)
5. EAST AFRICAN
    a. Small East African
    b. Mubende
    c. Kigezi
    d. Boran
6. CONGO
7. ANGOLA
8. SOUTHERN AFRICA
    a. Southern Rhodesia
    b. Nyasaland
    c. Mozambique
9. MADAGASCAR

1. Classification by Mason and Maule in: The Indigenous Livestock of Eastern and Southern Africa. 1960.

A Sub-Regional crops and forest seeds genebank - an example in germplasm conservation

The ten countries (Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, Swaziland, Tanzania, Zambia and Zimbabwe) making up the sub-regional organisation known as the Southern African Development Coordination Conference (SADCC) have agreed to establish a crops and forest seeds genebank. This came about after realising that the region possessed a broad base of domesticated and wild plants which had useful characteristics and which can be used in producing pests, disease, and drought resistant plants by breeders. There was a danger of loosing plant materials if seeds of such useful plants were wiped out by vermins such as rats; pests such as locusts, army worms and quella birds; by diseases or due to extreme weather conditions. It was also realised that some of the sub-region's plant and forest seeds were stored in Genebanks in foreign countries but plant breeders had little access to these source of seeds. It was decided therefore that a regional genebank be established supported by national genebanks. The objectives of the project are firstly, to collect and document these crops and forest plants in SADCC especially those threatened with extinction, in order to create a documented collection in each country's plant heritage. Secondly, to preserve samples of these plants either in their natural state (in situ) or in a bank or banks and to rejuvinate or regenerate such plants whenever necessary. Thirdly, to provide material and information to crop and forest plant breeders in the sub-region who are attempting to develop new strains and varieties for human and animal consumption in order to increase farm productivity.

The project envisages the setting up at sub-regional level a regional genebank (SRGB) and national genebanks. The SRGB will be run

by a Board whose members will be derived from the national plant genetic resources committees (NPGRCs). Each of the NPGRC will comprise a multidisciplinary team of plant breeders, botanists, foresters, botanical gardens specialists, etc.

Attempts to organise Livestock Improvement and Conservation

In 1980 FAO and the United Nations Environment Programme (UNEP) organised in Rome a Technical Consultation on Animal Genetic Resources Conservation and Management. Its objectives were:

To discuss and analyse the current state of the world's farm animal genetic resources with a view to proposing methods and action for improved management of this biological resource to minimise genetic losses.

To discuss reasons for the decline in genetic variability, including the decrease in the number of specific strains and breeds of farm animals.

To review international, regional and national activities on the management and conservation of animal genetic resources.

To recommend national and international action and coordination required in the field of farm animal genetic resources conservation.

Consultation which represented 46 countries and four international organisations agreed that there was need to develop recording/evaluation programmes, that these were to be run on a continuous basis, and that they were to be followed by close

monitoring of changes in numbers and structures of livestock populations. It was also recommended that some biological techniques such as blood typing could make a useful complement to the more traditional monitoring methods. As far as conservation per se is concerned, the Consultation recommended the development of a management system which would both maintain genetic variability of existing livestock resources and at the same time permit continous improvement in productivity and adaptability of that resource. For developing countries it was recommended that initial steps for conservation would best be arranged through the organisation of breeding programmes for their improvement in existing or slightly intensified systems. The conflict which seemed to exist between improvement and conservation in livestock was not large there than in the case of developed countries. In general the Consultation recommended the following regarding Animal Genetic Resources Programme:

Area of Activity

- Evaluation
- Genetic Improvement
- Monitoring
- Conservation
- Information

Level of Work

- National
- Regional
- International
- Global

At national level the activities were to be: evaluation, genetic

improvement, monitoring and conservation. At Regional level they were to be: evaluation, monitoring and information network and development such as the establishment of breed organisations and development of regional semen and embryo banks. At international level on-going activities of evaluation of breeds and types were to continue and new activities to be encouraged were the testing and comparing breeds and strains and establishment or maintenance of genetic resource herds and flocks as a support to national breeding programmes. At global level the activities recommended were on monitoring and information services mainly:

- Publication of Animal Genetic Resources Newsletter
- Monitoring progress of regional and inter-regional projects and activities;
- Development of further research and new activities
- Programme coordination

Activities undertaken in Eastern and Southern Africa on Improvement and Conservation of Livestock

Studies have been undertaken in an attempt to know the productive characteristics of the indigenous breeds and types of livestock. The improvement of the Boran cattle strains some for beef and others for milk, the development of the Blackhead Persian as a mutton breed, the studies on the potential of, Ngada cattle for milk, the Ankole for beef, the characterisation of the East African Shorthorn Zebu, the improvement of beef of the Tswana and the Tuli, the identification of Trypanotolerant cattle types. In addition, some countries in East and Southern Africa have had very good livestock recording and Artificial Insermination Schemes. But unfortunately some of these activities have not been undertaken on a continuous basis. Efforts need to be taken to plan a more coordinated programme of livestock

improvement and coordination for the benefit of present and future generations starting at national level, networking these activities at regional, inter-regional and international levels.

SUMMARY

Livestock play various important roles in the lives of citizens of Eastern and Southern African Countries. Fortunately, most of these animals are highly adapted to the conditions obtaining in the region. There is need to improve them for the benefit of the farmers and governments of the region. There is also need to conserve them for the future generations. A programme similiar to the Crops and Forest Seeds Genebank of the Southern African Development Coordination Conference (SADCC) could be developed for characterisation, evaluation, improvement and conservation of indigenous livestock of Eastern and Southern Africa.