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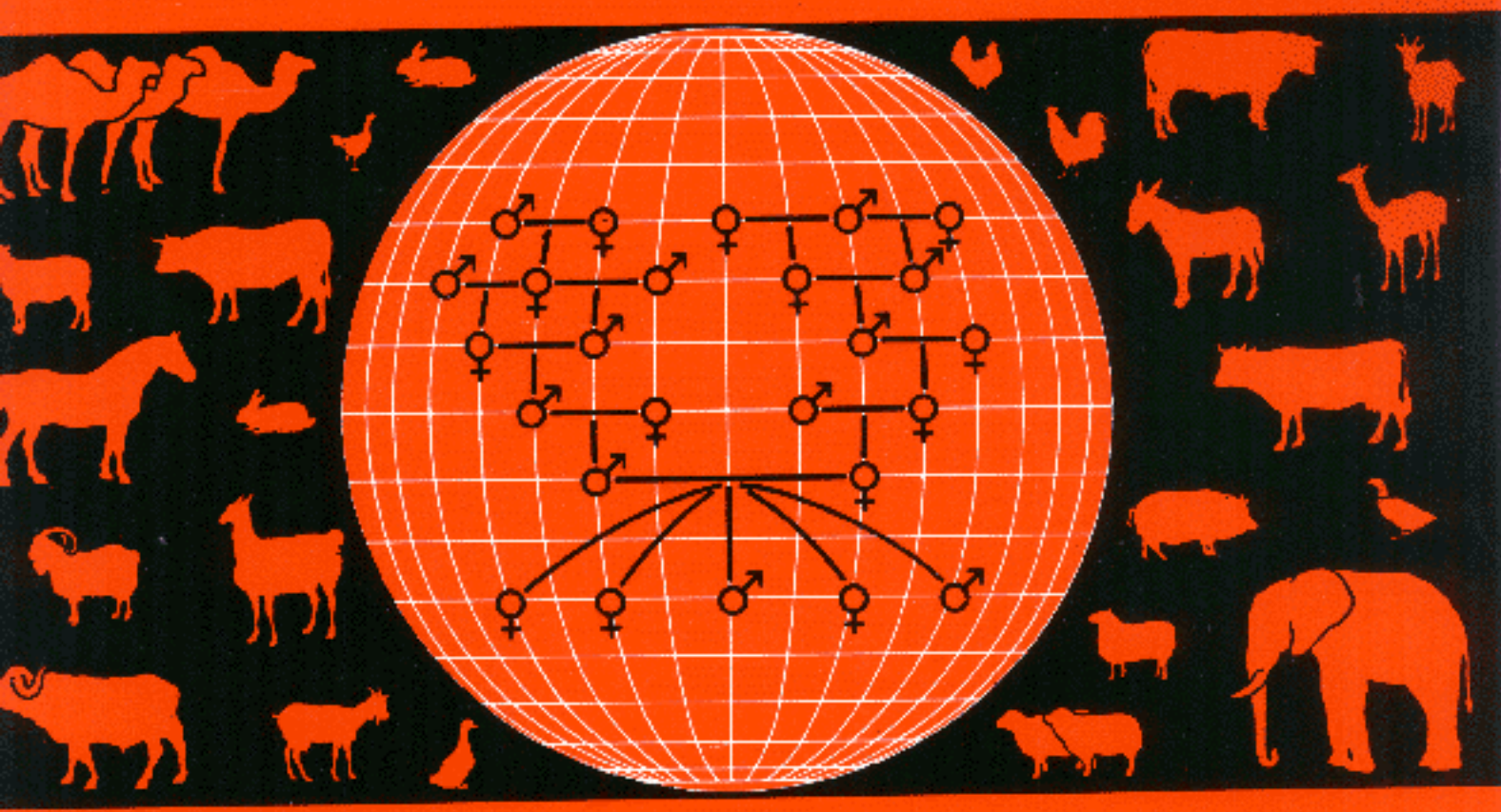
ANIMAL GENETIC RESOURCES INFORMATION

BULLETIN D'INFORMATION SUR LES RESSOURCES GÉNÉTIQUES ANIMALES

BOLETIN DE INFORMACION SOBRE RECURSOS GENETICOS ANIMALES

1992



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ANIMAL GENETIC RESOURCES INFORMATION will be sent free of charge to those concerned with the conservation, management or utilization of domestic livestock. Anyone wishing to receive it regularly should send their name and address to the Editor, at the address on page v.

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GUIDE TO CONTRIBUTORS

Animal Genetic Resources Information will be pleased to receive contributions up to 3000 words long in English, French or Spanish. If accepted, they will be published in the original language. Reports, news and notes about meetings, conservation and evaluation activities, and techniques would be appreciated. Manuscripts should be typed in double space and accompanied by a summary of not more than 5 percent of the original length. Photographs are acceptable but only high quality black and white prints. AGRI will also review new books on animal genetic resources. Correspondence is invited.

All contributions should be addressed to:

The Editor, AGRI, AGAP, FAO,
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Adresser toutes les contributions à l'adresse suivante:

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EI Boletin de Información sobre Recursos Genéticos Animales recibirâ con mucho gusto colaboraciones de hasta 3000 palabras de extensi6n en español, francés o inglés. Si son aceptadas, las contribuciones se publicarân en el idioma original. Interesa recibir informes, noticias y notas sobre reuniones, actividades de conservaciôn y evaluaci6n, y cuestiones técnicas. Los originales deberân presentarse mecanografiados a doble espacio y acompanados de un resumen que no supere el 5 por ciento de la extensi6n original. Se aceptan fotografías, pero únicamente en blanco y negro y de buena calidad. AGRI también publicarà resenas de libros sobre recursos genéticos animales. Se solicita correspondencia.

Todas las contribuciones deberân dirigirse a:

El Editor, AGRI, AGAP, FAO,
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00100 Roma, Italia.

EDITORIAL

The need for conservation of Animal Genetic Resources (AnGR) is more and more accepted and activities in this field are implemented everywhere. As regards FAO, a meeting was held with CATIE in Costa Rica (see page 3) to describe the status of AnGR in Central America and propose some urgent activities. A similar meeting is scheduled for Africa in early 1993. Projects aiming at the description and conservation of regional Animal Genetic Resources are being prepared for Africa within the Global Environment Facility and for Asia in collaboration with the Japanese Government. Numerous institutions and private organizations such as ILRAD, ILCA and IEMVT, have included these concerns in their future programmes, not to speak of private initiatives being implemented in several african countries.

At country level several institutions are already active at a real scale, such as CENARGEN in Brazil (see page 9), CPBR in the South of France (see page 33) or CIRCELO in Italy (to be published in N° 11). Papers describing such national activities are most welcome.

It is now accepted that conservation means both preservation and improvement of local breeds. Preservation can be either *in situ* or ex *situ.* In both cases there is a place for preservation of living animals and FAO has recently published a manual describing the principles and main realizations, giving also guidelines for the initiation of such programmes (see page 4).

Improvement of local breeds is mostly impaired by the lack of performance recording in developing countries. ONBS could be a way to overcome this difficulty, since only a screening is undertaken on farm level and all the precise performance recording is done within the nucleus. However, field implementation of ONBS is not always easy, mainly due to difficulties in getting the farmers' participation. A workshop will be held in Gambia in October 1992 to discuss the various aspects of the practical implementation of ONBS in West Africa and to elaborate guidelines.

All these activities must rely on a precise knowledge of the characteristics of local breeds. Of utmost importance is the determination of genetic distances between breeds, and of the degree of uniqueness of the breeds to preserve. DNA technologies will be the tools for these studies and FAO, jointly with UNEP, has started promoting training on DNA technologies and their use for Animal Genetic Resources eonservation and improvement. A first course was held in Brisbane, Australia (see page 4). Two others will hopefully be organized in the next two years.

NEWS AND NOTES

1.0 FAO RELATED ACTIVITIES

l.l Reunion Tecnica sobre la Conservacion para el Desarrollo de los Recursos Geneticos Animales en America Latina

FAO together with IUCN and Crokeva (an Italian NGO), through an agreement with CATIE in Costa Rica, funded a regional meeting on Animal Genetic Resources (23-26 June). Participants from 14 countries in the Latin American and Caribbean area attended. Each country provided a report on activities in this field and identified some of the constraints and difficulties.

A series of working groups culminated in the provision of a number of recommendations which are being incorporated into a report of the meeting (to be published by CATIE).

These recommendations underlined the need to develop and implement a regional programme on Animal Genetic Resources and proposed a small committee to pursue this objective. The meeting also expressed its wish to cooperate fully in the global programme as outlined by FAO and the recommendations of the 1992 Expert Consultation on the Management of Global Animal Genetic Resources. The meeting urged furthermore that ALPA (the Regional Animal Production Association) be requested to hold a full session on Animal Genetic Resources at its next meeting (1993 in Chile).

1.2 Strengthening of Regional Animal Gene Banks

A training course on the organization and implementation of a regional gene bank for Asia was held from 10 to 21 January 1992 at Nanjing University (China). Two participants per country (one trained in animal breeding, the other in animal reproduction) were invited from 15 different countries (Afghanistan, Bangladesh, China, India, Indonesia, Mongolia, Myanmar, Nepal, North Korea, Pakistan, the Philippines, South Korea, Sri Lanka, Thailand and Vietnam).

The first part of the course addressed the principles and methodology of animal genetic resources conservation, including characterization of breeds, genetic distances between breeds, identification of factors affecting risk of breed loss and criteria for selection of breeds for preservation. Principles and respective advantages and disadvantages of in situ and *ex situ* preservation programmes were equally discussed.

The second part dealt with the applicatzon of reproductive technologies to the conservation of animal genetic resources and demonstrated embryo (rabbit) collection, freezing and storage. Videos of semen collection were shown and a practical demonstration was given.

The third part presented lectures on the Global Data Bank for Domestic Livestock. Lectures were also given on the use of the software for the Data Bank for Stored Germ Plasm which allows information to be kept on the embryos and semen stored in a gene bank, including a practical demonstration.

It is hoped that ongoing as well as future activities at national level in the field of Animal Genetic Resources preservation will be shared between countries within the region taking advantage of links established during this training course.

1.3 Use of DNA technologies for Conservation and Selection of Animal Genetic Resources

A training course on “Use of DNA technologies for Conservation and Selection of Animal Genetic Resources” was organized from 14 to 26 June 1992 under a Letter of Agreement with the Molecular Animal Genetic Centre, Division of Tropical Animal Production, CSIRO, in Brisbane, Queensland, and attended by 9 participants [5 from Asia (China, India, Indonesia, Korea, Malaysia), 3 from Latin America (Brazil, Colombia, Mexico) and 1 from Africa (Tanzania)].

Theoretical lectures were given every morning, the main aspects covered being: nueleic acid structure, function and analysis; sampling, preparation and storage of DNA and RNA; DNA libraries; variations in DNA; Genome mapping; DNA markers and use in selection programmes; analysis of population structure; various aspects of genetic conservation (including semen and embryos); transgenic systems.

Lectures were given by staff of the Molecular Animal Genetic Centre, as well as of the Centre for Molecular Biology and Biotechnology of the University of Queensland, where a Gene Library is already operating.

Every afternoon was devoted entirely to practical sessions, giving to all participants the possibility to practice all the steps from treatment of the blood sample to pedigree and population analysis (each participant received two samples on the first day, on which he/she had to apply the various techniques, and from which his/her efficiency could be precisely evaluated step by step).

1.4 IN SITU CONSERVATION OF LIVESTOCK AND POULTRY, by E. L. Henson: FAO, Animal Production and Health paper No 99;1992.

This manual has been prepared to draw together the information and experience of *in situ* live animal conservation theory and practice as it is found throughout the world and is designed to assist with the planning, development and implementation of conservation projects and therefore incorporates many ideas and prineiples already described in prcvious FAO publications.

After a review of definitions of various aspects of animal genetic resources and of influences which have produced livestock varieties, the processes of genetic changes are presented. The following chapter discusses the need for conservation with consideration of economic potential, scientific use and cultural importance. The importance of the size of populations and the effects of small population size on genetic variation within populations are discussed. The manual then describes the various methods of conservation for live populations, with a comparison of the advantages and disadvantages of in *situ* and *ex situ* conservation, including considerations about problems of conservation of small populations (inbreeding, genetic drift), and description of some possible breeding strategies. In the final chapter the practical application of in situ conservation programmes are reviewed with examples from throughout the world.

The manual ends with a series of charts presenting a succession of steps for the identification of populations in need of conservation, strategies for conservation and suggestions for the implementation of programmes to conserve animal genetic resources in *situ.*

D. Chupin and D. Steane

2.0 COGNOSAC (COMMITTEE ON GENETIC NOMENCLATURE OF SHEEP AND GOATS); 147 C/3 AV J.B. CLEMENT, F - 92140 CLAMART, FRANCE

The creation of COGNOSAC goes back to the *National Coloured Sheep Congress at* Adelaide, South Australia, in 1979. It was then felt that nomenclature of loci for coat colour in sheep was confused and not standardized. The suggestion was made that a report on this subject be presented to the next *World Congress on Coloured Sheep and their Products* held in New Zealand in 1984.

As a result of this report, a Committee was formed (NGO-like) under the name of COGNOSAG. A first Workshop was held in the South West of France (Les Deux Moulins de Gontard, Manosque) in July 1986.

COGNOSAG was officially registered as a “non-profit organization” in France in 1987 under the name *of Comite de Nomenclature Genetique des Ovins et Caprins/Committee on Genetic Nomenclature of Sheep and Goats.* Since then workshops have been held every year (five to date), and invited representatives from the *International Society of Animal Genetics* (ISAG) and other relevant organizations attended. These five workshops were held in France (1986,1987,1988), the USA (1989) and the U.K. (1990).

At the request of the International Committee organizing the World Congresses on Genetics Applied to Livestock Production, COGNOSAG organized a special session on Genetic Nomenclature in Cattle during the 4th World Congress on Genetics applied to Livestock Production in Edinburgh in 1990. It was agreed at this session to include in the future cattle in the COGNOSAG activities and to publish a newsletter (N° 1 saw the light in March 1992).

The first and second workshops on the "Genetic Nomenclature of Farm Animals" were held in 1991 and 1992 in France; the third one will be held in Australia in 1993. The dates are October 11 to October 15,1993. The place is near McLaren Vale, in South Australia. The venue will be Tatachilla Lutheran Camp, some 40 km South of Adelaide, a residential conference center which has been converted from an old winery. The workshop will concern the publication of MIC (Mendelian Inheritance in Cattle), MIS (Mendelian Inheritance in Sheep) and MIG (Mendelian Inheritance in Goats) and it will be attempted to establish a worldwide network of contact persons for COGNOSAG. A report from the *Australasian Gene Mapping Workshop* which will be held in Adelaide a couple of months beforehand will be presented and there will be an opportunity to visit the albino *Suffolk* sheep at Marrabel.

-6The proceedings of the original two workshops (1986 and 1987) were published respectively in 1988 and 1989 by the *Bureau des Ressources Genetiques* (Paris, France). A third publication summarizing the work on the loci for coat colour in sheep and goats (19861989)" was recently published by INRA's department of Alnimal Genetics (Paris, France). The last two workshops were held in liaison with the *International Society of Animal Genetics* (ISAG). In 1992 was published, *in Animal Genetics,* a list of "alleles for blood and milk polymorphisms in Cattle, Sheep and Goats" by LARSEN, DI STASIA and TUCKER. The locus names and symbols and the allele symbols in this paper are in line with the decisions taken at the 2lst *International Conference on Animal Genetics,* Michigan,1990, and with the COGNOSAC "Guidelines for gene nomenclature in Ruminants,1991", published in *Genetique, Selection et Evolution.*

J. Boyazoglu

3.0 GENETIQUE ET ELEVAGE DU PORC AU VIET-NAM (PIG GENETICS AND HUSBANDRY IN VIETNAM) BY M.M. MOLENAT AND TRAN THE THONG (1991). I.E.M.VT (SERVICE DE DOCUMENTATION),10 RUE PIERRE CURIE, F - 94704 MAISONS-ALFORT, CEDEX (FRANCE). ISBN 2-85985-175-5.

L'objet de cette publication a ete de dresser un bilan de la situation et de mener une reflection sur 1'elevage porcin dans les pays en voie de developpement prenant le Vietnam comme un cas d'etude et de reference. La publication eomporte quatre parties:

1. Un aperçu de la production : le Viet-nam se place parmi les pays dont 1'effectif porcin depasse 10 millions de tetes. Lelevage industriel existe, mais avec 80 a 90 % de la production, le petit elevage familial domine et joue un role capital dans la vie sociale et economique du pays.
2. Les types genetiques exploites : le Viet-nam dispose d'une multitude de types genetiques : -races locales dont les plus representatives sont les races i et Mong Caï au nord, le races Ba Xuyen et Thuoc Nhieu au sud. D'autres races locales presentes des effectifs plus limites, en particulier la race naine Co; - race etrangeres (Large White, Landrace, Duroc, etc.). La reproduction et la pathologie de certaines races locales presentent des aspects singuliers qui meriteraient d'etre etudies.
3. Les programmes genetiques : les vietnamiens mettent a profit les phenomenes d'heterosis et effectuent de nombreux croisements; entre races locales, entre races importees, ou a partir de races locales et de races importees. Dans la selection des races pures, le Viet-nam evolue tres rapidement vers les programmes bases sur la genetique quantitative, qui on fait leurs preuves dans de nombreux pays.

4. Une diseussion suit qui prend la forme d'une "table ronde" ou les echanges debouchent sur des recommandations en matiere de formation, de circulation de I'information, de recueil et d'analyse des donnees, d'experimentation, de diffusion du progres genetique, etc.

Dans la conclusion, les auteurs emettent le voeu que des recherches specifiques aux conditions locales soient mises en place (nutrition, reproduction, etc.) et que les elevages familiaux et les elevages industriels cessent d'etre consideres comme des poles opposes. Leur liaison permettrait, au contraire, de faire beneficier le Viet-nam des acquis de son elevage moderne confortes par une collaboration fructueuse avec les pays industrialises.

D. Planchenault

4.0 INTERNATIONAL CONGRESS ON AUTOCHTONOUS BREEDS (1992)

An International Congress on Autochthonous Breeds was held on September 24, 25 and 26. It was organized within the International Livestock Exposition of the "5th Century" in Zafra, Spain; the scientific organization was taken eare of by J. Canon from the Animal Production Department of the Veterinary Faculty of Madrid and the local organizing eommittee's Secretary was Dr. M. Angel.

The aims of the Congress were to provide extensive insight into the wide framework of the local breeds and their productive potential. Although local breeds constitute an important proportion of the Spanish livestock, population and productive genetic parameters are not well known. In many cases these breeds yield high quality products from geographic areas with poor or limited sources; the socio-econimic interest they have is quite remarkable.

There were four main papers presented which delt with the conservation and management of animal resources, and participants from twelve countries presented some 50 free communications covering subjects as diverse as population breed structure, carcass and meat quality, reproductive cycle characteristics, ethnological description of local populations, conservation strategies of rare cattle breeds, etc.

J. Canon

ANIMAL GENETIC RESOURCES CONSERVATION PROGRAMME IN BRAZIL

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SUMMARY

The Brazilian Agricultural Research Corporation (EMBRAPA), through the National Research Centre for Genetic Resources and Biotechnology (CENARGEN), created the National Research Programme for Genetic Resources in 1974, but at that time only plant resources were included. A few years ago, the need for conservation of animal genetic resources in Brazil became clear, and the lack of necessary documentation and evaluation was recognized. Finally, in 1981, CENARGEN decided to include animal genetic resources in its Research Programme. In the case of cattle, actions are being taken to save the "Criollo" before it is too late as it is rapidly disappearing by indiscriminate crossbreeding. There is already considerable information on the "'local" livestock breeds, strains and varieties in Brazil. A number of these breeds, strains or varieties that are in danger of extinction have been identified, and are being documented and specifically evaluated, particularly to determine if they possess any unique or special inherited characteristic that would warrant their conservation. Until such evaluation is completed, steps are being taken to ensure preservation of these populations. More recently, the programme ineluded other species such as: buffaloes, pigs, sheep, goats, horses and donkeys.

RÉSUMÉ

A travers le Centre National de Recherche des Ressources Genetiques et de la Biotechnologie (CENARGEN), I'entreprise de Recherche Agricole Bresilienne (EMBRAPA) a cree, en 1974, le Programme National de Recherche dans le domaine des Ressources Genetiques. A 1'epoque, uniquement les ressources botaniques etaient prises en consideration. Il y a quelques annees, il est devenu evident quu'il fallait preserver les ressources genetiques animales au Bresil. On a reconnu que la documentation necessaire a 1'evaluationn'etait pas disponible. En 1981 le CENARGEN a decide d'inclure les ressources genetiques animales dans son programme de recherche. Dans le cas des bovins, des mesures furent prises pour sauver la race "Criollo" avant qu'il ne soit trop tard, vu la disparition rapide de cette race en raison de croisements indiscrimines. On dispose deja dinformations considerables sur les races, les lignees et les varietes "autochtones" de betail du Bresil. Plusieurs races, lignees ou varietes menacees d'extinction ont ete indentifiees; elles ont fait 1'objet d'une documentation et ont ete soumises a une evaluation specifique, tout particulierement pour determiner si elles possedent des caracteristiques hereditaires uniques ou speciales qui pourraient justifier leur conservation. Dans 1'attente que cette evaluation soit terminee des mesures ont ete prises afin d'assurer la preservation de ces populations. I'lus recemment, on a inclus d'autres especes dans le programme telles que les buffles, les porcins, les ovin, les caprins, les chevaux et les anes.

1.0 INTRODUCTION

In the developed countries, most of them located in the temperate regions, the selection eonducted for centuries by breeders and researchers, together with a recent application of modern technologies, created breeds with high production levels. The increasing need for animal products in the developing countries, mostly located in the inter tropical zone, is causing a quick substitution of the "local" breeds. Although these "local" breeds present lower production levels than the exotic ones, they are extremely well adapted to the tropics, where they have been naturally selected for centuries.

Due to the need of substantially increasing food production, and thus livestock productivity, many third world countries decided to establish breeding policies, which encouraged dilution of indigenous germplasm by extensive crossbreeding programs. Many of these efforts have failed, this made livestock breeders aware of the importance of the indigenous breeds in overall food production systems because of their adaptation to the environmental stress of the tropics.

The subject of animal conservation is somewhat new in South America. However, the quick substitution of "local" by exotic and less adapted breeds has just recently awakened the consciousness of breeders and researchers that do not want to witness the complete disappearance of this valuable indigenous germplasm.

The establishment of programmes for preservation of livestock breeds in danger of extinction are important to avoid their imminent disappearance. In 1981, aware of the importance of the conservation of animal genetic resources, the Brazilian Agricultural Research Corporation (EMBRAPA) through the National Research Centre for Genetic Resources and Biotechnology (CENARGEN), decided to include animal genetic resources in its National Research Programme. The animal genetic resources in Brazil are being preserved either *in-situ* and *ex situ.*

2.0 *IN-SITU* CONSERVATION OT ANIMAL GENETIC RESOURCES IN BRAZIL THE CONSERVATION OF ANIMAL GENETIC RESOURCES IN BRAZIL STARTED WITH CATTLE AND LATCR

included buffaloes, pigs, sheep, goats, horses and donkeys. The conservation work is done by many different Research Centres of EMBRAPA, with a national co-ordination by CENARGEN. The conservation of goats, however, is being conducted by EMBRAPACNPC (National Research Centre for Goats).

Figure No. 1 shows the localization of the breeding nuclei of the Brazilian endangered livestock species and breeds.

The programme established by EMBRAPA-CENARGEN includes the following steps:

a. Identification of the populations in an advanced state of genetic dilution, by census and geographic distribution surveys;
b. Characterization of the germplasm: blood typing analysis and cytogenetic characterization; and,
c. Evaluation of the productive potential through the use of phenotypic and genetic parameters.

The conservation is being done either *in-situ* (breeding nuclei) *or ex-situ* (cryopreservation of semen and embryos).

As can be seen in Table 1, the National Research Programme for Genetic Resources includes projects with six different species.

2.1.Cattle

2.1.1. The Caracu

Among the Brazilian Criollo breeds, the Caracu has, by far, the largest population. After a dramatic reduction, mostly due to the importation of zebu cattle from India in the beginning of this century, the Caracu has greatly increased numerically and in popularity in recent years.

Many positive research results called attention to this breed to such an extent that today many breeders have waiting lists for their bulls. This renewed interest changed completely the situation of the Caracu, which cannot be considered in danger of extinction any more.

The Caracu cattle has been kept as purebred only in some isolated situations:

- in the state of Minas Gerais, in the region of Poços de Caldas, where it has been selected for milk production, originating the so-called Caracu Caldeano;
- in the state of Sao Paulo, the Instituto de Zootecnia keeps a Caracu herd in the Experimental Station of Sertaozinho, evaluating its potential as a beef producer; and
- a few herds of Caracu were maintained in the states of Parana and Santa Catarina, where cold winters and the poor quality of the pastures were obstacles to the adaptation of European breeds for beef production.

In a trial evaluating different breeds of bulls bred with Nellore cows for beef production, the Caracu was shown to be superior to the Nellore, Santa Gertrudis, Holstein and Brown Swiss (RAZOOK et al.,1986).

In feedlot trials, Caracu steers showed their superiority to Guzerat, Nellore and Gir. Male puberty is earlier in the Caracu than in the Gir, Guzerat and Nellore breeds (VALVASORI et al.,1985). The breed is blond in colour, with a cream coloured variation occurring as a recessive in some populations. Hooves are light coloured and the muzzle and vulva are pigmented light brown. It is larger than any other Criollo breed, and cows of over 700 kg and bulls of over 1,200 kg have been seen in cattle shows. It has heavy horns that grow outwards, down and forward. It has dual purpose characteristics, and one owner, in a favourable environment, reported a mean yield of some 2,300 kg of milk for his 1,000 cow herd. (WILKINS,1986).

2.1.2. The Mocho Nacional

The Mocho Nacional or National Polled breed is phenotypically very similar to the Caracu but, obviously, hornless. Slight differences in head shape have been observed.

This breed can be considered as an example of a breed in danger of extinction. Being the only Brazilian polled breed was the main reason for its preservation. The animals used in the preservation herd were provided by a private breeder about 8-9 years ago, and were thought to be the last ones. Fortunately, in 1991, some purebred animals of this same breed were found in another property of the same breeder, and will be included in the preservation programme, decreasing the high inbreeding coefficient.

It is perhaps fortunate that this population, that has the minimum number of individuals for successful multiplication suggested by YAMADA and KIMURA (1983), possesses one character that is dominant and useful: it is polled. For this reason, we consider that the cryopreservation of semen and embryos of the breed is very important. Thus, this small herd is kept in an Experimental Station near Brasilia, where semen and embryos are being collected.

When the conservation programme started, the entire surviving population consisted of three bulls and eight cows, found in the states of Sao Paulo and Parana. Since then, after many semen and embryo collections, the population been conserved and has increased through embryo transfer, to a total of 25 animals.

Figure 1. Geographic Distribution of the Breeding Nuclei in Brazil

Table 1 - Genetic groups in danger of extinction - Brazil

Species	Breed	Population					
		Survey[1]	Size	Miscegenation degree	Geographic distribution	Situation	Nuclei
Cattle	Caracu	Concluded	>20000	Low	GO/MT/MS/MG/SP/PR/SC/RS	Increas.	Offic./Priv.
	Mocho Nacional	Concluded	100-150	High	SC/SP/DF	Increas.	Offic./Priv.
	Crioulo Lageano	Concluded	200-300	Low	SC/RS	Increas.	Private
	Curraleiro	In Course	>300	High	MA/PI/CE/GO	Decreas.	Offic./Priv.
	Pantaneiro	In Course	1000-2000	High	MT/MS	Decreas.	Offic./Priv.
Buffaloes	Carabao	In Course	100-1500	High	PA/AP	Decreas.	Offic./Priv.
	Baio	In Course	500-800	Low	PA/AL/BA/MG	Stable	Offic./Priv.
Pigs	Macau	In Course	>500	High	PR/SC	Decreas.	Private
	Moura	In Course	200-300	Low	PR/SC	Increas.	Offic./Priv.
	Caruncho	In Course	100-200	High	MG/PR/SC	Stable	Offic./Priv.
	Piraputinga	In Course	10-20	Low	MG	Stable	Official
	Pau	In Course	>1000	High	MG/PR/SC	Increas.	Offic./Priv.
	Nilo	In Course	>500	High	SP/RJ/PR/SC	Decreas.	Private
	Canastra	In Course	100-200	High	PR/SC	Decreas.	Private
Sheep	Crioula Lanada	In Course	300-400	Low	SC/RS	Stable	Offic./Priv.
Horses	Lavradeiro	Concluded	100-200	Low	RR	Decreas.	Official
	Pantaneiro	In Course	>10000	High	MT/MS	Decreas.	Private
Donkeys	Nordestino	In Course	>10000	Low	MA/PI/RN/CE/PE/PA/AL/BA/MG	Decreas.	Offic./Priv.

Source: Mariante et al. (1988)

[1]Survey in course: present estimate value for population size.

Moxotó goats, Mocho Nacional cow and Crioulo donkey

2.1.3. The Crioulo Lageano

Also called Franqueiro, the Criollo of Lages is found on one private property near Lages in the state of Santa Catarina. The environment is not severe, though the area is characterized by cold winters. The herd has 280 adults females and 20 bulls and is reported to be inbred and to contain some zebu blood.

This breed descends from animals brought by Spanish Jesuits, and has been selected for more than three centuries on acid and rocky soils, at high altitudes in Southern Brazil.

Like all unselected Criollo populations, the herd contains black, brown and white cattle and combinations of these colours. The horns are described as long and lyre-shaped curving upwards, forward and outward.

This herd is being evaluated under the classical conditions in which the breed is raised, that is, native pastures without supplementation. Means of some traits of the Crioulo Lageano are the following:

Trait	Mean weights
Birth weight	29.3 kg
Weaning weight	161.0 kg
12 months weight	180.0 kg
24 months weight	241.0 kg
36 months weight	307.0 kg[a]
[M]ature weight	429.0 kg
Milk production[b]	5.1 kg/day

[a] *Weight of mature cows suckling calves*

[b] *Milk production: one milking/day, calf separated from the cow for 14 hours.*

A crossbreeding programme has been established in the state of Santa Catarina, where Crioulo Lageano bulls are bred to Nellore and Charolais cows. This programme is an incomplete diallel in which the only matings included were the ones among Crioulo Lageano dams with Nellore and Charolais sires. Though the results are still partial, the evidence suggests that:

a. The best performance at weaning (average age of 173 days) was that of the offspring of Nellore x Charolais (148.00 ± 7.98 kg), followed by purebred Crioulo Lageano (136.60 ± 4.70 kg) and by Crioulo Lageano x Charolais (125.00 ± 7.63 kg);
b. The best milk production was presented by Crioulo Lageano cows, followed by the Charolais.

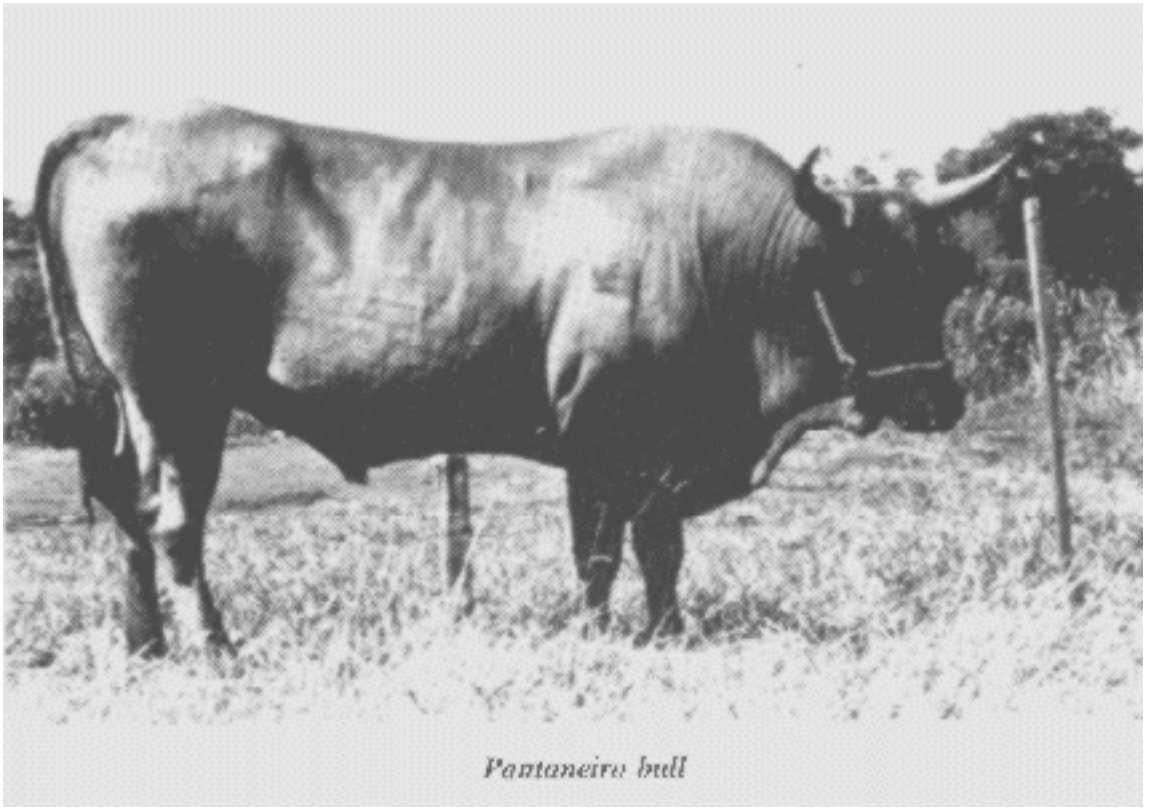
In the case of the Crioulo Lageano experimental herd, there was a need for a new introduction of animals. After survey, it was possible to identify a very similar herd in Argentina. A few bulls, from the Argentine Criollo herd were brought to Brazil, in order to decrease the inbreeding coefficient.

2.1.4. The Curralezro or Pe-duro Crioulo

The Corral or Hard Hoof Criollo is from the semi-arid Northeast of Brazil, an area of dense thorn scrub. The origin of this breed is the cattle brought to Brazil by the Portuguese settlers, and is a result of a natural survival in the hostile environment conditions of this region. According to ATHANASSOF (1956), this breed descends directly from the Mirandesa and, particularly, from the Beiroa type that can still be found in Portugal and in the Spanish Provinee of Leon.

The exceptional rusticity of the Curraleiro, and its capacity to survive on native pastures of marginal regions, where other types of cattle would have little chance, are two characteristics that justify the conservation of this breed. The Curraleiro is endangered not only because of crossbreeding with zebu breeds, but also due to the systematic castration of the bulls, by the

breeders who want to upgrade their herds to zebu blood, with the excuse that the Curraleiro is small and late maturing. This explains how the breeders are quickly substituting this breed by others, mostly zebu, which, they believe, produce more beef on better quality pastures, though they are not adapted to the poor native pastures of Northeastern Brazil.



Pantaneiro bull

A herd that contains 107 females and 43 males is now kept by EMBRAPA on the Octavio Domingues Experimental Station, near Sao Joao do Piaui, in the state of Piaui. Some production parameters were obtained (CARVALHO et al.,1986):

Trait	Males	Females
Mature weight (kg)	337.3 ± 55.0	228.6 ± 36.0
Birth weight (kg)	19.3 ± 4.0	17.2 ± 2.4
Fertility rate (%)	-	72.0
Mortality rate (%)	5.0	5.0

2.1.5. The Pantaneiro

The Crioulo Pantaneiro or Swamp Crioulo comes from swamp areas of the states of Mato Grosso and Mato Grosso do Sul, on the border with Bolivia, and is also called Tucura or Cuiabano. Due to the difficulty of access to the I'antanal region, the present size of the population is not known, but it is not large. It is supposed that there are still animals in very small groups scattered among the four million zebus of the zone.

In 1985, a group of cows and bulls was bought by EMBIRAPAA, and this herd is now kept in Fazenda Nhu-mirim, which belongs to CPAP (Agricultural Research Centre for the Pantanal), 210 km East of Corumba (Mato Grosso do Sul). In 1992, the herd was composed of 11 bulls, 49 cows and 24 heifers. A trial was initiated in 1986 to compare the performance of zebu cattle with the Pantaneiro, and a herd of 40 Nellore cows is being recorded at the Fazenda Nhu-mirim for this purpose. Data include birth weight, weaning weight, post-weaning gain, weight at parturition, mortality and fertility rates. The following are production parameters determined for the Pantaneiro herd (MAZZA et al.,1987,1992):

Trait	Males	Females
Birth weight (kg)	22.0 ± 3.0	19.0 ± 3.0
Mature weight (kg)	375.0 ± 7.0	298.0 ± 41.0
Calving interval (days)	-	404.0 ± 72.0
Calving rate (%)	-	70.0

2.2.Buffaloes

2.2.1. The Tipo Baio

EMBRAPA CPATU (Agricultural Research Centre for the Humid Tropics) keeps a herd of Tipo Baio {Brown Type) buffaloes in the Experimental Station situated in the low Amazon area. The number of animals in the region is small, and the herd kept by EMBRA1'A numbers around 80 animals.

This breed is well adapted to the adverse conditions of the Amazon region. Adult mean weights varies from 450 to 600 kg for females and from 700 to 800 kg for males (MARQUES et al.,1992). The following mean weights of the "Tipo Baio" buffaloes were measured (MARCOS et al.,1987a):

	Males	Females
Birth (kg)	34.1 ± 4.7	35.6 ± 2.3
Weaning (kg)	217.8 ± 22.4	193.8 ± 30.6

2.2.2. The Carabao

The first buffaloes brought to Brazil were the Carabao. They were brought to the Marajo Island at the end of the l9th century.

Indiscriminate crossbreeding has been reducing this population. For this reason, EMBRAPA CPATU decided to keep a herd of 70 animals, in the Experimental Station in the low Amazon area.

Adult mean weights of the Carabao buffaloes are slightly heavier than for the Tipo Baio; females weigh from 500 to 600 kg while males present an average weight of 700 kg. Birth and 12 months weights and the birth rates were estimated bu MAKCOS et al. (1987b):

	Males	Females
Birth weight (kg)	32.1 ± 4.4	31.5 ± 4.4 12
months (kg)	233.0 ± 14.6	222.2 ± 14.1
Birth rate (%)	-	96.8

2.3.Pigs

With the establishment of an industrial structure, based on well developed exotic breeds of pigs and their crosses with indigenous populations, there has been a decrease in the number of pigs of the "local" breeds.

The smallholders still raise animals of the "local" breeds extensively, at low technology levels, but while it is well known that these animals present low production levels their survival rate is extremely high.

EMBRAPA-CENARGEN has started a survey trying to identify nuclei of these

"local" breeds, with the help of five other research institutions: EMBKAPA-CNPSA (National Research Centre for Pigs and Poultry), UFPR, UFSC and UFMG (Federal Universities of Parana, Santa Catarina and Minas Gerais, respectively), IAPAR (Agricultural Research Institute of Parana).

Some of the already identified "local" breeds are the Piau, the Moura, the Caruncho, the Pirapetinga, the Nilo, the Macau and the Canastra.

A survey was just recently made, but there are not yet many statistical results available on the production potential of these "local" breeds.

In 1986, the Federal University of Parana established a breeding nucleus of Moura, and some production data are available (1986/1990; 183 litters):

Trait	**Mean Value**
Litter size (N)	9.04 ± 2.96
Males	4.66 ± 2.14
Females	4.39 ± 2.15
Mortality until 21 days (%)	18.47
Weights (kg)	
At birth	1.26 ± 0.19
21 days	4.46 ± 0.96
120 days	38.67 ± 10.06
180 days	78.08 ± 13.51

Source: SILVA et al. (1991).

2.4. Goats

The conservation of the four "local" breeds of goats (Moxot6, Marota, Caninde and Repartida) found in the Northeastern region of Brazil is being conducted by EMBRAPA CNPC (National Research Centre for Goats). The project is divided in many segments and distributed among seven states of that Brazilian region (FIGUEIREDO et al., 1987a,b,c):

State	**Breed**	**Institution**
Alagoas	Marota	EPEAL
Bahia	Repartida	EPABA
Ceara	Caninde	EPACE
Paraba	Caninde	EMEPA
Pernambuco	Moxoto	IPA
Piaui	Marota	UEPAE Teresina
Rio Grande do Norte	Caninde	EMPARN

This programme is finaneed by the Development Bank of the Northeastern Region af Brazil, and the goals are to conserve and multiply the breeds, and later, distribute animals to farmers. Unfortunately this *in-situ* eonserv'ation might not last long, since the breeders are much more interested in raising the exotic breeds. The cryopreservation is an urgent need and has just started. A small herd of Moxoto goats has been brought to CENARGEN, in Brasilia, where a cryopreservation programme (including storage of frozen semen and embryos), started in April 1989.

2.4.1. The Moxotó

The Moxoto is the most readily identifiable "local" type. It takes its name from the Moxoto Ualley in the state of Pernambuco. The animals are uniform in colour (light cream, almost white, with black spots), size and type. The uniformity in colour is automatic since it is this trait that makes them recognizable or causes them to be unique. Their uniformity in size and type suggests that they are of similar genetic origin and tend to breed true. The animals are of medium size, in comparison to the smaller indigenous types and the larger exotics. Typical weights for mature females range from 30 to 40 kg. Black colouring is found as a stripe or line on the dorsal surface, on the underline and on points such as the feet, legs and face. Most are horned with males having relatively small horns. The ears tend to be medium size and erect.

2.4.2. The Repartida

The goat known as the Repartida appears to be similar in forrn to the Moxoto. The term Repartida apparently refers to a unique colour pattern consisting of dark forequarters and points (face and legs) with a fawn or cream colour over the rest of the body. The reverse or reciprocal colour pattern, in which the rear quarters are dark, is almost as frequent. Most of the animals are horned with medium-sized erect ears. Body weights and reproductive rates approximate those of the Moxoto breed.

2.4.3. The Caninde

The Caninde is also similar to the Moxoto and Repartida in size and form. In this case, the name apparently originates from the city of Caninde in the state of Ceara. As with the Moxot6 and the Repartida, the Caninde is distinguished largely by its colour. It is usually black with a yellow belly and a small amount of yellow or tan occasionally occurring on the face. The size is also similar to the Moxoto and Repartida. It remains to be determined whether these animals are unique in production traits or whether they merely represent a colour variation of animals with the same or similar genetic background. All three types have short fine hair and produce good quality leather. It is assumed that since they have evolved in the respective regions, they are well adapted to local conditions.

2.4.4. The Marota

This breed is also known as Curaca, which derives from a city in the state of Bahia. The Marota or Curaca is a totally white goat which appears to differ from the other native types. Some animals have longer, coarse hair. Perhaps this is indicative of genes of the Saanen and/or Angora which are thought to have been introduced into Brazil in the past. To the extent that these hypotheses are true, it might be assumed that they produce less desirable skin quality and are less well adapted to the local or tropical conditions. Yet, these points remain to be confirmed by more studies. Under controlled conditions, body weights, milk production and reproductive rates appear to equal or exceed that of the other native types.

2.5.Sheep

The two most important woolless indigenous breeds of sheep are found in the Northeastern region. They are the Morada Nova and the Santa Ines. As for the conservation of local goat breeds, the conservation of woolless sheep in Brazil is conducted in the Northeastern region of Brazil by EMBRAPA CNPC. The project is also divided in many segments and distributed among seven states (FIGUEIREDO,1981; FIGUEIREDO et al.,1987a,b):

State	Breed	Institution
Alagoas	Santa Ines	EPEAL
Bahia	Morada Nova	EPABA
Ceara	Morada Nova	EPACE, UFC
Paraiba	Santa Ines	EMEPA
Pernambuco	Morada Nova	IPA
Piaui	Santa Ines	UEPAE Teresina
Rio Grande do Norte	Morada Nova	EMPARN

2.5.1. The Morada Nova

The name Morada Nova was given to the red variety by I'rofessor Octavio Domingues, during his visit to Northeast Brazil in June 1927, because he first saw them in Morada Nova county, state of Ceara. Other names which have been used are Deslanado do Nordeste (Northeastern woolless), Deslanado vermelho (Red woolless) and Deslanado branco (White woolless). At a meeting held by the Ministry of Agriculture in Fortaleza, Ceara, in October 1977, it was decided to use the name Morada Nova for all strains.

According to DOMINGUES (1954) the red, white and spotted hair sheep are descendant from the Bordaleiro of Portugal which came to Brazil when these virgin areas were being first populated. These Bordaleiro sheep are distinguished by their coat; a mixture of hair and wool. In the course of time, natural selection favoured the survival of woolless individuals with short, goat-like hair rather than those with longer, coarse hair and even with varying degrees of woolliness. The Morada Nova is very similar to the red African breed of Venezuela.

2.5.2. The Santa Ines

The Santa Ines breed results from the crossbreeding between the Morada Nova and the Bergamasca of Italy. It inherited the roman nose, lop ears and traces of wool from the Bergamasca and its hair coat from the Morada Nova. The White Pele de Boi of Bahia was included with the Santa Ines breed (white variety). The Santa Ines may be red, pied, black or white.

2.5.3. The Crioulo Lanado

Besides the two woolless indigenous breeds of sheep, Brazil has one hairy-wool sheep breed, the Crioulo Lanado.

This hairy-wool Criollo Sheep from Rio Grande do Sul (the most Southern state in Brazil) seems to have originated from the "Churra" of Spain, brought over by the first settlers to America. It is interesting to mention that similar animals can be found from Peru to Uruguay, which may suggest that they all have the same origin. Though this breed produces a very coarse and hairy wool, considered of inferior quality, it is important to emphasize the superiority of the breed in precocity, fertility and resistance to internal parasites, if compared to more specialized breeds. These positive traits can be interpreted as an adaptation of this breed to that environment.

The population of the Criollo sheep in the Southern Region of Brazil (states of Rio Grande do Sul, Santa Catarina and Parana) has been decreasing very quickly From a total of about 40 flocks in those three states, only five breeders confirmed that their flocks are purebred. EMBRAPA-CNPO (National Research Centre for Sheep) keeps a flock of Criollo sheep, with a total of 105 breeding females. Besides the in situ conservation, an evaluation programme is being conducted. Some information, collected in 1984/1990 by VAZ et al. (1991), is as follows:

Traits	Mean value
Weights	
Adult weight	35.15 kg
Lamb birth weight	3.30 kg
Lamb weaning weight	18.68 kg
Lamb 18-month weight	31.47 kg
Wool	
Greasy fleece weight	1.89 kg
Staple length	24.80 cm
Fertility	
Birth rate	87.30 %
Weaning rate	74.70 %
Mortality, from birth to weaning	12.50 %

In order to diminish inbreeding, it is attempted to import some Criollo rams from Uruguay, where there is a flock that have identical characteristics to the Brazilian breed.

2.6.Horses

2.6.1. The Pantaneiro

The Pantaneiro Criollo horse is of Portuguese origin and descends from animals introduced by the first settlers. It is adapted to the swampy area of the Pantanal Matogrossense and has been subject to indiscriminate crossing with other breeds, but to a much lesser degree than for the Criollo cattle. However, it has suffered considerable losses in recent years when equine infectious anaemia was introduced into the area. This breed has been playing an important role in the development of the region. No other breed can resist as well as the Pantaneiro to the adverse conditions of the Pantanal, with its flooded grazing lands. Crossbreeding with Arab and Thoroughbred horses is a common situation which threatens the breed with extinction.

EMBRAPA-CPAP (Agricultural Research Centre for the Pantanal) owns a small herd of these horses at Fazenda Nhu-mirim, and has started a study of body measurements. The same Research Centre is undertaking a survey to identify the existing nuclei and their geographic distribution. In a second phase, blood tests will be made (blood typing and karyotypes).

According to SANTOS et al. (1991), in 1988 there was a total of 1,358 registered animals scattered in 104 farms of the Pantanal region. The following are some morphometric measurements:

	Males	Females
Height at withers (cm)	141.6 ± 1.8	137.0 ± 2.7
Neck length (cm)	59.8 ± 6.3	59.5 ± 6.5
Thoracic girth (cm)	166.3 ± 43.7	163.2 ± 44.0

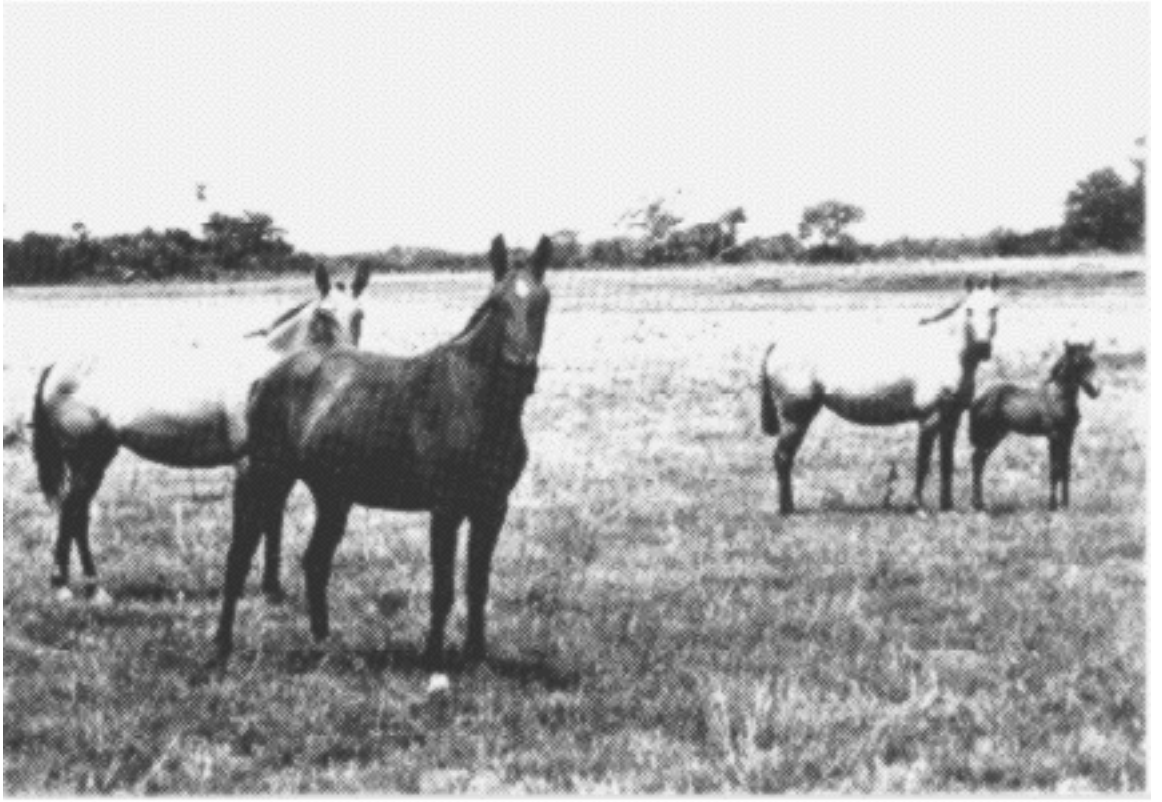
2.6.2. The Lavradeiro

The Lavradeiro Criollo, also known as the Wild Horse of Roraima, consisted of a population of about 1,000 animals until 1982, but today they do not exceed 200. The Lavradeiro constitutes the only horse population developed in conditions similar to those of the Cerrado (Savanna) of

Repartida goat

Santa Ines sheep

Lavradeiro horses



Pantaneiro horses

Central Brazil, and represents an extremely valuable potential genetic resource. The Cerrado is a region of about 180 million hectares with 39% of the cattle existing in Brazil and, for this reason, it is easy to imagine the importance that the Lavradeiro horse may represent to the beef cattle industry of that region.

Besides their adaptation to the adverse elimatic conditions, these animals survive with very poor diets, and are possibly resistant to external and internal parasites (BECK and MARTINS,1986). Though it has great potential importance, the population has been decreasing dramatically in recent years due to predatory hunting and to indiscriminate crossbreeding with horses of exotic breeds.

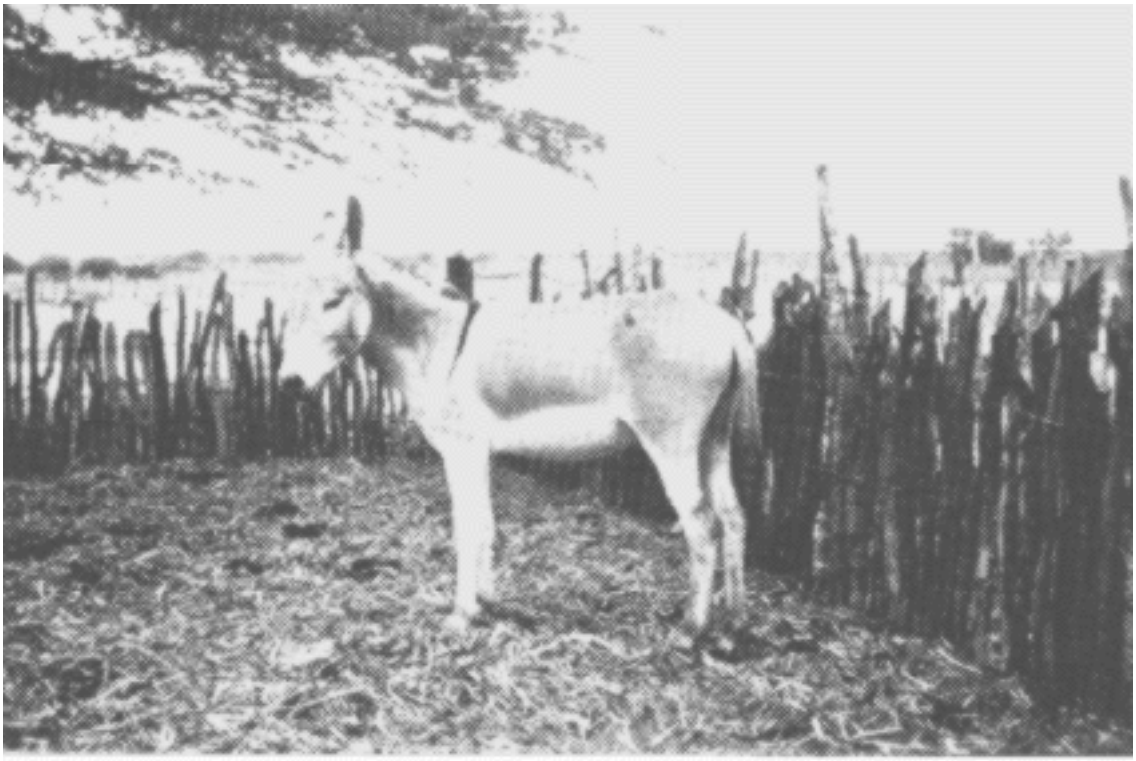
EMBRAPA has just established a breeding nucleus of Lavradeiro horses in the state of Roraima, with a total of 50 animals.

2.7.Donkeys

2.7.1. Jumento Nordestino

The disappearance of the Northeastern Criollo donkey seems imminent, and if this really happens, will cause a serious problem for the human population of that region, since they are accustomed to use the donkeys for transport, draft and field work. AZEVEDO et al. (1984) showed the seriousness of this problem. The population was around 2,700,000 in 1967; it decreased to less than 700,000 in 1982. This corresponds to a reduction of 74% in 15 years. This decrease is mostly due to the slaughter by abattoirs that export the meat to Japan and to some European countries.

The Northeastern donkey is being conserved by EMBRAPA in cooperation with EMPARN (Rio Grande do Norte Agricultural Research Corporation) that keeps a herd in the Terras Secas Experimental Station, in the state of Rio Grande do Norte.



Northeastern Criollo donkey

3.0 EX SITU CONSERVATION PROGRAMME IN BRAZIL

After the establishment of the *in-situ* programme all over the country, it was decided that EMBRAPA should start *an ex-situ* programme, to avoid genetic dilution and irreplaceable gene losses of the valuable "local" breeds. A semen and embryo bank was then established, which until now stores frozen semen and embryos of cattle. The numbers of semen and embryos stored can be seen in Tables 2 and 3.

TABLE 2

Number of doses of stored semen of different "local" breeds of cattle (ex situ EMBRAPA collection).

Cattle Breed	No. of Bulls	No. of Doses
Crioulo Lageano	7	6,119
Mocho Nacional	10	4,314
Caracu	2	4,010
Curraleiro	8	375
Crioulo Argentino[1]	3	288
Pantaneiro	2	280
TOTAL	30	15,386

[1]*Some Crioulo Argentino bulls were imported in order to decrease inbreeding in the Crioulo Lageano.*

TABLE 3

Number of stored embryos of different "local" breeds of cattle (ex-situ *EMBRAPA collection).*

Cattle Breed	No. of Embryos
Crioulo Lageano	16
Mocho Nacional	60
Caracu	49
Pantaneiro	16
TOTAL	141

3.1. Cryopreservation by Means of Modern Biotechnologicel Methods

3.1.1. Cattle

3.1.1.1. Embryo transfer

Techniques in cryopreservation, thawing and embryo transfer to recipient cows are fully dominated. During the years 1990 and 1991, 534 embryos were obtained from 83 donors, with an average of 2.8 viable embryos/donor. The average pregnancy rate is 55-60% after non-surgical transfer. With frozen/thawed embryos, a similar pregnancy rate (55%) was obtained, while 80% of them showed *in-vitro* growth.

3.1.1.2. Embryo Bisection

Micro-manipulation of embryos has permitted tlhe production of identical twins from a single embryo. Hemi-embryos (embryo halves) can be frozen and stored for a long time, thus allowing the evaluation of important traits of an individual or its progeny, while maintaining a copy in the Gene Bank. Genotype by environment interactions can be evaluated over time, by allowing identical twins to develop in different years. The pregnancy rate utilizing hemi-embryos reached almost 100% if one considcrs the number of original embryos that have been transferred. Some frozen/thawed embryos were bisccted and 73.5% of them showed *in-vitro* growth.

3.1.1.3. Embryo sexin

A technique for embryo sexing utilizing Y Specific DNA se$_{d}$uences with the diagnosis through PCR (Polimerase Chain Reaction) has been developed. Six embryos have been sexed until now, utilizing this method, and at present (May 1992), two calves sexed during the embryonic stage, have been born (one male and one female). Through cytogenetic technology, another calf was born after the male sex had been previously identified (LIMA, 1992).

3.1.1.4. In-vitro fertilization

A total of 3,144 oocytes has been collected. Different methods for oocytes lnaturation are being compared, particularly the microscopic study of meiosis. Some oocytes have been studied for this purpose under an electronic microscope. The maturation of oocytes over granulosa cells is one of the methods being studied. The percentage maturation ranged from 24 to 100%, this last figure being the result of the addition of 0.02 mg/ml of FSH-1' on the culture medium.

3.1.2. Horses

3.1.2.1. Ernhryo transfer

More recently, CENARGEN started a cryopreservation programme with horses. The embryo transfer technology used with cattle has been successfully adapted to horses. 3.1.2.2. *Semen and embryo freezing*

The technidue for freezing stallion semen is fully successful. The technique for freezing mare embryos is being adapted. Until now, 41 embryos have bcen cryopreserved and since they do not belong to endangered horse breeds, they will be only utilized for cytogenetic studies.

3.1.2.3. Emnbryo bisection

In 1988, a foal originating from a hemi-embryo was produced, as well as foals from frozen embryos.

3.1.2.3. Oocytes Maturation

A total of 138 oocytes obtained from mare ovaries collected in slaughterhouses has been selected and incubated in a TCM-199 medium, with *l5%o* mare serum. After incubation, 80% of the oocytes presented expanded *cufnulus oophorus* cells, and after fixation *32%/o* of these oocytes presented nuclear maturation. This is the first step for the in*vitro* fertilization in this species.

3.1.3. Goats

3.1.3.1. Embryo collection

The cryopreservation of goat material has just started, but a methodology for embryo collection through surgery has been already developed. With previously synchronized goats it was possible to collect an average of 7.8 embryos, with 89% of them being viable. A total of 98 frozen embryos were tlzawed and after incubation 47% of them presented growth. Even though these are partial results, they show that it is already possible to store goat embryos in a Gene Bank, knowing that the population can be regenerated. The technique for non-surgical embryo collection is being developed utilizing a flexible catheter. To date, the results seem favourable.

3.2. Regional Animal Gene Bank for South America

In 1987, the Food and Agriculture Organization of the United Nations (FAO) decided to create seven Regional Animal Gene Banks in the developing countries: two in South America (Brazil and Argentina), two in Africa (Ethiopia and Senegal) two in Asia (China and India) and the last one in Mexico (for Central America and the Caribbean, a zone free of foot and mouth disease).

Looking for a place to establish the Gene Bank in South Alnerica, FAO decided on CENARGEN, due to the work this Research Centre is already doing in this field. It is expected that this Gene Bank will open by the beginning of 1993, receiving semen and embryos from all over the continent, with duplicate samples being sent to INTA-Argentina, for safety reasons.

In May 1991, CENARGEN together with the Animal Production & Health Division of FAO, organized a Training Course on Regional Animal Gene Banks, with participants from 11 countries of South and Central Alnerica. It was very interesting to compare the reactions of the participants at tlze beginning and at the end of the Training Course. At the beginning it became clear that most of them had never thought very much about conservation of animal genetic resources, but two weeks later they looked so enthusiastic that it seemed that they would go baek to their countries and start a conservation programme right away.

Until recently there was almost no interest in the conservation of "Criollo" cattle or other endangered species in Latin America. It seems that finally there is a sign of awareness of many countries in terms of recognition of the importance of the conservation of animal genetic resources. With simultaneous efforts by FAO, EMBRAPA and INTA, the chances of organizing a strong Regional Animal Gene Bank are much greater.

4.0 CONCLUSIONS

The fast growing science of Biotechnology may lead to newer techniques of gene preservation. DNA recombinant techniques, embryo manipulation, cloning of desirable genes from the same or other breed populations may one day become commonplace. We do believe that doubts that may persist about the importance of the conservation of animal genetic resources will disappear when one thinks about the future use of just one special technique: the creation of transgenic animals.

Gene banks will play an important role when the desirable genes, responsible for characteristics such as adaptation, disease tolerance and resistance to parasites will be retained with the creation of such animals. And then, only the countries which have started serious conservation programmes will be able to form the transgenic animals that will meet their specific needs. At that moment, it will be too late for some countries to start a conservation programme. The time is now, before most of the "local" populations have disappeared due to systematic crossbreeding programmes with exotic breeds.

5.0 ACKNOWLEDGEMENTS

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