

COUNTRY REPORT ON THE STATE OF ANIMAL GENETIC RESOURCES BRAZIL



**Brasília – DF
2003**



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COUNTRY REPORT ON THE STATE OF ANIMAL GENETIC RESOURCES BRASIL

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PRESENTATION

It is with great satisfaction that we present the **Country Report on the State of Brazilian Animal Genetic Resources**, a strategic document on policies for the planning and implementation of priority actions for the development of the sector, in the context of sustainable production systems.

This document will be part of the **Report on the State of the World's Animal Genetic Resources**, as well as serve as a basis for establishment of national, regional and world priorities, help in the maintenance and increase of animal genetic resources participation in food and agriculture. The elaboration of similar reports was carried out by most of the member countries of the Food and Agriculture Organization of the United Nations (FAO), coordinated by the Genetic Resources Commission for Food and Agriculture.

This Country Report is the result of the collaboration by numerous researchers, university lecturers and technicians from Rural Assistance Corporations, farmers, as well as representatives of the Ministry of Agriculture, Livestock and Food Supply - MAPA, Department of Inspection and Promotion of Animal Production. We would like to express our sincere thanks to all those who participated in its elaboration. Without a doubt, this Country Report will be part of the new agricultural scene, as a strategic point to face the challenges of a globalised economy, where productivity and quality are determining factors for competition on equal conditions in the international market.

It is clear that much has yet to be done for the Conservation and Use of Animal Genetic Resources, so we therefore invite all to continue with this dedicated participation, which involves farmers, specialists and Government, so that the objectives proposed in this Country Report can be met.

This Report follows the structure defined by FAO. Due to the nature of a country with the dimensions of Brazil, with such widely differentiated biomes, which determine diverse production systems, it was impossible to limit the number of pages originally suggested. In the beginning, it was thought that only naturalised breeds should be contemplated. Nevertheless, after the work began, it was concluded that in this way the Country Report would not mirror the true situation of Brazilian animal production. It would also complicate the elaboration of priorities that include the insertion of traits such as adaptation and resistance, developed by the naturalised breeds after five centuries of natural selection, into the production systems.

Finally, we would like to mention that although Brazil already had a well structured Conservation Programme, with research projects linked to a National Network for Animal Genetic Resources, spread over the whole country, the fact that the National Consultative Committee, responsible for the elaboration of this report, asked for and received the valuable collaboration of researchers and technicians that normally work with only commercial herds, meant that many of the latter became more interested in the importance of conservation and use of threatened breeds and began to consider their use in research projects.

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EXECUTIVE SUMMARY

With an area of 8,547,403 km², Brazil is the largest country in South America. Compared with other countries, it is only smaller than Russia, Canada, Peoples' Republic of China and United States of America. Brazil is a privileged country as it has an extensive surface area of continuous lands, which for the most part, are capable of being cultivated. It also has abundant water resources (the largest fresh water reserves on the planet, 8% of world volume), as well as having different biomes, which places it among the countries with most biological diversity. Of the estimated 250 thousand superior plant species worldwide, about 60 thousand are native of Brazil.

In 2002, total Brazilian exports, including manufactured goods, valued US\$ 60.36 billion, with agricultural goods contributing with US\$ 24.86 billions, or 41.2% of the total, showing the enormous potential of agribusiness in the Brazilian economy. By the end of 2003, the agricultural goods exported increased by 23%, to a total of US\$ 30.64 billion.

Even though a very reduced number of animal species were considered domestic in the pre-colonial period, the indigenous people did not have the habit to domesticate them. Most of the domestic animal species were introduced into Brazil through successive voyages of the colonisers. And 500 years later, the country ended 2003 as the largest exporter of beef and poultry meat.

With a population that in 2002 was estimated as 174,63 million inhabitants, Brazil has the largest commercial cattle herd in the world (167.46 million head), second only in numbers to India, which, for religious reasons, does not use its herd commercially. Among the domestic species, the second largest population is the pig, with 33.75 million head, of which 43% are in the South Region, where most of the canning industry is located. In 2002, 3,901 million tonnes of pork were exported world-wide, led by the European Union, Canada, United States of America and Brazil, which jumped from 12th position to 4th. Brazil exported 476 thousand tonnes, representing 12.2% of the world market, a record for the country. Poultry breeding is today one of the most vigorous sectors of Brazilian agribusiness. The country ended 2003 exporting a total of 1.62 million tonnes of poultry meat, representing 57.5% of the total meat exported.

Although sheep breeding can be found all over the country, the effective population is decreasing. In 1990, the population was about 20 million head, while today the national herd is 14.48 million head, having highest concentrations in the Northeast where hair breeds dominate. The Southern region is traditionally dominated by wool sheep. The Brazilian goat herd has approximately 9.4 million head, distributed countrywide. About 90% is concentrated in the Northeast, where they are reared extensively and principally used for meat production. The country has the third largest horse herd in the world, with an estimated population of 5.9 million head in 2003, and the largest herd of buffalo among western countries, with a population of approximately 3.0 million head.

The country has approximately twenty animal breeding programmes, with different focal points, for the distinct breeds and species. Even though most of them are for cattle, there are specific programmes for buffaloes, pigs and poultry, as well. Various breeds were developed from those brought by the colonisers soon after the discovery. In these 500 years, they were submitted to natural selection, to the point where they show adaptive traits to certain ecological niches, and began to be called naturalised, Criollo, or "local" breeds. By the end of the XIX century, exotic breeds of the different species began to be imported and, little by little, substituted the "local" breeds. Today most of them are in danger of extinction.

To reduce the extinction of naturalised breeds, the National Research Centre for Genetic Resources and Biotechnology - Cenargen, of the Brazilian Agricultural Research Corporation - Embrapa, included, from 1983, the conservation of animal genetic resources in its conservation programme, which up to that date contemplated only plants. From there, the conservation of animal genetic resources began to be carried out by various Research Centres of Embrapa,

Universities, State Research Corporations and by private farmers, under the national coordination of Cenargen. The animal conservation programme includes the following stages: (a) identification of populations in advanced state of genetic dilution; (b) phenotypic and genetic characterisation; and (c) evaluation of their production potential. Conservation is being carried out in Conservation Nuclei, maintained in the habitats where the animals have been naturally selected (*in situ*), while and embryo and semen are being stored (*ex situ*) at the Animal Germplasm Bank (AGB) in Brasilia. It is important that techniques developed for the conservation work find economic use for each one of the breeds being conserved. The research alone is not able to conserve the endangered breeds and a partnership with private breeders is of fundamental importance for the success of the programme. Some successful cases of conservation are presented in this Report.

Higher education in areas related to Agricultural Sciences is quite old in Brazil. Agronomy courses were the first to be created in the country, and most of the faculties in this area, are linked to the government, either state or federal. In 2001, including undergraduates in Agronomy and Veterinary Medicine, there was a total of 59,745 registered students. Brazil has a high number of post-graduate courses in Agricultural Sciences. The number is a direct result of the investment made between the decades of 70 to 90, when a large number of researchers were sent abroad to be trained at post-graduate level, especially in the United States of America and Europe. Upon their return, it was possible not only to create various post-graduate programs in the country, but also form various research teams in the National Research Centres which were recently created with the formation of EMBRAPA, in 1973.

The National System for Agricultural Research - SNPA, is mainly made up of federal and state public institutions, which, in a co-operative manner, carry out research in different fields of scientific knowledge. The SNPA is co-ordinated by EMBRAPA, and includes Research Corporations from the different states of the country. The large number of Breeders' Associations have an important role to play in the supply of animal production.

One way of verifying the importance of animal production in Brazil is to look at the number of animal reproduction companies, the diversity of breeds using artificial insemination, as well as the number of semen doses sold each year. The country has 86 Artificial Insemination Centres recognised by the Ministry of Agriculture, Livestock and Food Supply - MAPA. In 2002, over 7.0 million doses of semen were sold. Due to the success of the *Bos indicus* breeds selected in the country, a huge international demand has opened up, which are looking for Brazilian genetic material. In terms of volume of embryo transfers, Brazil is placed second world-wide, with approximately 82,000 transfers per year. It is estimated that approximately 400 professionals are involved in this market, as well as in improvement of techniques linked to animal reproduction.

The fundamental priorities for the continued success of the conservation programme in Brazil include: (a) characterisation in genetic and phenotypic terms of all naturalised breeds; (b) stimulate the formation of an Ibero-American project to compare Brazilian breeds with those in other Latin-American countries as well as with those from the Iberian Peninsula, which originated them; (c) accelerate the collection and storage of genetic material in the AGB; (d) Insert naturalised breeds into sustainable production systems; (e) determine economic niches for naturalised breeds to increase economic returns for breeders; and (f) use traits inherent to naturalised breeds, such as resistance and rusticity, as priorities in all production systems, to improve animal well-being and environmental sustainability.

As for international co-operation, due to the large quantity of courses in the different areas of Agricultural Sciences, Brazil has the conditions to offer formal training at both undergraduate and postgraduate level to technicians from various countries, especially of Spanish or Portuguese speaking countries. The country could also offer training courses or International consultations, in the areas of conservation of animal genetic resources and animal reproduction, to countries of South and Central America, as well as Africa. Requests for technical visits and research periods at EMBRAPA's Research Centres are common. Each Centre has different aims, and works with one or two specific species.

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CHAPTER 1

EVALUATION OF STATUS OF FARM ANIMAL BIODIVERSITY IN BRAZIL

1.1. COUNTRY PRESENTATION

1.1.1. Geographic Situation. Coordinates. Limits

Brazil is located in South America, between parallel 5°16'20" Latitude North and 33°45'03" Latitude South and meridians 34°47'30" and 73°59'32", west of Greenwich (Figure 1). It is bound on the north by the Atlantic Ocean, French Guyana, Suriname, Guyana, Venezuela and Colombia; to the south by Uruguay, Argentina and Paraguay; to the west by Peru and Bolivia and east by the Atlantic Ocean, where it has several islands, including Fernando de Noronha, Abrolhos and Trindade.

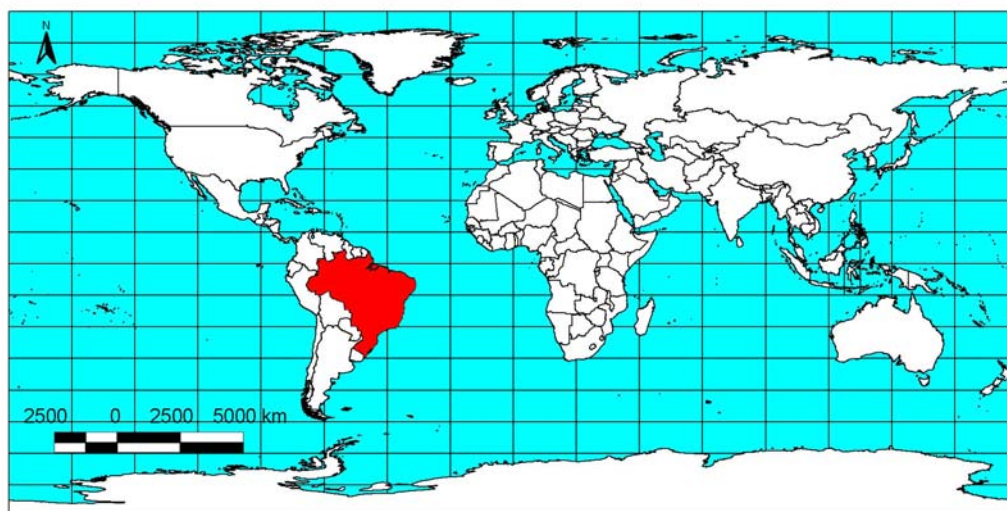


Figure 1 – Geographic localization of Brazil.

1.1.1. Surface

With an area of 8,547,403 km², Brazil is the largest country on the South American continent. Compared with other countries it is only smaller than Russia, Canada, Peoples' Republic of China and United States of America. Distances, as the crow flies, between extreme points are considerable and practically equal: 4,394.7 km North-South and 4,319.4 km East-West. The country has a 23,086 km frontier, of which 7,367 km are with the Atlantic Ocean. Occupation by the settlers began along the coast and therefore most terrestrial frontiers are in areas with low demographic density.

1.1.2. Climate

The Equator and the Tropic of Capricorn both cut Brazil, with most of its territory situated at low latitudes, both to the north and south. Climatic conditions are therefore mainly tropical. The country has ample climatic variation in both tropical and subtropical environments, due to factors such as geographic position, position relative to sea or land mass, altitude, relief and air mass dynamics. The air masses that cause most interference in climatic differences in Brazil are: the Equatorial (Continental and Atlantic), Tropical (Atlantic and Continental) and Atlantic Polar. According to the Köeppen International Classification, dominant climates per region in Brazil are: Northern Region – Tropical rainy (Am, Aw, Aw' and Af); Northeast – Tropical

dry (BSH'); Centre-West – Tropical rainy (Aw); Southeast – Temperate mild dry (Cwa and Cwb) and Southern – Temperate mild subtropical (Cfa and Cfb) (Figure 1A of the Annex).

1.1.3. Regionalization. Biomes. Geographic Regions

Brazil is a privileged country as it has an extensive surface area of continuous lands, which for the most part, are capable of being cultivated. It also has abundant water resources (the largest fresh water reserves on the planet, 8% of world volume), as well as having different biomes, which places it among the countries with most biological diversity. Of the estimated 250 thousand superior plant species worldwide, about 60 thousand are native of Brazil. To facilitate description, animal production systems will be divided by biome. It is important to note that Brazil is divided into five Regions: North, Northeast, Centre-West, Southeast and South, which in general have more than one biome. In Figure 2, the biomes discussed in this Report can be found as well as the localization of the five geographic regions.

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Figure 2 – Localization of Brazilian biomes

1.1.4.1. Brazilian Biomes

The diversity of species of Brazilian flora is due to the particular edapho-climates which cause the formation of types of vegetation in six distinct biomes: Amazon, Cerrado, Caatinga, Atlantic Forest, Southern Fields and Pantanal, described below:

1.1.1.1.1. Amazon

Made up of different eco-regions, the Amazon biome covers 48.1% of the Brazilian territory and represents 1/3 of tropical forests in the world. With reference to wild fauna, it is worthwhile mentioning the quantity of vertebrate and invertebrate species registered in the Brazilian Amazon. In terms of vertebrates, a total of 311 species of mammals; more than 1,000 species of fish; 163 species of amphibians; 550 species of reptiles and more than 1,000 species of birds. For invertebrates, there are thousands of species of butterflies, ants, spiders, wasps, and bees. Of the latter 30,000 species described worldwide, about 4,000 are found in Brazil.

1.1.1.1.2. Cerrado

The Cerrado is a type of tropical savannah, of about 2 million km² in Central Brazil. The most common type is an open formation with low trees and bushes, coexisting with low grassy stratum. Nevertheless, there are other types, varying from clean fields to forest formations. In the last three decades the Cerrado has become an alternative for agricultural expansion in Brazil. The Cerrado is usually associated with relief of the plateau or plain type, with deep soils with a friable texture. These soils tend to be hard and of low natural fertility. In general, this type of vegetation can be found in all Brazilian regions, from clean fields, to a tree savannah, known as Cerradão and rocky fields. These forms, as well gallery and mesophile forests, where the peripheral savannahs of the southeast are found (São Paulo and Paraná), and Amazonian savannahs in the States of Pará, Amazonas, Roraima and Amapá. In relation to vertebrate animals found in the Cerrado, we can highlight the fish with at least 780 species, shared with the Pantanal, 180 species of reptiles, of which 20 are endemic and 113 amphibian species, of which 32 are endemic. About 35% of the total beef cattle herd is concentrated in the Cerrado, in the Centre-West region of the country.

1.1.1.1.3. Caatinga

The Caatinga biome is characterized by xerophytic vegetation, with a varied physiognomy and flora. It occupies an area of approximately 800,000 km² in the semi-arid region of the Brazilian Northeast. It is the only biome that is exclusively national, a large part of its biological patrimony, not found anywhere else in the world. It covers nine states and represents about 11% of national territory. Approximately 50% of the area of the Caatinga is land of sedimentary origin, rich in subterranean water (artesian or semi-artesian). The rivers, for the most part, are intermittent; regional altitude varies from 0 to 600 m; mean temperature varies from 20 to 28°C, while rainfall oscillates between 250 and 1,000 mm/yr, causing elevated hydro-deficits. The Caatinga is highly heterogeneous. Its vegetation is extremely diversified, with 12 distinct physiognomies being recognized. It is made up of small woody species and herbaceous plants, which generally have thorns and are normally deciduous (lose their leaves at the start of the dry season), as well as cacti and bromeliads. The density, frequency and dominance of species are determined by topographic variations, soil type and rainfall. The forage potential of the Caatinga is very rich and diverse, giving herds a highly nutritious diet, which is made up of, in great part, by legumes (herbaceous and woody) and grasses, that produce on average 4,000 kg/ha of phytomass. This is converted into food for goats, sheep, cattle and donkeys.

1.1.1.1.4. Atlantic Forest

The Atlantic Forest biome shows high biodiversity indices, as well as endemism, but it finds itself in a critical situation due to changes in its natural systems. It houses 70% of the Brazilian population as well the largest cities and industrial centres of Brazil. The history of the country is intimately linked to the Atlantic Forest, which is considered one of the most important threatened biomes in the world. Reduced to less than 8% of its original area, it covered more than 1,360,000 km², extending from the Northeast to the extreme south of the country, to the State of Rio Grande do Sul. According to studies carried out by *Conservation International*, of the 25 world *hotspots*, the Brazilian Atlantic Forest occupies the fourth place in amphibian density and in vascular plants. A total of 1,807 species of mammals, birds, reptiles and amphibians occur in this biome, of which 389 are endemic, meaning it holds approximately 7% of all species on the planet.

1.1.1.1.5. Southern Fields

The Southern Fields biome groups all the non-savannah fields in the south of Brazil, reaching the interior of Paraná and Santa Catarina States, amidst the Region of the Mixed Ombrophile Forest (Araucarian Forest), until reaching the southern fields of Rio Grande do Sul State, in the region known as Campanha Gaúcha. Although having an apparently homogeneous physiognomy, the Southern Fields are important because of the abundance of herbaceous species and the various types of fields, making up in some regions, integrated environments with the Araucarian Forest (*Araucaria angustifolia*), a species endemic to the region and known as Paraná Pine. Although it has less biological biodiversity than the other biomes, it concentrates a varied fauna, sharing several species with the Atlantic Forest. It has 102 mammal species (five endemic), 476 birds and 50 fish species. Due to its environmental vocation, cattle rearing is developed as a priority in the region, using breeds of European origin such as Hereford and Aberdeen Angus. Sheep breeding, for wool and meat, is also evident. The edaphoclimatic conditions are favourable, with mild temperatures in winter, which may reach 0°C.

1.1.4.1.6. Pantanal Mato-grossense

Occupying an area of more than 110,000 km², the Pantanal biome is made up of the largest floodplain in the world, and unites a mosaic of different environments. The springs of the Pantanal Mato-grossense are in the savannah domain and its terrestrial biota is closely linked to the Cerrado biome. This vast sedimentary plain is in the basin of the Paraguay River, integrating terrestrial areas of three countries: Brazil, Bolivia and Paraguay. The hydric cycle controls life in the Pantanal. The annual periodic floods in the region are due to pluvial and fluvial water, due to rivers breaking their banks. The annual average rainfall oscillates around 1,100 mm, with two well-defined seasons: rainy, between October and March, and dry, between April and September. The Pantanal flora is made up of species from the Cerrado, Atlantic Forest and Amazon, the first being more evident, occupying sandy areas. More than 10,000 plant species have been catalogued in this biome, including around 200 used in human and animal feeding, as well as for the industry in general. The main economic activity is beef cattle rearing, with a herd of over 4.0 million head, whose composition had significant participation of the Pantaneiro, a naturalised breed which was gradually substituted by the Nellore.

1.1.4.2. **Physiographic Regions of Brazil**

A quick description of each of the five physiographic regions into which Brazil is divided follows: North, Northeast, Centre-west, Southeast and South. Generally each one of these regions has more than one of the biomes described above.

1.1.4.2.1. North Region

Inserted in the Amazonian biome, with small inclusions of the Cerrado, the Northern Region represents almost half of the national territory. In spite of its size, it has only 13.8% of the Brazilian cattle herd, or little more than 23 million head, of which 90% are beef and 10% dairy cattle. This region also has more than one million head of buffalo, or approximately 50% of the national herd.

1.1.4.2.2. Northeast Region

Most of the Northeast region, which is over 1 million km², experiences semi-arid conditions and almost 90% is Caatinga. Mainly Atlantic Forest and Cerrado make up the other 10%. This region has little more than 15% of the national cattle herd, about 25.43 million head, of which 63% are beef cattle. Goat and sheep farming are especially important with, respectively, 93.65% (8.8 million head) and 53% (7.7 million head). The latter is dominated in this region by hair breeds.

1.1.4.2.3. Centre-west Region

This region is in the Cerrado and Pantanal biomes, but also has a small part of the Amazon in the north of Mato Grosso State. This region has a large part of the national cattle herd, almost 35%, over 57 million head of which almost 90% are for meat. The herd is made up of mostly zebu breeds, dominated by the Nelore. Except in areas susceptible to flooding in the Pantanal, these cattle are reared mainly on cultivated pastures, and dominated by the genera *Brachiaria* and *Panicum*. This region is also important for grain production, especially soybean, rice, corn, sunflower and cotton. The perspectives for poultry and pig industries in the region are also promising.

1.1.4.2.4. Southeast Region

Localised mainly in the Atlantic Forest, with part in the Cerrado in Minas Gerais and São Paulo States, the Southeast has the largest urban centres and main industrial, agro-industrial, technological and financial points in the country. It maintains 21.26% of the national cattle herd, or 35.6 million head of which 71.64% are for beef. It concentrates more than 45% of poultry for eggs and meat. The main milk basins are also located in this region, as well as feedlots for beef cattle, the largest milk processing plants and important networks of slaughterhouses, grain stores, and large food processing plants.

1.1.4.2.5. South Region

Situated in the domains of the Atlantic Forest and Southern Fields, the Southern region has approximately 16% of the Brazilian cattle herd, about 26 million head, of which 77.7% are for beef. Pigs and sheep are also important in the region with, respectively, 14.47 million head (42.87%) and 5.24 million head (36.2%). It is the major producer of poultry meat in the country with 4.0 million tonnes (55.8% of national production). Because of its temperate climate, there is a predominance of European breeds, either in purebred herds or industrial crosses. There are abundant native pastures with high nutritional value, with clover and grasses of the *Paspalum* genus. It is also important to note the magnitude and high technological level of the industry installed for processing and industrialization of meats and their derivatives in the region.

1.1.5. Population Data. Urban and Rural Populations

The Federal Republic of Brazil is made up of the Union, the Federal District, States and Townships, all autonomous under the terms of the Federal Constitution of 5th October 1988. The Federal District houses the headquarters of the Federal Government with its three powers:

Executive, Legislative and Judiciary. Brazil is divided into 26 states and 5,507 townships. In 2002, the Brazilian population was estimated as 174,63 million inhabitants, projected for 2003 as approximately 177,0 million. In recent years, there has been a large migration to large urban centres, so that at present approximately 70% of the population live in cities and 30% in rural areas.

1.1.6. Agricultural Sector. GNP. International Market

In 2002, the Gross National Product (GNP) of Brazil was 432.6 billion US dollars, with agriculture contributing with 7.73%, industry with 35.55% and services with 56.72%. The contribution of agriculture has increased in recent years, and the 2003 harvest is expected to be a record, almost 115 millions of tonnes of grains. The main crops are soybean, corn, rice, wheat and beans, which together make up about 95% of the production. In 2002, total Brazilian exports, including manufactured goods, valued US\$ 60.36 billion, with agricultural goods contributing with US\$ 24.86 billions (Table 1), or 41.2% of the total, showing the enormous potential of agribusiness in the Brazilian economy. By the end of 2003, the participation of the agricultural goods on Brazilian exports increased by 23%, to a total of US\$ 30.64 billion.

1.1.7. Animal Production Sector. Animal Inventory. Localization

Brazil, at present, has the largest commercial cattle herd in the world, second only in numbers to India, which, for religious reasons, does not use its herd commercially. The country is rapidly becoming the largest producer and supplier of meat on the planet, not only of beef but also pigs and poultry. Data from Anualpec (2003) are presented, which based on IBGE data, estimated a cattle herd of 167.46 million head (Table 2) for 2003, but other government sources (Conab/Digem/Sufog/Geole), estimate for 2002 and 2003, herds of 176.45 million and 181.50 million head, respectively. The first source was used here due to the greater number of animal species studied and better distribution per region. Table 3 shows the distribution of the cattle herd by aptitude.

Table 2 – Distribution of Brazilian herds, by region – 2003*

Product	Production (tonnes)	Value (US\$ 1,000)
Sugar and alcohol	14,198,872	2,386,572
Cotton and derivatives	317,672	775,005
Coffee and derivatives	1,620,251	1,384,500
Beef	580,965	1,080,322
Poultry meat	1,624,251	1,392,878
Pork	468,524	482,004
Leather and shoes	346,715	2,341,397
Tobacco and derivatives	474,473	1,008,169
Fruits and derivatives	2,094,924	1,335,169
Wood and derivatives	10,399,468	4,269,107
Corn and derivatives	2,767,856	272,715
Soybean and derivatives	30,421,543	6,008,903
Other products	-	1,768,802
T O T A L	-	25,210,357

Source: SECEX - Elaboration: CONAB/DIGEM/SUINF/GEINT

Brazil has the largest herd of buffalo among western countries, with a population of approximately 3.0 million head according to the Brazilian Association of Buffalo Breeders - ABCB. There is, nevertheless, a large discrepancy between this number and that of the IBGE, which gives a population of less than 1.2 million head. Pará State, especially the Island of Marajó, has about 600 thousand head. It is estimated that 85% of the national buffalo herd is for meat production, while

the other 15% is used for milk. In the last 10 years, buffalo rearing has shown an annual growth rate of 12%, showing the increasing interest in breeders for this species.

Table 3 – Distribution of cattle herd, by aptitude – 2002

Species	Region					TOTAL
	North	Northeast	Centre-west	Southeast	South	
Cattle	23,148,485	25,435,902	57,384,515	35,587,216	25,855,971	167,412,089
Buffalo	737,225	82,408	71,796	85,977	156,433	1,133,840
Swine	2,772,677	7,450,214	3,138,259	5,966,898	14,468,243	33,746,291
Sheep	425,782	7,706,443	721,310	389,627	5,245,552	14,488,715
Goats	139,545	8,823,646	94,361	198,658	165,730	9,421,940
Poultry**	2,008,282	12,625,113	7,605,740	45,767,385	30,260,636	98,267,156

Source: IBGE - *Estimates by FNP Consultoria/Anualpec 2003; **Laying and meat hens

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Table 3 – Distribution of cattle herd, by aptitude – 2002

Region	Aptitude		TOTAL
	Dairy	Beef	
North	2,519,974	20,628,512	23,148,486
Northeast	9,316,429	16,119,472	25,435,901
Centre-west	7,013,478	50,371,037	57,384,515
Southeast	10,091,478	25,495,738	35,587,216
South	5,769,294	20,086,676	25,855,970
TOTAL	34,710,653	132,701,435	167,412,089

Among the domestic species, the second largest population is the pig, with 33.75 million head (Table 2), of which 43% are in the South Region, where most of the canning industry is located. This industry is also growing in the Southeast and Centre-west regions, due to large investments in the area. In 2002, 3,901 million tonnes of pork were exported worldwide, led by the European Union, Canada, United States of America and Brazil, which jumped from 12th position to 4th. Brazil exported 476 thousand tonnes, representing 12.2% of the world market, a record for the country.

Although sheep breeding can be found all over the country, the effective population is decreasing. In 1990, the population was about 20 million head, while today the national herd is 14.48 million head (Table 2), having highest concentrations in the Northeast (7.7 million) where hair breeds dominate. The Southern region (5.24 million head) is traditionally dominated by wool sheep, while in the Southeast (389.6 thousand head) and in the Centre-west regions (721.3 thousand head), both wool and hair sheep can be found, the latter dominating.

Poultry breeding is today one of the most vigorous sectors of Brazilian agribusiness. The country ended 2003 as the largest exporter of poultry meat, with 1.62 million tonnes, representing

57.5% of the total meat exported. The main buyers of Brazilian meat are Europe (37.8%), Middle East (30.5%) and Asia (23.3%) of national exportation.

The Brazilian goat herd has approximately 9.4 million head (Table 2). Although these are distributed countrywide, about 90% is concentrated in the Northeast, where they are reared extensively and principally used for meat production.

Brazil has the third largest horse herd in the world, with an estimated population of 5.9 million head in 2003, behind China and Mexico. At present, it is estimated that horse breeding employs directly 500 thousand people. Considering only registered animals, the Manga-Larga Marchador breed has 300 thousand animals, the Quarterhorse has 278 thousand, 197 thousand for the Crioula, 186 thousand for the Manga-Larga, 88 thousand for the Campolina, 80 thousand for the Arab and 30 thousand for the Thoroughbred. According to data from the Brazilian Institute for Geography and Statistics - IBGE, in 2001 (Table 4), the regions with the largest horse herds were the Southeast and Northeast. The South and Centre-west have similar effective populations, while the North region has the smallest horse herd in the country.

Table 4 – Distribution of horses, donkeys and mules.

Region	Horses	Donkeys	Mules
North	592,192	39,876	160,479
Northeast	1,403,297	1,138,847	686,987
Centre-west	1,090,664	12,942	142,469
Southeast	1,634,182	41,997	288,115
South	1,080,720	5,363	67,606
TOTAL	5,801,055	1,239,025	1,345,656

Table 4 shows the number of donkeys and mules (hybrids between horse and ass) in Brazil. According to IBGE data, the number of mules is greater than the number of donkeys. The greatest concentration of both these species is in the Northeast region. Nevertheless, there is a considerable number of mules in the Southeast, maybe because this region has two important donkey breeds, used in the formation of hybrids. Dr. Francisco Peixoto de Lacerda Werneck, wrote in his book “Breeding mules”, in 1945 on the importance of this species for the exploration of Brazil:

“The mule will always be, in Brazil, the pioneering pathfinder of the outback, as he is the first to reach the end of the thorns, carrying the tent, the kitchen and the rations of the explorer or land measurer; it is he who carries on his back the first harvest; he, who, except for the first plough, wakens the raw earth; he who works the rustic press to produce the first brick; he who makes the wooden mills turn to give sugar cane juice used to make common treacle candy and the “sugar of the day”, of common use by the outbackers. Someone will remember that these functions can be carried out by the ox, but, there is always the mule, because the former depends on the latter to lead him.”

1.2. MAIN ANIMAL PRODUCTION SYSTEMS IN THE COUNTRY

1.2.1. Characterisation of Products of Animal Origin Available in the Country, by Species. External Market

1.2.1.1. Meat

Generally, meat production in Brazil from various animal species has increased. The main meats are beef, pork and poultry.

1.2.1.1.1. Cattle

The production of beef, from 1994 to 2002, grew at an annual rate of 2.15%, from 6.1 million tonnes in 1994 to 7.14 million in 2002. Imports, which were 86 thousand tonnes in 1994, reached 139 thousand tonnes in 1996, and from there decreased rapidly, maintaining an annual average of 66 thousand tonnes until 2002. Exports grew at an average annual rate of 18.4%, from 376 thousand tonnes in 1994 to 929 thousand tonnes in 2002. From the performance registered in the first six months of 2003, projections indicated that Brazil would become world leader, selling abroad an estimated 1.2 million tonnes of beef. At the end of the year, total sales reached 1.4 million tonnes (US\$ 1.5 billion), confirming Brazil as world leader in beef exports. With the outbreak of Bovine Spongiform Encephalitis (BSE or Mad Cow Disease) in the United States of America at the end of 2003, the future growth in beef exports from Brazil is foreseen.

1.2.1.1.2. Pigs

The Brazilian production of pork grew significantly at an annual rate of 7.48%, from 1.52 million tonnes in 1994 to 2.43 million tonnes in 2002. In 2002 there was a growth of 6%, representing almost the double of the world average. This result is due to mainly exports. The country is 4th in the world ranking, behind China, European Union and United States. As such, Brazil exported 476 thousand tonnes in 2002 (which represents 481.5 million dollars), behind the European Union, Canada and United States. The quantity exported in 2002 is 1,060% superior to that exported in 1992 (Table 6). The slaughter of pigs is inspected in general by the Federal Government (56.9%), from where export products originate, with the rest inspected at state and township level (43.1%). The on-farm slaughter is not estimated, where the consumption is by the family of the owner. This happens more often in the North and Northeastern States. Imports have remained constant throughout the period examined, with an annual average of 8.17 thousand tonnes, which represents less than 0.3% of the total production in 2002.

1.2.1.1.3. Sheep

Official Brazilian statistics on sheep slaughter and respective meat production have not been produced by the IBGE since 1997. Therefore, in this Report data will be presented from 1988 to 1996. From 1988 to 1993, sheep meat production grew slowly, from 12.2 thousand tonnes in 1989 to 12.8 thousand tonnes in 1993. From 1994, this showed a slow fall, remaining around 11.0 thousand tonnes. In the period considered, the number of animals slaughtered increased from 711.2 thousand head in 1988, to a maximum of 926,8 thousand in 1993, falling thereafter to about 700 thousand in 1996. The mean carcass weight varied around 14.0 kg. In relation to imports, the main supplier is Uruguay, who in 2000 and 2001, exported to Brazil, respectively, 3.1 thousand tonnes and 1.8 thousand tonnes of de-boned and on-the-bone sheep meat (Secex/MDIC 2003). Brazil has no tradition of exportation of sheep meat.

1.2.1.1.4. Goats

Recent statistics are also lacking for goat meat, therefore the period from 1988 to 1996 will be considered. National goat meat production practically grew only from 1988 to 1991, passing from 7.4 thousand tonnes (carcass equivalent) in 1988 to 11.4 thousand tonnes in 1991, remaining stable until 1993. From thereon, it started to decline, reaching 8.8 thousand tonnes in 1996. Slaughters totalled 509.5 thousand head in 1988, reaching a maximum 804 thousand head in 1992 and fell again in the following years, reaching 627.4 thousand head in 1996. Mean carcass weight was about 14 kg. Brazil has no import or export tradition for goat meat. European businessmen have shown interest in investing in the Brazilian semi-arid region,

producing animals for importing special cuts from weaned kids to the Italian and French markets.

1.2.1.1.5. Chickens

Brazilian production of poultry meat has grown expressively at a mean annual rate of 14.80%, from 3.41 million tonnes in 1994 to 7.45 million tonnes in 2002. Along the time frame (1994-2002), national production fully met internal demand and the rest was exported. Exports grew at an annual mean rate of 29.08%, from 480.9 thousand tonnes in 1994 to 1.6 million tonnes in 2002. At the end of 2003, this figure reached approximately 2.0 million tonnes embarked to 120 countries (US\$ 1.9 billion), making Brazil the world's largest exporter of this product.

1.2.1.1.6. Horses

Although horse meat is produced in Brazil, there is no consumer tradition for this product; therefore almost all production is for export. Official statistics of the IBGE on slaughter of donkeys, horses and mules have not been published since 1997. A high growth rate is seen in the number of animals slaughtered between 1988 and 1993, with a mean annual rate of 46.6%, increasing from 49,682 head in 1988 to 165,691 head in 1993. From thereon a decrease was seen, reaching 109,082 head in 1996.

1.2.1.1.7. Buffaloes

In Brazil, buffaloes are used mainly for meat production, with the North, South and Centre-west regions being the main producers. It is estimated that more than 600 thousand head are slaughtered yearly, totalling more than 150 thousand tonnes of meat. There are no registers of exports of this meat, as it is all consumed in the country.

1.2.1.2. **Milk**

Almost all the milk sold in Brazil is of cattle origin. The rest is from buffaloes and goats, but there are few statistics available for these two species.

1.2.1.2.1. Cattle

Milk production from cattle in Brazil has grown significantly in the last decade. Total production, which was 14.48 million tonnes in 1990, reached 20.98 million tonnes in 2002, an average annual growth rate of 3.4%. The number of cows milked decreased from 19.07 million head in 1990, to 18.51 million head in 2002, a reduction of approximately 3%. The increase mentioned above means that production/cow/year increased from 760 litres, in 1990, to 1,138 litres in 2002, an increase of 5% per year. Presently, the imports of milk and derivatives represent 1% of the total country production. In 2001 and 2002, imports were, respectively, 141.2 thousand tonnes (US\$ 178.61 million) and 212.9 thousand tonnes (US\$245.93 million), imported mainly from Argentina and Uruguay. Although relatively insignificant, in 2001 and 2002 Brazilian exports of milk and derivatives were, respectively, 19.37 thousand tonnes (US\$ 25.03 million) and 40.12 thousand tonnes (US\$ 40.25 million).

1.2.1.2.2. Goats

The Brazilian goat herd is the 11th largest in the world but produced only 1.3% of the milk. The annual Brazilian production is about 6.44 million litres, with São Paulo State being the largest producer, processing approximately 2.1 million litres/year, followed by Rio de Janeiro State with 1.94 million litres/year and Rio Grande do Norte State with 1.8 million litres/year. Mato Grosso do Sul and Rio Grande do Sul States produce the other 600 thousand litres.

1.2.1.2.3. Buffaloes

National buffalo milk production is concentrated mainly in the Southeast region, where it has shown a significant increase in recent years, explained by the demand for the product. The main use for this milk is the production of mozzarella cheese, based on the Italian method, bought by sophisticated restaurants, in large urban centres. Estimates show that in the metropolitan region of São Paulo, the monthly demand for this product is 30 tonnes while the offer is only 3 tonnes, showing the growth potential in the region. It is believed that there are about 450 thousand milk buffaloes in Brazil, which produce on average 4 litres of milk/day, generating an annual production of 396 million litres. On the other hand, on the Island of Marajó there exists a milk production potential of 50 thousand litres/day, which has attracted the attention of groups interested in installing production plants in the region.

1.2.1.3. Eggs

The production of eggs in the period from 1994 to 2002, grew at a mean annual rate of 2.62%, from 1,122 million dozen from 1994 to 1,362 million dozen in 2002. Brazil is an egg exporter, but not importer. In 2001 and 2002 the quantities exported were, respectively, 7.08 thousand tonnes (US\$ 14.08 million) and 5.38 thousand tonnes (US\$ 9.61 million).

1.2.1.4. Wool

Almost all Brazilian wool production (98%) is from the South region. It reached its maximum, both in terms of economic importance and total volume produced) at the end of the 1980s. In the following decade, it started to decrease, from approximately 30 thousand tonnes in 1990 to less than half (13.4 thousand tonnes) in 1999. Brazilian imports of wool and fine hairs were, in 2002, 751 tonnes, with a value of US\$ 7.67 million. From January to July 2003 these reached 529 tonnes, costing US\$ 4.94 million. Exports in 2001 and 2002 totalled 9.48 thousand tonnes (US\$ 24.43 million) and 7.47 thousand tonnes (US\$ 21.95 million) respectively, giving a positive commercial balance.

1.2.1.5. Hides

The Brazilian production of processed cattle hides showed, between 1994 and 1999, a mean annual growth of 4.2%, evolving from little more than 21 million pieces in 1994 to approximately 25.5 million units in 1999. After this period, there was an accumulated decrease of 9% in the two following years, with the production of 23.25 million pieces in 2001. Imports, which in 2000 were 21.49 thousand tonnes (US\$ 159.8 million) decreased to 13.72 thousand tonnes in 2001 and 15.12 thousand tonnes (US\$ 68 million) in 2002. Exports, represented by salted hides, "wet blue" leather, sole, cured leather and others, evolved from 197.89 thousand tonnes (US\$ 585.6 million) in 1999 to 230.96 thousand tonnes (US\$ 928.27 million) in 2002, a mean yearly growth rate of 5.56%. In the same period, exports showed highly significant surpluses. In 2002, the Northeast region processed 8 million sheep and goat hides, with tanneries working at only 60% of installed capacity, indicating great growth potential. In relation to commercial balance, in 2001 Brazil exported the equivalent of US\$ 336.61 million in sheepskins and imported US\$ 448.08 million, giving a negative commercial balance of US\$ 111.47 million, while exports of goat skins were US\$ 28.58 million and imports were US\$ 52.5 million, representing a deficit of US\$ 23.72 million (FAO, 2003).

1.2.2. Characteristics of Consumption and Use of Animal Products, by Species.

1.2.2.1. Meat

Beef is the preferred meat of Brazilian consumers, but due to the elevated price, its consumption has remained practically constant along the years, while chicken meat almost

doubled in the last eight years. In decreasing order of consumption, come pork, sheep and lastly goat meat.

1.2.2.1.1. Cattle

The consumption *per capita* of beef in the last ten years (1992-2002) has been practically stable, decreasing from 38.9 to 38.0 kg/inhabitant/yr, with a small bias for less, which should increase in the coming years as Brazil increases its exports and competition from other meats, as found in futures research. In general beef is consumed fresh or chilled.

1.2.2.1.2. Pigs

Between 1992 and 2002, pork meat consumption *per capita*, grew on average 7.4% per year, from 7.9 kg/inhabitant/yr. to 13.8 kg/inhabitant/yr. Of the total pork produced in 2002, 84% was destined for internal consumption and 16% exported. Of the total consumed, 65% was fresh meat and industrialized derivatives (ham, canned goods, pre-prepared ready to eat or semi-ready to eat) and 35% was in the form of frozen meats, salted products, fats and others (smoked). Although the *per capita* consumption of pork meat is relatively low, Brazil occupies 6th position worldwide in volume of consumption. No official data is available on the consumption of pork meat from naturalised breeds in the country. It is estimated, in some states, where the effective population of these breeds is greater, consumption reaches 30% of the total meat eaten.

1.2.2.1.3. Sheep

Although the consumption *per capita* is still extremely low (less than 1.0 kg/inhabitant/yr), the meat from young animals has widespread acceptance, especially in large urban centres. In Brazil, in general, the largest consumption of sheep meat is concentrated in rural areas. There are perspectives for an increase in production and consumption of this meat, due to support from the Federal Government for family agriculture, the segment of the economy which contributes most for sheep production.

1.2.2.1.4. Goats

Similar to sheep meat, goat meat also shows low levels of consumption. Research carried out in large urban centres in the Northeast region, the main producer, showed that *per capita* consumption of this meat is just 0.375 kg/inhabitant/yr. The government programme of support for family agriculture, which is responsible for almost all goat production, will certainly cause increase in production and consumption. International interests for the product also bring growth perspectives to the sector.

1.2.2.1.5. Chickens

The consumption of poultry meat in Brazil has increased significantly in the last ten years, from 16.8 kg/inhabitant/yr in 1992 to 33.8 kg/inhabitant/yr, which represents an average annual growth of 10.1% per year. At the end of 2003 Brazil became the world's largest exporter of poultry met, as well as being one of the major producers and consumers of this product.

1.2.2.1.6. Buffaloes

There are no official statistics on buffalo meat consumption in the country. Informal data shows that 10 to 15% of meat eaten in Belém, capital of Pará State, is of buffalo origin. This percentage increases to 90% in the cities of Soure and Salvaterra, on Marajó Island, in the same state, where there is a huge concentration of buffalo herds.

1.2.2.2. Milk

1.2.2.2.1. Cattle

In the last decade, the growth of 3.4% per year in milk production in Brazil was higher than the growth in human population (1.44% per year). There was however a growth in production *per capita*, which may cause an eventual excess in production. The *per capita* liquid milk consumption varied from 49.24 kg/inhabitant/yr in 1992 to 80.18 kg/inhabitant/yr in 1999, a linear increase in this period of about 7.85% per year. Powdered milk consumption, *per capita*, was 0.45 kg/inhabitant/yr, in 1992, increasing to 0.79 in 1996 and decreasing to 0.63 in 1999. About 63% of milk consumed in the country is pasteurised, inspected and distributed in the formal marketplace. The informal market sells 23%, while 14% is consumed on-farm.

1.2.2.2.2. Goats

As mentioned above, there are almost no statistics on goat milk production in Brazil. In the Northeast region, which concentrates the majority of the goat herd, this milk is considered a secondary component, with little commercial expression. It is used almost exclusively domestically on-farm. Although lacking statistics, it is known that the market is sub-divided into liquid milk (93%), powdered milk (4%) and cheeses, sweets and yoghurts (3%).

1.2.2.2.3. Buffaloes

In the same way as for buffalo meat in Brazil, no statistics are available for milk consumption for this species, or how this product is consumed or varies according to the different regions of the country. On Marajó Island, for example, most of the milk produced is transformed into a type of homemade cheese, known as “requeijão do Marajó”, sold mainly in Belém, the state capital. In the Southeast region, almost all buffalo milk is destined to Italian type mozzarella production. In September 2002, the Brazilian Association of Buffalo Breeders - ABCB created a seal of purity, registered in the Ministry of Agriculture, Livestock and Food Supply - MAPA, which is given to milk industries that use buffalo milk as prime material. As well as protecting the product against fraud, it guarantees the consumer the origin of this milk. Before mozzarella fabrication began in Brazil, a cheese made from cow milk was, erroneously, called mozzarella. With the purity seal mentioned, only cheese made from buffalo milk will receive this name.

1.2.2.3. Eggs

The *per capita* consumption of eggs in Brazil grew, in the last ten years, at an average annual rate of 4.77%, from 88 units/inhabitant/yr, in 1992, to 130 units/inhabitant/yr in 2002. This growth shows that the poultry farmer has put more emphasis on meat than egg production.

1.2.3. Production Systems, by Product and Species

Due to its territorial characteristics, Brazilian animal production is practiced in an extensive manner for cattle, sheep and goats, using almost exclusively pastures, both cultivated and native. Nevertheless, pig and poultry farming are practiced intensively, using balanced rations, which use a huge volume of grain, especially corn and soybean, the latter used in the form of meal. In this way, the country is in a privileged position, as it is the world's 2nd largest producer of soybean, with 41.92 million tonnes in 2002 (Table 5), behind the United States. It is also the 3rd largest producer of corn, with 35.28 million tonnes collected in 2002, behind the United States and China. Brazil is at present the Latin American leader in the production of balanced feedstuffs, with 41.59 million tonnes (48.35% of the total). This represents almost double the production of Mexico, which is placed second. About 30% of corn production is destined for pig production and 49% for poultry.

Table 5 – National Production of grains used in animal rations (million tonnes)

Ingredient	Production	
	2002	2003
Corn	35.28	42.76
Soybean	41.92	50.33

Source: CONAB

1.2.3.1. Meat

1.2.3.1.1. Cattle

Beef cattle production in Brazil is based, predominantly, on extensive production systems, on cultivated pastures. This production includes the phases of rearing, growth and finishing or fattening. The first phase is related to reproduction, through natural crossing or artificial insemination, and ends at calf weaning, between six and eight months of age. The growth phase extends to finishing. Depending on the region there are farmers who have animals in all three phases. In the Centre-west, North and Northeast regions, as well as in part of the Southeast region, extensive systems are more frequently found. In the Pantanal, lower Amazon, Marajó Island (largest river island in the world), southern fields and Caatinga, in the Brazilian semi-arid region, farmers use more native pastures in extensive production systems.

It is estimated that at present in Brazil, depending on the source consulted, there are between 105 million and 115 million hectares of cultivated pastures, with *Brachiaria* species leading the list of the forage plants most used, with almost 95 million hectares. Of this total, 63% are cultivated with *B. brizantha*, 26% with *B. decumbens* and the remaining 11% with other grass species. According to the Agricultural Census of the IBGE, in 1996 there were in Brazil, approximately 100 million hectares of cultivated pastures and 78 million hectares of native pastures.

Cattle finishing for slaughter in Brazil follows one of three different processes: (a) feedlot, which consists of the animals staying for a period of about 100 days, in a regime of intensive protein, energy and mineral supplementation, based on concentrates and forage, with mean weight gains of over 1,0 kg/day; (b) semi-feedlot, which consists of grazing allied with supplementation of over 0.5 kg/head/day of concentrate; and (c) fattening with rye grass, oats, pearl millet and clover pastures, carried out in the Southern region. Another alternative, which is found to be efficient and sustainable, has been carried out in the semi-arid region of the Brazilian northeast for beef cattle production: an integrated system called CBL (Caatinga + Buffel grass + Leucaena). In the traditional system (only native pasture), cattle are slaughtered at over six years of age while in the CBL system, the slaughter occurs at three years of age.

In 2001 and 2002, 1.83 and 1.91 million cattle were confined, respectively, for slaughter in Brazil. In 2002, the Centre-west region had 39.2% and the Southeast region 35.9% of the total. This production system corresponds to about 5% of the total of slaughtered animals in the country.

As Brazilian beef production is fundamentally obtained from herds fed at pasture, the introduction of forage grasses of the *Brachiaria* genus was of extreme importance, in the last 30 years. These occupy huge territorial extensions (approximately 90 million hectares) in the Centre-west, Southeast and North regions, in the Cerrado and in the Amazon Forest with soils of low natural fertility. Among the grasses of this genus, the most important were *Brachiaria brizantha* cv. Marandu, for its high production (6 to 8 tonnes DM/ha./yr., with 8 to 10% gross protein), medium demands for nutrients and good tolerance for spittlebugs (*Deois flavopicta* and *D. incompleta*). In soils of medium to high natural fertility, or those that have been corrected, pastures can be cultivated with high nutritive value, using grass species of the genus *Panicum* (*Panicum maximum*), using rotational pastures, with a high level of inputs and advanced technology. For the edaphoclimatic conditions of the semi-arid Northeast, the solution is the use of forage species, which adapt and produce adequately in that environment. The buffel grass (*Cenchrus ciliaris*) can be highlighted, which is much used in the formation of pastures in the region, and “Protein Banks”, small isolated areas, cultivated with shrub legumes, to which animals have limited access at predetermined times of the day. The most used species for the Protein Banks are *Leucaena leucocephala*, *Gliricidia sepium* and *Prosopis juliflora*.

Brazil has one of the largest commercial zebu herds on the planet, with the Nellore breed being dominant, which has about 85% of all pedigree cattle registers in the country. It has high genetic and production levels, after over half a century of selection. The cross between the Gyr and Holstein breeds resulted in a national dual-purpose breed (meat and milk) called Girolando, which has been a big success. The third zebu breed in importance is the Guzarat. In the Southern Fields biome, with its subtropical climate, European breeds such as Hereford, Aberdeen Angus, Charolais, Chianina and Simmental are dominant. The number of animals slaughtered in the Southern region is about 17% of the total. Therefore, it is possible to conclude that almost 83% of national beef production is from zebu breeds and their crosses.

1.2.3.1.2. Pigs

Brazilian pig farming is based mainly on intensive production systems with high levels of technology, where breeds of high genetic value, specialized in meat production are used. These are defined by their precocity, carcass production, prolificacy, as well as high feed conversion indices. In this context, the most efficient reproduction, feeding, management, health and hygiene are used, helped by the high level of inputs used. The breeding systems represent more than 90% of the production and use mainly F_1 females of white breeds such as Landrace and Large White. These are crossed with males of Duroc, Pietrain and Large White breeds. Crossbred animals, imported from England and United States, contributed for the first step of Brazil in the development of pig farming, keeping its influence until the middle of the 1960s. With the campaign for the production of the lean type pig, these breeds were substituted by genotypes that are dominant today. The former are considered extinct in Brazil in the present day.

Pigs produced to meet the demand of the slaughterhouses are fed, basically, with rations based on corn and soybean meal, complemented with a vitamin and mineral nucleus. These rations are elaborated for each phase of reproduction and production. Depending on the region, alternative energetic and protein rations are used in substitution of corn and soybean meal. Subsistence pig farming as well as that for the local sale of extra animals, receive varied ration, based on sources produced on farm, as well as leftovers. No care is taken in balancing the ration, much less meeting nutritional requirements.

Pigs described as naturalised types guaranteed the maintenance of Brazilian families for centuries, but were substituted by specialised meat production breeds. Although health

questions were alleged, due to high fat and cholesterol levels, the substitution was commercial, since, in intensive systems, a pig of an industrial breed is more productive and precocious than of a naturalised one. Additionally, selection practiced by breeders before the advent of large canning industries, was based on the production of animals of greater capacity to produce lard. At present, naturalised breeds are confined to small rural properties with no control of breeding or selection process. These are destined for family subsistence and demand of local markets. Racial purity is a worrying factor as it is not uncommon for crossbreeding to be carried out, mischaracterizing phenotypic particularities of racial groups. Due to this, it is important to organize regional *in situ* preservation programmes, for these breeds, through census, registration and monitoring, before they are made extinct.

The supply for main slaughter industries is carried out through integration systems ($\pm 90\%$ of the demand), where the industry supplies genetic material, nuclei, concentrates or rations and technical assistance. The farmer is responsible for the breeding and rearing *per se*. The integration of industry/farmer is carried out at several levels, or: (a) Complete Cycle Production (CC), where the same farmer is responsible for all stages of production; (b) Piglet Production Unit (PPU), where the farmer rears the piglets to final crèche phase and gives them up to ± 22 kg live weight; (c) Finishing Unit (FU), where the farmer receives piglets from a PPU and rears them to slaughter weight; (d) Partner System, where the farmer does the same job as the FU, but receives from the industry piglets and all inputs needed for rearing, receiving in return, after delivery of the animals for slaughter, a value which varies according to feed conversion of the group and mortality level.

Table 6 – Evolution of Brazilian pork exports.

Year	Volume (1,000 tonnes)	Value (million US\$)	Mean Value (US\$ 1,000/ton.)
1992	44.48	74.42	1.67
1993	34.77	61.98	1.78
1994	32.32	57.79	1.79
1995	36.46	91.65	2.51
1996	64.36	130.09	2.02
1997	63.83	148.05	2.32
1998	81.57	153.80	1.89
1999	87.29	122.75	1.41
2000	127.88	171.85	1.34
2001	265.17	358.97	1.35
2002	475.86	481.43	1.01

Source: ABIPECS

1.2.3.1.3. Sheep

Many sheep breeds are reared in Brazil, both imported exotic and adapted national breeds, as well as ecotypes maintained for subsistence of rural populations. Each breed presents distinct economic aptitudes, but all are reared for meat production, and afterwards hides. Sheep breeds can present more than one aptitude. Table 7 presents a list of the principal sheep breeds reared in the country and their aptitudes. For each breed, the aptitudes received a score, where score 1 was given for the priority aptitude and score 3 for aptitude of lowest priority. The Brazilian production of sheep meat is from herds reared exclusively at pasture in small to medium farms where, in most cases, the family work force is fundamental for maintenance of the system. It is characterised by extensive production, where the entrance of inputs is very restricted. Native pastures in both the South and Northeast regions are the feeding basis for these herds.

In the Southern region, where edaphoclimatic conditions are subtropical, animals of woolled breeds of European and Australian origin are reared in fields rich in herbaceous species of

forage plants of temperate climate. These are dominated by the bahia grass (*Paspalum notatum*) or carpet grass (*Axonopus affinis*) and hybrids of the genus *Stipa* (needle grass) and *Bromus* (brome grass), as well as legumes such as field clover (*Trifolium polymorphum*), carretilha medic (*Medicago polymorpha*) and desmodium (*Desmodium incanum*). Depending on the physiographic region, soil fertility, forage availability in terms of dry matter can vary between a minimum of 2,500 kg/DM/ha to a maximum of 6,700 kg/DM/ha.

Table 7 – Sheep breeds reared in Brazil, by aptitude.

BREED		APTITUDE			
		Meat	Skin	Wool	Milk
Exotic	Australian Merino	2	3	1	
	Ideal	2	3	1	
	Hampshire Down	1	3	3	
	Suffolk	1	3	3	
	Texel	1	3	2	
	Île de France	1	3	2	
	Dorper	1	2		
	Poll Dorset	1	3	2	
	Polypay	1	3	1	1
	Lacaune	2	3	3*	1
	Karakul	2	1	1*	
	Corriedale	1	2	1	
	Romney Marsh	1	2	1	
	Border Leicester	1	2	1**	
	Naturalised				
	Criolla Lanada	1	1	1*	
	Brazilian Somali	1	1		
	Morada Nova	1	1		
	Santa Inês	1	1		
	Cariri	1	1		
	Fat tail	1	2		
	Bergamasca	1	3	3	1
	Damara	1	1		
	Sabugi	1			
	Angora	1	1	2	
	Black Belly	1	1		

1 = Main aptitude; 1* = Naturally coloured wool, of high interest for craft use, no industrial demand;

1** = Shiny and very soft wool; of high interest for craft industry and industrial demand for carpets;

3* = Wool without craft or industrial interest due to strand length.

In the Northeast region, in the tropic semiarid, xerophytic species of a shrub, subshrub or creeping size represent the forage support for hair breeds. Among these species can be seen: (a) trees - angico (*Anadenanthera macrocarpa* Benth), catiguêira (*Caesalpinia pyramidalis* Tul.), mororó (*Bauhinia* sp.), sabiá (*Mimosa caesalpinifolia* Bent) and juazeiro (*Zizyphus joazeiro* Mart.); (b) shrubs and subshrubs – black jurema (*Mimosa tenuiflora* (Wild) Poiré), and zornia (*Zornia* spp.); (c) lianas and creepers - mucunas (*Stylobium* sp.) and blue pea (*Clitoria* sp.). The support capacity in this system varies from 1 to 1.5 ha/head, characterized by a type of ultra-extensive exploration. To reduce the exclusive dependence on native pastures and increase productivity of the herd for short periods farmers with more resources are introducing exotic grasses and legumes in cultivated pastures. The species used include buffel grass (*Cenchrus ciliaris*), leucaena (*Leucaena leucocephala*), blue pea, gliricidia (*Gliricidia sepium*) and pigeon pea (*Cajanus cajan*).

In the Northeast outback, herds are made up of native animals, with no defined breed or by crossbred animals from uncontrolled crossbreeding with rams of different levels of

crossbreeding or even purebreds. There are breeders who are dedicated to rearing defined breeds and selling of improved and selected animals for reproduction. In the rainy season, animals are fed exclusively on native pastures and, in some cases, native pastures improved by clearing (control of woody tree and shrub species with no forage value, to increase the participation of the grass and creeping legume herbaceous extract). In the dry season, besides these, there are the remains of crops. In some cases, animals receive chopped green grass, disintegrated corn grain or other feeds. Mineral supplementation is restricted to irregular supply of common salt. Some productivity indices include: lambing rate 70-80%; twin lambings 30-35%, slaughter age 18-24 months and off-take 35-36%.

In more privileged edaphoclimatic conditions in the Northeast such as the Atlantic Forest zone and agreste (intermediate zone between the Atlantic Forest and Caatinga) predominates the semi-intensive rearing system, where farmers have herds of defined breed characteristics fed in cultivated pastures, hay, silage as well as permanent mineral mixture. In this system, artificial insemination and, in some cases, embryo transfer are used. Under these conditions, productivity indices are as follows: lambing rate 80-90%, twin lambings 30-40%, slaughter age 16-18 months and off-take 42-43%.

In the Southeast region, an intensive system predominates, where animals are confined and fed chopped green forage and concentrates. In the North and Centre-west regions there is a noted tendency towards increase in sheep production, where these are fed exclusively on cultivated pastures.

1.2.3.1.4. Goats

National goat farming is concentrated almost fully in the semi-arid region of the Brazilian Northeast. The 8.82 million head herd represents almost 94% of the total effective population. The dominant production system is extensive, using native pastures with a support capacity varying from 1 to 1.5 ha/head. The similarity between sheep and goat production systems in the Northeast region is very large. Forage support and management techniques are identical. The main challenge to its development is the production of feed. Techniques for the manipulation of Caatinga vegetation accompanied by conservation practices of natural resources have increased the availability of forage in 80%, without large investments. One of them is cutting, which consists of cut of aerial part of the plants at a height of 40 cm from soil, so that the rebirth is out of reach of the animals. Other practices used are clearing (described above in item on sheep) and enrichment with native and/or exotic forage species adapted to semi-arid conditions, aiming to increase forage production and consequently animal production. One alternative for strategic supplementation, in periods of lower forage availability, is manissoba (*Manihot pseudoglaziovii*) hay. This is a native species, which can be cultivated systematically and used in combination with other fibres and concentrates. Some production indicators for goat production show that 80% of kiddings occur every 8 months or 120% per year, while 40% of kiddings are twins. The off-take is 20 to 35% per year and mortality is 3% in adult animals and 10% in animals to one year of age

1.2.3.1.5. Chickens

Although Brazilian poultry production for meat is one of the most developed in the world, there exists a subsistence poultry production where hens hatch their eggs naturally; receiving only daily feed supplementation with grain, ration and vegetables. These animals have low growth rate and varied coloration/multicoloured. Most males are slaughtered after six months of age and females are usually maintained for egg and chicken production.

In industrial exploration, between 1994 and 2002 production increased from 3,411 thousand tonnes to 7,449 thousand tonnes, which represents a growth of 118% (Table 8). In the same

table, it is shown that the evolution of meat chickens between 1998 and 2002, presented a growth of 34% in this four-year period. The technological level used is one of the more advanced in the world, from the use of specialized more productive breeds, precocious and high feed conversion to more efficient production systems in terms of feeding, management, installations, hygiene and sanitary care.

The historic trajectory of poultry production in Brazil covers numerous introductions of exotic breeds of American, European and Asiatic origin. In the segment of industrial meat chicken production there are eleven commercial trademarks (Table 9A of the Annex) and four commercial marks of colonial meat chickens. It is important to note that these data refer to the South and Southeast regions of the country, as there may be breeders in the other regions of the country that were not localized in time to include in this report.

Table 8 - Evolution of aviculture in Brazil.

CATEGORY	1994	1998	2002
Production of meat (thousand tonnes)	3,411	4,854	7,449
Internal consumption (thousand tonnes)	2,930	4,241	5,849
Exportation (thousand tonnes)	481	612	1,600
Meat hens (thousand head)	-	25,058	30,499
Housing for meat young chicks (1,000 head)	-	2,849,336	3,816,968

Source: ANUALPEC, 2003

1.2.3.1.6. Buffaloes

At present buffalo farming is carried out all over the country, where in the North, South and Centre-west regions the farming is based on meat production, while in the Southeast region it is based on milk production. The main breeds are of Asian origin, including Jaffarabadi, Murrah and Carabao, the latter classified as swamp buffalo. As well as these, there is a fourth breed, the Mediterranean, of European origin. The buffalo production systems used in Brazil vary from one based exclusively on native pastures, used in the Amazon (Lower-Amazon and Marajó Island) to rotational pastures with exotic forage species, practiced in the Southeast, South and Centre-west regions. Presently the Southeast region is producing baby buffalo, a system where the animals are slaughtered at about 18 months, weighing at least 400 kg. A similar system exists on some properties in Pará State, where buffaloes reared in an intensive system and slaughtered at 18 months, are also called baby buffaloes. More recently, a large company, which owns several meat boutiques in the Southeast region of the country, started to produce buffalo veal, where animals are slaughtered up to four months of age, and fed exclusively with milk, which produces a differentiated meat and greater added value.

1.2.3.2. **Milk**

1.2.3.2.1. Cattle

The significant increase in productivity that happened in the last decade reflects structural changes verified in production systems that answer for the greater part of the national production. Greater commercial openings, deregulation of milk market, decrease in inflation and mainly, the use of technological innovations generated by agricultural research, were

factors, which contributed to structural changes that occurred in this period, allowing for an improvement in productivity. Changes in the sources of growth in production collaborated to change relative participations of diverse groups of farmers in the total production of milk. In 1990, small farmers, producing less than 50 litres/day, were responsible for 21% of the milk production and in 2000, for only 2%. At the other extreme, large farmers, with production above 500 litres/day, were responsible, in 1990, for 10% of total production and in 2000, for 60%. The greater participation in productivity, as a source of growth in production, indicates an increase in specialized systems of milk production, which have greater elasticity in the supply. According to research, systems of zebu cattle have 0.43 in elasticity of offer, crossbred cattle 0.65 and Holstein 1.47. Milk production in Brazil is mostly concentrated (80% national production) on farms with an area greater than ten hectares and smaller than 500 hectares. The farms with an area smaller than 20 hectares are responsible for 18.6% of national milk production, which makes it clear the importance of small farmers in the milk production scenario in Brazil. Another important structural trait in milk production is that 66.5% of milk production comes from farms whose main activity is animal production and about 21.3% from farms with mixed activity, animal production and crops. Another important aspect refers to the production in accordance with the type of herd. About 75% of the production comes from herds whose main aim is milk production, while the other 25% come from herds working with breeding, growing and fattening cattle.

In systems of medium and high inputs, the specialised European breeds are most used, with predomination of Holstein breed and, on a lesser scale, Brown Swiss and Jersey. The numbers of Guernsey and Simmental, milk type, breeds are inexpressive. It is estimated that about 5% of a total of almost 13 million cows milked are on farms whose main aim is milk production, which is the equivalent of almost 630 thousand cows. On the other extreme are more extensive systems, where milk zebu breeds predominate, including Gyr, Guzarat and, on a lesser scale, Red Sindhi. This latter group represents only about 0.15% of the cows being milked, approximately 19 thousand cows. Crossbred animals, of various blood groups, from crossing different European and zebu breeds, correspond to about 95% of the number of cows milked in the country, almost 12 million head. In tropical and subtropical regions of the country, the Holstein x Gyr and Holstein x Guzarat, on a smaller scale, are used in semi-intensive production systems.

1.2.3.2.2. Goats

In the Northeast Region, generally, goat milk is produced in non-specialised herds, at the family agriculture level, in less favoured rural communities, which have this type of farming as their main source of subsistence. Although the Northeast region has the greatest number of goats, the Southeast region has the largest goat herd of breeds specialised in milk production. As milk is the main product of goat farming in the Southeast, there is a predominance of an intensive system, where installations frequently include raised goat shed with slats, mechanised milking parlour, cold rooms and pasteurisers. Each year the production of this type of milk increases due to the demand for specialised milk products for making goat cheese, similar to those produced in France, for a sophisticated market in large consumer centres.

1.2.3.2.3. Buffaloes

In recent years, milk production has increased in the Southeast region, due to a growing demand for milk products, especially legitimate “mozzarella” made with buffalo milk. This is much appreciated and has a wide acceptance on the markets. Because of its aptitudes and use as animals for traction and transport, buffaloes have become viable not only on large properties but also in the development and sustainability of family agriculture. The breeds

that stand out in milk production in Brazil are the Murrah and the Mediterranean, as well as their crosses. Production systems vary from extensive, on native pastures, in swamp or dry land areas in the Amazon, to intensive systems using cultivated pastures.

1.2.3.3. Eggs

As with meat poultry, egg laying in Brazil is one of the most highly developed on the planet. The technological standard used in egg production systems is one of the most advanced, including the most productive breeds, highly efficient techniques for feeding, management, health and hygiene. In 2002, 1,362 million dozen eggs were produced in Brazil (Anualpec, 2003). Table 9 lists the trade names of laying chickens present in the Brazilian industrial segment, while Table 10 shows the number of egg laying poultry in the country.

Table 9 – Commercial breeds of laying hens used in Brazil

<i>CATEGORY</i>	Commercial Breed
White egg layers	Lohmann, Isa Babcock, Hisex, Hy-Line Dekalb, H&N, Shaver, Embrapa 011
Brown egg layers	Isa Brown, Lohmann Brown, Hisex Brown, Embrapa 031, UFSM-TJ, UFSM-TZ, Hy-Line Brown
<i>Colonial layers</i>	Embrapa 051, Caipira Negra

Source: EMBRAPA Suínos e Aves

Table 10 – Housing for laying hens in Brazil

CATEGORY	UNITS (thousand head)		
	1994	1998	2002
White egg layers	41,881	41,881	50,240
Brown egg layers	13,609	15,631	17,530
TOTAL	55,490	56,512	67,770

Source: ANUALPEC, 2003

1.2.3.4. Animals for Work, Sports or Competition

1.2.3.4.1. Horses

In a country with an agricultural vocation such as Brazil, horses are dispersed over the whole national territory, where they are used for agricultural and military activities as well as sport and leisure. The use of exotic breeds for sports and leisure is concentrated mainly in the South and Southeast regions. As they use small areas for rearing, horse breeding attracts

investments even in regions of high demographic density. In the Southern region there is a great number of studs, as the large breeders from the Southeast region also have studs in that region, as the climate is more favourable for breeding this species. The animals from these studs are kept there until two years of age, when they are transferred to the Southeast region to be trained.

1.3. EVALUATION OF THE STATE OF CONSERVATION OF BIODIVERSITY OF DOMESTIC ANIMALS.

1.3.1. Farmed Species

Most of the domestic animal species were introduced into Brazil through successive voyages of the colonisers. A very reduced number of animal species, at the time considered domestic, existed in the pre-colonial period although the indigenous people did not have the habit to domesticate them. The lack of animals considered domestic in Europe in 1500 was noted in the Letter of the Discovery of Brazil, sent by the scribe Pero Vaz de Caminha, to the King of Portugal, Dom Manuel, in April 1500:

“The people of this place do not plough, nor raise animals, nor are there oxen, nor cows, nor goats, nor sheep, nor hens, nor any other animal species which would normally share man’s life. These people do not eat, if not for this yam, of which there are many and these seeds and fruits, that the land and trees throw from themselves; and with this, they walk so strong and so vigorous that we are not as such, despite all the wheat and vegetables that we eat”.

At present, Brazil has various breeds that developed from those brought by the colonizers soon after the discovery. In this period, they were submitted to natural selection in determined environments, to the point where they show specific adaptive traits to certain ecological niches. These breeds began to be called naturalised, Criollos, or “local”. At the end of the XIX century and beginning of the XX, zebu cattle from India began to be imported, which rapidly adapted to Central Brazil, which became the most important in national beef cattle breeding. These breeds gave origin to other zebu breeds through programmed crosses.

1.3.2. Naturalised Breeds by Species and Region in Brazil. Conservation Status

Table 11, below, shows the naturalised breeds reared in the country, their geographic distribution and conservation status.

Table 11 – Naturalised breeds, their location and conservation status.

Species	Breed	Region	Conservation Status
Cattle	Caracu	Southeast	Not threatened
	Crioulo Lageano	South	Threatened
	Curraleiro ou Pé-duro	Northeast	Threatened
	Junqueira	Southeast	Critical
	Mocho Nacional	Southeast	Threatened
	Pantaneiro	Centre-west (Pantanal)	Threatened
Buffaloes	Baio	North	Critical
	Carabao	North	Threatened
Donkeys	Jumento Nordestino	Northeast	Not threatened
	Jumento Brasileiro	Southeast	Threatened
Horses	Campeiro	South	Critical
	Lavradeiro	North	Critical
	Marajoara	North	Threatened
	Pantaneiro	Centre-west (Pantanal)	Threatened
	Puruca	North	Critical
Goats	Azul	Northeast	Threatened
	Moxotó	Northeast	Not threatened
	Repartida	Northeast	Threatened
	Canindé	Northeast	Not threatened
	Gurguéia	Northeast	Threatened
	Marota	Northeast	Threatened
Sheep	Santa Inês	Northeast	Not threatened
	Morada Nova	Northeast	Threatened
	Rabo Largo	Northeast	Critical
	Crioulo Lanado	South	Threatened
Pigs	Caruncho	Centre-west	Threatened
	Monteiro	Centre-west	Threatened
	Moura	South	Threatened
	Pereira	Southeast	Threatened
	Piau	Southeast	Threatened

1.3.2.1. Naturalised Cattle Breeds

1.3.2.1.1. Caracu

The Portuguese breed Minhota was believed to contribute most to the formation of the Caracu, which was formed in the south of Minas Gerais State, and spread to the State of São Paulo. Although it is, at present, the most numerous of the naturalised breeds, it was almost extinct due to crossing with breeds of European and zebu origin, from the 1930s. At

present the Caracu is not at risk of extinction due to its adaptation and production in tropical conditions. Although it is considered a dual-purpose breed, there is a lineage that has been selected for milk production for many decades by the Carvalho Dias family, known as the Caracu Caldeano.

1.3.1.1.1. Crioulo Lageano

The Crioulo Lageano is believed to have originated from the ancient Hamitic cattle, characterized by long horns, which were introduced into the South of Spain from the North of

Africa. In Brazil, they developed exclusively by natural selection over the last four centuries. Today the effective population is probably not more than 500 animals, the greater part on the Canoas farm, in the region of Lages - SC (from where the name Crioulo Lageano came). It is very well adapted to the region, which registers the lowest temperatures in the country. The animals are rustic, large, with late sexual maturity and high prolificacy. The most frequent coat colour is known as African (white back and belly, red or black marks on the ribs, with red or black hair around the eyes).

1.3.2.1.3. Curraleiro or Pé-duro

Known as Curraleiro in Goiás and Tocantins States and Pé-duro (hard foot) in the Northeastern states, this breed also descended from cattle brought by Portuguese and Spanish colonisers. It is thought to have descended from the Mirandesa breed, which still can be found in the Spanish province of León. Reared in a super-extensive regime, without sanitary care and feed lacking quantity and quality, the Curraleiro is an extremely rustic animal that is well adapted to unfavourable environments such as semiarid plains of the Brazilian Northeast. Due to their small size, the farmers gradually substituted them for other breeds, especially zebus. To avoid their disappearance, Embrapa Meio Norte has been developing a conservation programme for this breed through a Conservation Nucleus maintained in São João do Piauí, in the semi arid Northeast. With the incentive of Embrapa, the Brazilian Association of Curraleiro Breeders was formed in Mara Rosa, Goiás, where its headquarters is located.

1.3.2.1.4. Junqueira

Originated from a mixture of Portuguese breeds, which came to Brazil during the colonisation, the Junqueira was found principally in the north of São Paulo State and south of Minas Gerais State. Their hide varies from bay to chestnut and they have a rose muzzle. As well as robust and heavy, these animals have an unusual headset conformation. The horns grow in a disproportionate way, there being animals whose horns are capable of storing between 5 and 12 litres of liquid. Although this quality should be looked on as a curiosity, in the past breeders tried to select their animals for horn size, the farmer feeling pride in being the owner of the bull with the largest horns. The berrante is an instrument much used by herders while driving cattle, and it is made from horns, often from this breed. Maybe this is one of the reasons why this breed did not develop its potential for meat production, which would be expected for animals of this size.

1.3.2.1.5. Mocho Nacional

Reared mainly for traction and slaughter, this breed had a high population in São Paulo, Minas Gerais and Goiás States at the end of the XIX century and start of the XX century. It has a unique trait among all Brazilian Criollo breeds: it is polled. This was the first breed with which Embrapa Genetic Resources and Biotechnology started to work, since, in 1983, it was thought that there remained only three bulls and eight cows. The official creation of the breed started in Nova Odessa, São Paulo State, in 1911. The pedigree registration started in 1939, with the establishment of the Brazilian Association of Mocho Nacional Cattle Breeders. The population was highest between the end of the 1930s and start of the 1950s. From there, the breed declined, with the end of the pedigree register around 1965. During the 1970s the action of some farmers avoided extinction of this breed. Presently, the Brazilian Association of Caracu Breeders (ABCRC) is registering these animals as "Caracu Polled Variety".

According to information in the registers of the Brazilian Association of Tabapuã Breeders, the polled nature of hornless Tabapuã originated by crossbreeding between Mocho Nacional cows with zebu cows, brought with the first ships from India, which ended up on a farm in Planaltina, today part of the Federal District.

1.3.2.1.6. Pantaneiro

Also known as “Tucura” or “Cuiabano”, the Pantaneiro cattle managed to survive for a long period in flooded areas of the Pantanal Mato-grossense. This breed, which represented a considerable parcel of the effective population in the region was, little by little, substituted by zebras, which adapted well to the region. At present the Pantaneiro runs serious risk of extinction and the small remaining populations are found mainly in areas of maximum flooding in the northern portion of the Pantanal, on the margins of the Paraguay, São Lourenço and Bento Gomes rivers. Although it is small, studies show that it has a birth rate of 72%, greater than zebu herds in the regions, which present an average birth rate of 53%.

1.3.2.2. Naturalised Buffalo Breeds

1.3.2.2.1. Carabao

Introduced into Brazil at the end of the XIX century, via the Island of Marajó, the Carabao originated on the Asian continent, where it was found in China, the Philippines, Thailand, Malaysia and Vietnam. In those countries the Carabao has an important role to play in traction in swampy regions. It is known as the “swamp buffalo” and has aptitude for meat production and traction work. In Brazil, a small Carabao herd multiplied in the beginning and later was crossed with animals from the Mediterranean breed, which led this small genetic group almost to extinction. Worried about the de-characterization of the breed, Embrapa Amazônia Oriental Research Centre, located in the State of Pará, created a Conservation Nucleus on its Experimental Farm on the Marajó Island (BAGAM). There are other small herds of this breed in the States of Pará and São Paulo.

1.3.2.2.2. Baio

Introduced more recently, the Bay type buffalo originated in the Indian region of Assam, and is considered to be a dual purpose (meat and milk) buffalo. It is brownish, with a bay hide, to which it owes its name. Until recently it was thought that the Baio type (*Bubalus bubalis fulvus*) belonged to a single breed of the *fulvus* subspecies found in the Amazon region of Brazil. Recent studies of genetic characterization hope to show the true identity of this genetic group. Embrapa Amazônia Oriental has the only controlled herd in the country, as with the Carabao, which is being conserved in the BAGAM, on Marajó island.

1.3.2.3. Naturalised Donkey Breeds

1.3.2.3.1. Northeastern Donkey (Jumento Nordestino) or Jegue

It is believed that the donkey arrived in Brazil around 1534, brought from the Madeira and Canary Islands. In 1549, Thomé de Souza brought from Cape Verde more animals to the State of Bahia. It is one of the animals used for draught in fields and the city, as well as used for riding. Highly rustic and adapted to adverse conditions in the Brazilian semiarid, the Northeastern donkey is the animal used by the man of the outback in a wide variety of services compared to the care it receives.

Various surveys show that the population of donkeys in the Northeast was reduced from 2.7 million head in 1967 to about 700 thousand in 1981, a reduction of about 75% of the effective population. The main reason for this, was the indiscriminate slaughter of animals of all ages, for export of meat and derivatives, especially for Japan and Europe. The Agricultural Research Corporation of Rio Grande do Norte (Emparn) maintains a Conservation Nucleus.

1.3.2.3.2. Brazilian Donkey (Jumento Brasileiro)

The donkeys of the Brazilian breed originated from animals brought from Italy, predominantly Sicily, and have a close genetic relationship with African donkeys. In Brazil they were crossed with donkeys from Portugal or its African colonies. These breeding nuclei started in São Paulo State, and the products of these crosses are known as Paulista Donkeys. This breed is known to support hard work in the fields and long treks, when used under saddle. In 1939 the Breeders Association was founded, which called it the Brazilian Donkey. At present there are about 80 animals being conserved at the Animal Production Experimental Station of Colina, belonging to the Animal Production Institute of São Paulo (IZSP), as well as a reduced number with some breeders in the region.

1.3.2.4. **Naturalised Horse Breeds**

1.3.2.4.1. Campeiro

Of Spanish and Portuguese origin, these horses arrived in the Highlands of Santa Catarina State, brought by Spanish Jesuits in 1546, where they formed a huge herd – the wild horses of the Catarinense Highlands. In 1912, a Belgian, known as Dr. Vincent, started selecting some animals from this herd, crossing them with Thoroughbred and Arab stallions from France. This gave rise to the present Campeiro, also known as Marchador das Araucárias. Its population is restricted to small troops on the Catarinense Highlands between the townships of Lages and Curitibanos.

1.3.2.4.2. Lavradeiro

The origin of the Lavradeiro horse is connected to the colonization of Roraima, where animal production was one of the first activities developed on the vast native fields known as “Lavrado”. To help with cattle management, the original horses were introduced, mainly from Portugal and Spain. Its creation in an extensive form was due to the lack of fences between properties, which meant that man lost dominion over these animals. They became part of a large wild troop, and so became erroneously known as the “Wild Horse of Roraima”. Among its traits the following can be highlighted: highly adapted, represented by its high birth rate; feed sobriety due to the low quality of forage available; high tolerance to infectious equine anaemia (trait similar to that shown by the Pantaneiro horse); rusticity, due to the inhospitable climatic conditions and, above all, for its potential for work, with high speed and resistance to prolonged physical effort. Due to indiscriminate crosses with other horse breeds, the Lavradeiro is today threatened with extinction.

1.3.2.4.3. Marajoara

The animals that gave origin to the Marajoara breed were taken from Belém to Marajó Island, acquiring excellent adaptive capacity to the hot and swampy region of the Island. In the middle of the 19th century the horse population on Marajó Island was greater than one million head, which meant that an emergency slaughter programme was created. Some European countries made use of the hides and hooves of the slaughtered animals. The Marajoara is a medium size horse, well proportioned with well-defined muscles, and present an active and energetic temperament. They are excellent animals for work and not substitutable in the region. In 1981 it was created the Marajoara Horse Breeders Association.

1.3.2.4.4. Pantaneiro

Introduced by the pioneers during the colonisation of the Pantanal Matogrossense, the horse adapted to those bioclimatic conditions and multiplied easily, forming an adapted type. In this way, the Pantaneiro is the result of over two centuries of natural selection. It is believed

that the animals that arrived in the Pantanal originated from crosses with animals of Lusitanian (Celtic, Barb and Andalusia) origin, with Arab and Argentinean Criollo. After a phase when it was in decline, due mainly to illness and indiscriminate crossbreeding, the breed survived and today is of fundamental importance to the breeders of the Pantanal, who cannot substitute it for working with cattle. One of its most important traits is its tolerance to Equine Infectious Anaemia, an illness that affects this species in the region. Although the Pantaneiro can be infected, it rarely presents clinical symptoms of this illness and continues working as if it was healthy. As a result of its importance to the region, in 1972 the Brazilian Association of Pantaneiro Horse Breeders was founded (ABCCP), to organize and maintain the pedigree record. Embrapa Pantanal has an experimental farm (Nhu-mirim), located in Corumbá, State of Mato Grosso do Sul, where a conservation nucleus of this breed is maintained.

1.3.2.4.5. Puruca

This breed descends from three Shetland pony stallions brought from France to Marajó Island at the end of the 19th century, which were crossed with animals of the local Marajoara horse. At the start, the owner, because of its pedigree, called them Pure Blood. Bit by bit, the unimportant “pure blood” was transformed by the local Marajó population, arriving at the denomination Puruca. Its adaptation was excellent and what is known today as the Puruca is the result of the original ponies with horses in the region. This breed is much appreciated by the native for work driving cattle and buffaloes.

1.3.2.5. Naturalised Goat Breeds

1.3.2.5.1. Azul

The Blue goat is of African origin, of the “Wad” group (West African Dwarf). It is a rustic and docile animal used for milk production. Much appreciated for the grey colour of its hide, the animals have a small head, with short to medium sized ears, that are erect or horizontal; short horns and polled animals can occur naturally. The ABCC approved light brown eyes as a trait of the breed. The neck is firm and delicate in females and more robust in males. The dorsal line is straight and short, and its members are short and erect. The Blue goat found in Brazil is no bigger than that found in other countries. Although more common in the caatinga of Piauí State, this breed can also be found in the States of Pernambuco, Paraíba, Rio Grande do Norte and Ceará.

1.3.2.5.2. Canindé

It is believed that the Canindé breed originated in the valley of the Canindé, in Piauí State. The Black Grisone breed from Switzerland is supposed to have taken part in its formation. Similar to the Moxotó and Repartida breeds in size, form and function they have aptitude for milk, superior to the other breeds above. The hair is short and shiny, of a black colour, with its underbelly and legs with tones that vary from red-yellow to white. One of the reasons for the reduced number of animals of this breed is the fact that females were being crossed with males from exotic breeds to get goats with higher milk production. At present, a conservation nucleus is maintained at an Experimental Station of the Agricultural Research Company of Rio Grande do Norte, in the township of Pedro Avelino.

1.3.2.5.3. Gurguéia

This breed has its possible formation in the region of the valley of Gurguéia, Piauí. It is probably descended from goats of the Alpine trunk, introduced to Brazil during the colonization. It is similar to animals of the Brown Alpine breed, with brown hair with a black line on the back, underbelly and legs. This breed has been much used in crosses with exotic breeds, looking for better adaptation to the semi-arid climate, higher milk production and coat uniformity. It

has excellent milk and reproductive potential, reaching 71% multiple births. Embrapa Meio Norte, in Teresina, maintains a Conservation Nucleus for this breed.

1.3.2.5.4. Marota

The Marota is thought to originate from crosses between descendents of animals brought by the colonizers and the White Alpine goat. This is thought to have occurred in Bahia State where this breed predominates. Also called Curaçá, the Marota has uniform white coat, skin, mucus membranes and light coloured hooves. It has small ears and horns turned back and out. Some animals have rough hairs. It is used mainly for meat and skin production, any may show some milk tendency. Embrapa Meio Norte, in Teresina, maintains a conservation nucleus for this breed.

1.3.2.5.5. Moxotó

The Moxotó breed is descendent of animals brought from Portugal and Spain by the colonizers and its name come form the Valley of Moxotó, in Pernambuco State. It seems to have originated from the Serpentina breed, which still exists in Portugal, with which has similar phenotype. In Brazil, it is found in all the Northeast Region. It has many aptitudes, but most used for meat and skin. These traits, together with rusticity, give the breed enormous socio-economic importance. Its hide is principally bay or lighter with a black stripe on the back. The ears, underbelly, leg extremities, mucous membranes, nails and udder are black. The hairs are short, straight, and shiny. A Conservation Nucleus for this breed is maintained in Embrapa Goats, Sobral – State of Ceará.

1.3.2.5.6. Repartida

The Repartida goat comes from crosses between animals brought by the colonizers with animals from the French Alpine breed. The cross of the latter with brown animals may give rise to animals of two colours, with the coat black towards the anterior of the body and light or dark brown on the posterior part, or vice versa. The Repartida breed is highly prolific, rustic and well adapted to conditions in the semi-arid northeast. It shows good meat production, high quality hide and low milk production. At present the effective population size is very small, most easy to find small populations in Bahia State.

1.3.2.6. **Naturalised Sheep Breeds**

1.3.2.6.1. Santa Inês

From Bahia State, the Santa Inês was originally thought to be the result of crosses between Bergamasca, Crioula and Morada Nova sheep but recent studies have put this in doubt. The animals lack wool and its coat can be reddish or white, with various intermediary tones, and even black. The population expansion of this breed is due to its size, which is larger than the Morada Nova. They are highly prolific and sexually precocious, used mainly for meat and hide production.

1.3.2.6.2. Morada Nova

This breed received its name from observations carried out by Octávio Domingues in 1954, in the town Morada Nova, Ceará State. Its origin is not certain. It is believed that they are derived from breeds introduced by colonizers with influence from hair sheep of African origin. The coat varies from red to cream, as well as white. It is well adapted to environmental conditions in the Brazilian Northeast, being used usually for family subsistence on small properties. It has high disease resistance, mainly to worms.

1.3.2.6.3. Rabo Largo (Fat Tail)

This breed is believed to be descendant from animals from the South of Africa, crossed with animals of the Crioula Breed. There are various degrees of crossing, decharacterising the breed. The coat is very varied, predominated by white and red and, as the name suggests, has a fat tail. This trait is due to fat accumulation, which serves as a reserve for periods of food scarcity and gives it high adaptability to the semi-arid climate. A small number of animals can be found in Bahia State. This breed differs from the other hair breeds by the presence of horns in both sexes.

1.3.2.6.4. Crioulo Lanado

Brought from the Iberian Peninsula by the colonizers the Crioulo Lanado is not only found in the South of Brazil, but also almost all South American countries from Peru to Uruguay, indicating similar origins. They are believed to have originated from the Spanish Churra. The Crioulos have advantages such as precocity, fertility and endoparasite resistance. Its wool, naturally coloured, varies from White to black, passing through innumerable tones of gray and brown, and is much used in craft industries. Although considered poor quality wool compared with specialized breeds, it is used in the manufacture of articles, which require the use of long, thick fibres with little elasticity. Its hide is used as fleece and its meat is much appreciated as being soft. The reduction in effective population size was due to its substitution by specialized meat or wool production breeds or indiscriminate crossing with other breeds.

1.3.2.7. **Naturalised Pig Breeds**

1.3.2.7.1. Caruncho

This is a small pig, with mean weight between 90 and 100 kg, when finished. It has a hide similar to the Piau: black marks on a white-cream or sandy base or even a reddish colour. It is a rustic animal, with low food requirement, a quiet temperament and produces a high quantity of fat. It has a concave profile, Iberian or Asiatic ears, short, thick neck, with straight back of median length and short, wide and deep leg.

1.3.2.7.2. Monteiro

The Monteiro pig, from the Pantanal is a breed that became feral, and originated from pigs brought by the colonizers that, in the second half of the 18th century, founded Albuquerque (at present the city of Corumbá). Some animals escaped and found suitable conditions in the Pantanal, multiplied, and became more wild than domestic. Although well adapted to Pantanal conditions, it is a relatively recent animal in the region and maintains favourable production traits. Animals are reared free, passing from one property to another and hunted when they reach slaughter weight. This type of farming is ideal for smallholders as the Monteiro pig is a resistant animal, not needing any care. It has a well-developed muzzle, coloured black or dark brown, abundant, long hairs with medium sized head and neck, as well as a full, long leg.

1.3.2.7.3. Moura

Found mainly in the south region of Brazil, the Moura pig probably arose from crossing the Canastrão, Canastra and Duroc breeds. It is a medium sized animal with high tendency to accumulate fat. It has a sub-concave and rectilinear profile with medium sized head and ears, the latter are droopy with a shape intermediary between Celtic and Iberian types. The

muzzle is of medium length and has a small double chin. The dappled grey hair is most characteristic of the breed, and varies from light dapple-grey to black dapple-grey. It has a short neck and a more or less wide chest, wide back of medium length, wide leg of medium depth and little muscle, straight short belly and short, fine, strong bones.

1.3.2.7.4. Pereira

Originated in São Paulo State, from crosses between Canastra with Duroc. It is known as Capitão Chico in the State of Maranhão. The animals are rustic of medium prolificacy and tendency to fatten easily. It has a dappled-grey colour or, less often, black or roan. It has a wide to medium head, with concave profile, large Iberian type ears, short neck, more or less wide chest, wide back and medium length, wide leg without depth and little muscle, firm underbelly with development and short, strong bone structure.

1.3.2.7.5. Piau

There are indications that this breed originated in the area between the south of Goiás, the Triângulo Mineiro and the West of São Paulo State,. It is not possible to define the exact location of origin. The greatest concentration of the breed is in the basin of the Paranaíba River, between the south of Goiás and the Triângulo Mineiro. The Piau breed can have large, medium and small animals. They are rustic animals that are not precocious or prolific. It is an easy breed to manage, used in crosses to increase meat production. It can have a white-cream coloration, with black marks or a dapple-grey coat with black marks. Its head is of medium size, with a flat head between the eyes, a sub-concave and rectilinear profile, Iberian ears, medium, full, well inserted neck, wide and deep chest, long shoulders with a small arch of medium width, short back, wide, full leg and fine bone structure that is resistant, but with fine tendons.

1.3.2.7.6. Pirapitinga

The Pirapitinga pigs have been in the Forest Zone in Minas Gerais for a long time. It is thought that the breed originated on farms in the basin of the Pirapitinga River, where it spread to neighbouring townships, such as the States of Espírito Santo and Rio de Janeiro. It is an Asiatic type pig, of medium size, with fine bone structure and good length. It is almost without hair, with black or purplish hide, head without meat, ears that stand up and long muzzle. Its profile is rectilinear and fine and medium sized bones. It is an active animal that can be reared at pasture or in a sty. The Pirapitinga fattens easily, and can make use of a large number of feeds. Produces excellent quality and good quantity of fat. It is a rustic animal, and medium precocity and prolificacy.

1.3.2.7.7. Tatu

Known in the North of Brazil as “Baé”, “Macau” or Canastrinha in other states, the Tatu pig originated in Ásia (China or Indochina). It has a small size, short, thick neck, double-grey developed, pronounced underbelly with little musculature, dragged on the ground when adult and fat or when the female is pregnant. Generally is black with fine, sparse hairs, some completely hairless. They are excellent fat and meat producers for home use, are precocious but not very prolific, producing on average between six and eight piglets per litter. Its head is of medium size, with a sub-concave profile, Asiatic ears, short, thick neck, narrow chest, short, full shoulder and back, narrow leg that isn’t deep as well as a fine, short bone structure.

1.3.2.7.8. Nilo

The Nilo was common in São Paulo State. They are of average size, black, and their main trait is lack of hair. They are rustic, late developing and medium prolificacy. Under intensive conditions, nevertheless, they can be precocious. The Nilo has a sub-concave profile, with Iberian type

ears. It has fine bone structure with reduced musculature and large production of lard. They are rustic and indicated for grazing, with additional rations. The dams are good mothers, producing litters with 6 to 8 piglets. The Nilo-Canastra breed fattens easily, producing large quantities of lard and fat. Its head is mean size, a short, thick neck, wide chest, straight back of medium length and short, medium thick shoulder, wide full leg, straight full belly with fine but resistant bone structure and fragile tendons.

1.3.2.7.9. Canastra

The Canastra breed is also known in Pernambuco State as Meia Perna (Half Leg) and in Minas Gerais as Maxambomba. They are medium-sized animals, of Iberian type, probably closely related to the Portuguese Alentejo. They are considered good lard producers. They have mostly black hair, and present a great capacity to fatten as well as high rusticity and prolificacy. They have poor conformation, precocity and fecundity. Its head is small, with a sub-concave profile, large Iberian type ears, short neck, wide, shoulder and back that is straight and of medium length. The leg is not very wide, lacks depth and muscle mass, with a straight belly and strong, fine bone structure.

1.3.2.7.10. Casco de Mula

The name of this breed comes from the fact these pigs are syndactyles, or with fused hoof. Darwin reported various cases of syndactylism in pigs and considered them mutations. Some authors indicate Brazil as the origin of these animals, supported by the fact that since colonial times syndactyle pigs exist and some boars were taken from Brazil to the USA, where the breed was selected and the trait fixed. This hypothesis is questionable, due to the inexistence of references in Brazil in remote times. The breed called Casco de Mula or Casco de Burro is apparently the same the Americans call “Mule Foot”, which literature gives as Norwegian origin. It is also important to mention that this trait can appear in animals of other breeds.

1.3.2.7.11. Canastrão

The Canastrão is a large, Celtic type animal. It may have descended from the Portuguese breed called Bizarra. It may be found in various Brazilian states with different names depending on the region, including Junqueira, Capitão Chico, Zabumba, Vermelho and Cabano. The animals are rustic, but not very early maturing or prolific. They have some conformation defects, and have not had the benefit of natural selection. They are black with white marks and spots. They have a concave profile with Celtic ears. It is hard to find pure animals and miscegenation is common.

1.3.2.7.12. Sorocaba

This is a synthetic breed, reared in São Paulo State and is the result of crosses between the Duroc, Tamworth and Red Caruncho breeds. The Sorocaba is a rustic animal, with medium prolificacy and tendency to fatten. The animals are reddish in colour with a small head and narrow forehead, sub-concave profile, Asiatic ears, wide, long cheek, shoulders and back are straight but not wide, deep leg which isn't wide or full, straight underbelly and short, fine bone structure.

1.3.2.7.13. Junqueira

A synthetic breed formed by crossing Duroc, Poland China and Caruncho. These are very rustic animals with medium prolificacy and good fattening tendency. They are of a whitish colour, small black marks. Its head is medium, with a concave profile, Iberian ears, wide

deep chest, back and shoulders that are straight without being wide, wide, deep leg that isn't full, large belly with a small arch and medium bone structure.

1.3.2. Zebu Breeds Selected or Developed in Brazil

At the end of the 19th century, animals started to arrive in Brazil that until then we considered extremely exotic - zebus – and which today are responsible for almost all beef produced in the country from the latitude of São Paulo northwards, either as pure or crossbred animals. Table 12 shows the zebu breeds that were imported and selected in Brazil, as well as those developed in the country from the original breeds. It shows the region of the country where each breed is found as well as the name by which they are known in India.

1.3.2.1. Naturalised Cattle Breeds

1.3.2.1.1. Caracu

The Portuguese breed Minhota was believed to contribute most to the formation of the Caracu, which was formed in the south of Minas Gerais State, and spread to the State of São Paulo. Although it is, at present, the most numerous of the naturalised breeds, it was almost extinct due to crossing with breeds of European and zebu origin, from the 1930s. At

present the Caracu is not at risk of extinction due to its adaptation and production in tropical conditions. Although it is considered a dual-purpose breed, there is a lineage that has been selected for milk production for many decades by the Carvalho Dias family, known as the Caracu Caldeano.

1.3.2.1.2. Crioulo Lageano

The Crioulo Lageano is believed to have originated from the ancient Hamitic cattle, characterized by long horns, which were introduced into the South of Spain from the North of Africa. In Brazil, they developed exclusively by natural selection over the last four centuries. Today the effective population is probably not more than 500 animals, the greater part on the Canoas farm, in the region of Lages - SC (from where the name Crioulo Lageano came). It is very well adapted to the region, which registers the lowest temperatures in the country. The animals are rustic, large, with late sexual maturity and high prolificacy. The most frequent coat colour is known as African (white back and belly, red or black marks on the ribs, with red or black hair around the eyes).

1.3.2.1.3. Curraleiro or Pé-duro

Known as Curraleiro in Goiás and Tocantins States and Pé-duro (hard foot) in the Northeastern states, this breed also descended from cattle brought by Portuguese and Spanish colonisers. It is thought to have descended from the Mirandesa breed, which still can be found in the Spanish province of León. Reared in a super-extensive regime, without sanitary care and feed lacking quantity and quality, the Curraleiro is an extremely rustic animal that is well adapted to unfavourable environments such as semiarid plains of the Brazilian Northeast. Due to their small size, the farmers gradually substituted them for other breeds, especially zebus. To avoid their disappearance, Embrapa Meio Norte has been developing a conservation programme for this breed through a Conservation Nucleus maintained in São

João do Piauí, in the semi arid Northeast. With the incentive of Embrapa, the Brazilian Association of Curraleiro Breeders was formed in Mara Rosa, Goiás, where its headquarters is located.

1.3.2.1.4. Junqueira

Originated from a mixture of Portuguese breeds, which came to Brazil during the colonisation, the Junqueira was found principally in the north of São Paulo State and south of Minas Gerais State. Their hide varies from bay to chestnut and they have a rose muzzle. As well as robust and heavy, these animals have an unusual headset conformation. The horns grow in a disproportionate way, there being animals whose horns are capable of storing between 5 and 12 litres of liquid. Although this quality should be looked on as a curiosity, in the past breeders tried to select their animals for horn size, the farmer feeling pride in being the owner of the bull with the largest horns. The berrante is an instrument much used by herders while driving cattle, and it is made from horns, often from this breed. Maybe this is one of the reasons why this breed did not develop its potential for meat production, which would be expected for animals of this size.

1.3.2.1.5. Mocho Nacional

Reared mainly for traction and slaughter, this breed had a high population in São Paulo, Minas Gerais and Goiás States at the end of the XIX century and start of the XX century. It has a unique trait among all Brazilian Criollo breeds: it is polled. This was the first breed with which Embrapa Genetic Resources and Biotechnology started to work, since, in 1983, it was thought that there remained only three bulls and eight cows. The official creation of the breed started in Nova Odessa, São Paulo State, in 1911. The pedigree registration started in 1939, with the establishment of the Brazilian Association of Mocho Nacional Cattle Breeders. The population was highest between the end of the 1930s and start of the 1950s. From there, the breed declined, with the end of the pedigree register around 1965. During the 1970s the action of some farmers avoided extinction of this breed. Presently, the Brazilian Association of Caracu Breeders (ABCRC) is registering these animals as “Caracu Polled Variety”. According to information in the registers of the Brazilian Association of Tabapuã Breeders, the polled nature of hornless Tabapuã originated by crossbreeding between Mocho Nacional cows with zebu cows, brought with the first ships from India, which ended up on a farm in Planaltina, today part of the Federal District.

1.3.2.1.6. Pantaneiro

Also known as “Tucura” or “Cuiabano”, the Pantaneiro cattle managed to survive for a long period in flooded areas of the Pantanal Mato-grossense. This breed, which represented a considerable parcel of the effective population in the region was, little by little, substituted by zebras, which adapted well to the region. At present the Pantaneiro runs serious risk of extinction and the small remaining populations are found mainly in areas of maximum flooding in the northern portion of the Pantanal, on the margins of the Paraguay, São Lourenço and Bento Gomes rivers. Although it is small, studies show that it has a birth rate of 72%, greater than zebu herds in the regions, which present an average birth rate of 53%.

1.3.2.2. **Naturalised Buffalo Breeds**

1.3.2.2.1. Carabao

Introduced into Brazil at the end of the XIX century, via the Island of Marajó, the Carabao originated on the Asian continent, where it was found in China, the Philippines, Thailand,

Malaysia and Vietnam. In those countries the Carabao has an important role to play in traction in swampy regions. It is known as the “swamp buffalo” and has aptitude for meat production and traction work. In Brazil, a small Carabao herd multiplied in the beginning and later was crossed with animals from the Mediterranean breed, which led this small genetic group almost to extinction. Worried about the de-characterization of the breed, Embrapa Amazônia Oriental Research Centre, located in the State of Pará, created a Conservation Nucleus on its Experimental Farm on the Marajó Island (BAGAM). There are other small herds of this breed in the States of Pará and São Paulo.

1.3.2.2.2. Baio

Introduced more recently, the Bay type buffalo originated in the Indian region of Assam, and is considered to be a dual purpose (meat and milk) buffalo. It is brownish, with a bay hide, to which it owes its name. Until recently it was thought that the Baio type (*Bubalus bubalis fulvus*) belonged to a single breed of the *fulvus* subspecies found in the Amazon region of Brazil. Recent studies of genetic characterization hope to show the true identity of this genetic group. Embrapa Amazônia Oriental has the only controlled herd in the country, as with the Carabao, which is being conserved in the BAGAM, on Marajó island.

1.3.2.3. Naturalised Donkey Breeds

1.3.2.3.1. Northeastern Donkey (Jumento Nordestino) or Jegue

It is believed that the donkey arrived in Brazil around 1534, brought from the Madeira and Canary Islands. In 1549, Thomé de Souza brought from Cape Verde more animals to the State of Bahia. It is one of the animals used for draught in fields and the city, as well as used for riding. Highly rustic and adapted to adverse conditions in the Brazilian semiarid, the Northeastern donkey is the animal used by the man of the outback in a wide variety of services compared to the care it receives.

Various surveys show that the population of donkeys in the Northeast was reduced from 2.7 million head in 1967 to about 700 thousand in 1981, a reduction of about 75% of the effective population. The main reason for this, was the indiscriminate slaughter of animals of all ages, for export of meat and derivatives, especially for Japan and Europe. The Agricultural Research Corporation of Rio Grande do Norte (Emparn) maintains a Conservation Nucleus.

1.3.2.3.2. Brazilian Donkey (Jumento Brasileiro)

The donkeys of the Brazilian breed originated from animals brought from Italy, predominantly Sicily, and have a close genetic relationship with African donkeys. In Brazil they were crossed with donkeys from Portugal or its African colonies. These breeding nuclei started in São Paulo State, and the products of these crosses are known as Paulista Donkeys. This breed is known to support hard work in the fields and long treks, when used under saddle. In 1939 the Breeders Association was founded, which called it the Brazilian Donkey. At present there are about 80 animals being conserved at the Animal Production Experimental Station of Colina, belonging to the Animal Production Institute of São Paulo (IZSP), as well as a reduced number with some breeders in the region.

1.3.2.4. Naturalised Horse Breeds

1.3.2.4.1. Campeiro

Of Spanish and Portuguese origin, these horses arrived in the Highlands of Santa Catarina State, brought by Spanish Jesuits in 1546, where they formed a huge herd – the wild horses of the Catarinense Highlands. In 1912, a Belgian, known as Dr. Vincent, started selecting

some animals from this herd, crossing them with Thoroughbred and Arab stallions from France. This gave rise to the present Campeiro, also known as Marchador das Araucárias. Its population is restricted to small troops on the Catarinense Highlands between the townships of Lages and Curitiba.

1.3.2.4.2. Lavradeiro

The origin of the Lavradeiro horse is connected to the colonization of Roraima, where animal production was one of the first activities developed on the vast native fields known as “Lavrado”. To help with cattle management, the original horses were introduced, mainly from Portugal and Spain. Its creation in an extensive form was due to the lack of fences between properties, which meant that man lost dominion over these animals. They became part of a large wild troop, and so became erroneously known as the “Wild Horse of Roraima”. Among its traits the following can be highlighted: highly adapted, represented by its high birth rate; feed sobriety due to the low quality of forage available; high tolerance to infectious equine anaemia (trait similar to that shown by the Pantaneiro horse); rusticity, due to the inhospitable climatic conditions and, above all, for its potential for work, with high speed and resistance to prolonged physical effort. Due to indiscriminate crosses with other horse breeds, the Lavradeiro is today threatened with extinction.

1.3.2.4.3. Marajoara

The animals that gave origin to the Marajoara breed were taken from Belém to Marajó Island, acquiring excellent adaptive capacity to the hot and swampy region of the Island. In the middle of the 19th century the horse population on Marajó Island was greater than one million head, which meant that an emergency slaughter programme was created. Some European countries made use of the hides and hooves of the slaughtered animals. The Marajoara is a medium size horse, well proportioned with well-defined muscles, and present an active and energetic temperament. They are excellent animals for work and not substitutable in the region. In 1981 it was created the Marajoara Horse Breeders Association.

1.3.2.4.4. Pantaneiro

Introduced by the pioneers during the colonisation of the Pantanal Matogrossense, the horse adapted to those bioclimatic conditions and multiplied easily, forming an adapted type. In this way, the Pantaneiro is the result of over two centuries of natural selection. It is believed that the animals that arrived in the Pantanal originated from crosses with animals of Lusitanian (Celtic, Barb and Andalusia) origin, with Arab and Argentinean Criollo. After a phase when it was in decline, due mainly to illness and indiscriminate crossbreeding, the breed survived and today is of fundamental importance to the breeders of the Pantanal, who cannot substitute it for working with cattle. One of its most important traits is its tolerance to Equine Infectious Anaemia, an illness that affects this species in the region. Although the Pantaneiro can be infected, it rarely presents clinical symptoms of this illness and continues working as if it was healthy. As a result of its importance to the region, in 1972 the Brazilian Association of Pantaneiro Horse Breeders was founded (ABCCP), to organize and maintain the pedigree record. Embrapa Pantanal has an experimental farm (Nhu-mirim), located in Corumbá, State of Mato Grosso do Sul, where a conservation nucleus of this breed is maintained.

1.3.2.4.5. Puruca

This breed descends from three Shetland pony stallions brought from France to Marajó Island at the end of the 19th century, which were crossed with animals of the local Marajoara horse. At the start, the owner, because of its pedigree, called them Pure Blood. Bit by bit, the unimportant “pure blood” was transformed by the local Marajó population, arriving at the

denomination Puruca. Its adaptation was excellent and what is known today as the Puruca is the result of the original ponies with horses in the region. This breed is much appreciated by the native for work driving cattle and buffaloes.

1.3.2.5. Naturalised Goat Breeds

1.3.2.5.1. Azul

The Blue goat is of African origin, of the “Wad” group (West African Dwarf). It is a rustic and docile animal used for milk production. Much appreciated for the grey colour of its hide, the animals have a small head, with short to medium sized ears, that are erect or horizontal; short horns and polled animals can occur naturally. The ABCC approved light brown eyes as a trait of the breed. The neck is firm and delicate in females and more robust in males. The dorsal line is straight and short, and its members are short and erect. The Blue goat found in Brazil is no bigger than that found in other countries. Although more common in the caatinga of Piauí State, this breed can also be found in the States of Pernambuco, Paraíba, Rio Grande do Norte and Ceará.

1.3.2.5.2. Canindé

It is believed that the Canindé breed originated in the valley of the Canindé, in Piauí State. The Black Grisone breed from Switzerland is supposed to have taken part in its formation. Similar to the Moxotó and Repartida breeds in size, form and function they have aptitude for milk, superior to the other breeds above. The hair is short and shiny, of a black colour, with its underbelly and legs with tones that vary from red-yellow to white. One of the reasons for the reduced number of animals of this breed is the fact that females were being crossed with males from exotic breeds to get goats with higher milk production. At present, a conservation nucleus is maintained at an Experimental Station of the Agricultural Research Company of Rio Grande do Norte, in the township of Pedro Avelino.

1.3.2.5.3. Gurguéia

This breed has its possible formation in the region of the valley of Gurguéia, Piauí. It is probably descended from goats of the Alpine trunk, introduced to Brazil during the colonization. It is similar to animals of the Brown Alpine breed, with brown hair with a black line on the back, underbelly and legs. This breed has been much used in crosses with exotic breeds, looking for better adaptation to the semi-arid climate, higher milk production and coat uniformity. It has excellent milk and reproductive potential, reaching 71% multiple births. Embrapa Meio Norte, in Teresina, maintains a Conservation Nucleus for this breed.

1.3.2.5.4. Marota

The Marota is thought to originate from crosses between descendents of animals brought by the colonizers and the White Alpine goat. This is thought to have occurred in Bahia State where this breed predominates. Also called Curaçá, the Marota has uniform white coat, skin, mucus membranes and light coloured hooves. It has small ears and horns turned back and out. Some animals have rough hairs. It is used mainly for meat and skin production, any may show some milk tendency. Embrapa Meio Norte, in Teresina, maintains a conservation nucleus for this breed.

1.3.2.5.5. Moxotó

The Moxotó breed is descendent of animals brought from Portugal and Spain by the colonizers and its name come form the Valley of Moxotó, in Pernambuco State. It seems to have originated from the Serpentina breed, which still exists in Portugal, with which has similar phenotype. In Brazil, it is found in all the Northeast Region. It has many aptitudes, but most

used for meat and skin. These traits, together with rusticity, give the breed enormous socio-economic importance. Its hide is principally bay or lighter with a black stripe on the back. The ears, underbelly, leg extremities, mucous membranes, nails and udder are black. The hairs are short, straight, and shiny. A Conservation Nucleus for this breed is maintained in Embrapa Goats, Sobral – State of Ceará.

1.3.2.5.6. Repartida

The Repartida goat comes from crosses between animals brought by the colonizers with animals from the French Alpine breed. The cross of the latter with brown animals may give rise to animals of two colours, with the coat black towards the anterior of the body and light or dark brown on the posterior part, or vice versa. The Repartida breed is highly prolific, rustic and well adapted to conditions in the semi-arid northeast. It shows good meat production, high quality hide and low milk production. At present the effective population size is very small, most easy to find small populations in Bahia State.

1.3.2.6. Naturalised Sheep Breeds

1.3.2.6.1. Santa Inês

From Bahia State, the Santa Inês was originally thought to be the result of crosses between Bergamasca, Crioula and Morada Nova sheep but recent studies have put this in doubt. The animals lack wool and its coat can be reddish or white, with various intermediary tones, and even black. The population expansion of this breed is due to its size, which is larger than the Morada Nova. They are highly prolific and sexually precocious, used mainly for meat and hide production.

1.3.2.6.2. Morada Nova

This breed received its name from observations carried out by Octávio Domingues in 1954, in the town Morada Nova, Ceará State. Its origin is not certain. It is believed that they are derived from breeds introduced by colonizers with influence from hair sheep of African origin. The coat varies from red to cream, as well as white. It is well adapted to environmental conditions in the Brazilian Northeast, being used usually for family subsistence on small properties. It has high disease resistance, mainly to worms.

1.3.2.6.3. Rabo Largo (Fat Tail)

This breed is believed to be descendant from animals from the South of Africa, crossed with animals of the Crioula Breed. There are various degrees of crossing, decharacterising the breed. The coat is very varied, predominated by white and red and, as the name suggests, has a fat tail. This trait is due to fat accumulation, which serves as a reserve for periods of food scarcity and gives it high adaptability to the semi-arid climate. A small number of animals can be found in Bahia State. This breed differs from the other hair breeds by the presence of horns in both sexes.

1.3.2.6.4. Crioulo Lanado

Brought from the Iberian Peninsula by the colonizers the Crioulo Lanado is not only found in the South of Brazil, but also almost all South American countries from Peru to Uruguay, indicating similar origins. They are believed to have originated from the Spanish Churra. The Crioulos have advantages such as precocity, fertility and endoparasite resistance. Its wool, naturally coloured, varies from White to black, passing through innumerable tones of gray and brown, and is much used in craft industries. Although considered poor quality wool compared with specialized breeds, it is used in the manufacture of articles, which require the use of

long, thick fibres with little elasticity. Its hide is used as fleece and its meat is much appreciated as being soft. The reduction in effective population size was due to its substitution by specialized meat or wool production breeds or indiscriminate crossing with other breeds.

1.3.2.7. Naturalised Pig Breeds

1.3.2.7.1. Caruncho

This is a small pig, with mean weight between 90 and 100 kg, when finished. It has a hide similar to the Piau: black marks on a white-cream or sandy base or even a reddish colour. It is a rustic animal, with low food requirement, a quiet temperament and produces a high quantity of fat. It has a concave profile, Iberian or Asiatic ears, short, thick neck, with straight back of median length and short, wide and deep leg.

1.3.2.7.2. Monteiro

The Monteiro pig, from the Pantanal is a breed that became feral, and originated from pigs brought by the colonizers that, in the second half of the 18th century, founded Albuquerque (at present the city of Corumbá). Some animals escaped and found suitable conditions in the Pantanal, multiplied, and became more wild than domestic. Although well adapted to Pantanal conditions, it is a relatively recent animal in the region and maintains favourable production traits. Animals are reared free, passing from one property to another and hunted when they reach slaughter weight. This type of farming is ideal for smallholders as the Monteiro pig is a resistant animal, not needing any care. It has a well-developed muzzle, coloured black or dark brown, abundant, long hairs with medium sized head and neck, as well as a full, long leg.

1.3.2.7.3. Moura

Found mainly in the south region of Brazil, the Moura pig probably arose from crossing the Canastrão, Canastra and Duroc breeds. It is a medium sized animal with high tendency to accumulate fat. It has a sub-concave and rectilinear profile with medium sized head and ears, the latter are droopy with a shape intermediary between Celtic and Iberian types. The muzzle is of medium length and has a small double chin. The dappled grey hair is most characteristic of the breed, and varies from light dapple-grey to black dapple-grey. It has a short neck and a more or less wide chest, wide back of medium length, wide leg of medium depth and little muscle, straight short belly and short, fine, strong bones.

1.3.2.7.4. Pereira

Originated in São Paulo State, from crosses between Canastra with Duroc. It is known as Capitão Chico in the State of Maranhão. The animals are rustic of medium prolificacy and tendency to fatten easily. It has a dappled-grey colour or, less often, black or roan. It has a wide to medium head, with concave profile, large Iberian type ears, short neck, more or less wide chest, wide back and medium length, wide leg without depth and little muscle, firm underbelly with development and short, strong bone structure.

1.3.2.7.5. Piau

There are indications that this breed originated in the area between the south of Goiás, the Triângulo Mineiro and the West of São Paulo State,. It is not possible to define the exact location of origin. The greatest concentration of the breed is in the basin of the Paranaíba River, between the south of Goiás and the Triângulo Mineiro. The Piau breed can have large, medium and small animals. They are rustic animals that are not precocious or prolific. It is an easy breed to manage, used in crosses to increase meat production. It can have a white-cream coloration, with black marks or a dapple-grey coat with black marks. Its head is of

medium size, with a flat head between the eyes, a sub-concave and rectilinear profile, Iberian ears, medium, full, well inserted neck, wide and deep chest, long shoulders with a small arch of medium width, short back, wide, full leg and fine bone structure that is resistant, but with fine tendons.

1.3.2.7.6. Pirapitinga

The Pirapitinga pigs have been in the Forest Zone in Minas Gerais for a long time. It is thought that the breed originated on farms in the basin of the Pirapitinga River, where it spread to neighbouring townships, such as the States of Espírito Santo and Rio de Janeiro. It is an Asiatic type pig, of medium size, with fine bone structure and good length. It is almost without hair, with black or purplish hide, head without meat, ears that stand up and long muzzle. Its profile is rectilinear and fine and medium sized bones. It is an active animal that can be reared at pasture or in a sty. The Pirapitinga fattens easily, and can make use of a large number of feeds. Produces excellent quality and good quantity of fat. It is a rustic animal, and medium precocity and prolificacy.

1.3.2.7.7. Tatu

Known in the North of Brazil as “Baé”, “Macau” or Canastrinha in other states, the Tatu pig originated in Ásia (China or Indochina). It has a small size, short, thick neck, double-grey developed, pronounced underbelly with little musculature, dragged on the ground when adult and fat or when the female is pregnant. Generally is black with fine, sparse hairs, some completely hairless. They are excellent fat and meat producers for home use, are precocious but not very prolific, producing on average between six and eight piglets per litter. Its head is of medium size, with a sub-concave profile, Asiatic ears, short, thick neck, narrow chest, short, full shoulder and back, narrow leg that isn't deep as well as a fine, short bone structure.

1.3.2.7.8. Nilo

The Nilo was common in São Paulo State. They are of average size, black, and their main trait is lack of hair. They are rustic, late developing and medium prolificacy. Under intensive conditions, nevertheless, they can be precocious. The Nilo has a sub-concave profile, with Iberian type ears. It has fine bone structure with reduced musculature and large production of lard. They are rustic and indicated for grazing, with additional rations. The dams are good mothers, producing litters with 6 to 8 piglets. The Nilo-Canastra breed fattens easily, producing large quantities of lard and fat. Its head is mean size, a short, thick neck, wide chest, straight back of medium length and short, medium thick shoulder, wide full leg, straight full belly with fine but resistant bone structure and fragile tendons.

1.3.2.7.9. Canastra

The Canastra breed is also known in Pernambuco State as Meia Perna (Half Leg) and in Minas Gerais as Maxambomba. They are medium-sized animals, of Iberian type, probably closely related to the Portuguese Alentejo. They are considered good lard producers. They have mostly black hair, and present a great capacity to fatten as well as high rusticity and prolificacy. They have poor conformation, precocity and fecundity. Its head is small, with a sub-concave profile, large Iberian type ears, short neck, wide, shoulder and back that is straight and of medium length. The leg is not very wide, lacks depth and muscle mass, with a straight belly and strong, fine bone structure.

1.3.2.7.10. Casco de Mula

The name of this breed comes from the fact these pigs are syndactyles, or with fused hoof. Darwin reported various cases of syndactylism in pigs and considered them mutations. Some authors indicate Brazil as the origin of these animals, supported by the fact that since colonial times syndactyle pigs exist and some boars were taken from Brazil to the USA, where the breed was selected and the trait fixed. This hypothesis is questionable, due to the inexistence of references in Brazil in remote times. The breed called Casco de Mula or Casco de Burro is apparently the same the Americans call “Mule Foot”, which literature gives as Norwegian origin. It is also important to mention that this trait can appear in animals of other breeds.

1.3.2.7.11. Canastrão

The Canastrão is a large, Celtic type animal. It may have descended from the Portuguese breed called Bizarra. It may be found in various Brazilian states with different names depending on the region, including Junqueira, Capitão Chico, Zabumba, Vermelho and Cabano. The animals are rustic, but not very early maturing or prolific. They have some conformation defects, and have not had the benefit of natural selection. They are black with white marks and spots. They have a concave profile with Celtic ears. It is hard to find pure animals and miscegenation is common.

1.3.2.7.12. Sorocaba

This is a synthetic breed, reared in São Paulo State and is the result of crosses between the Duroc, Tamworth and Red Caruncho breeds. The Sorocaba is a rustic animal, with medium prolificacy and tendency to fatten. The animals are reddish in colour with a small head and narrow forehead, sub-concave profile, Asiatic ears, wide, long cheek, shoulders and back are straight but not wide, deep leg which isn't wide or full, straight underbelly and short, fine bone structure.

1.3.2.7.13. Junqueira

A synthetic breed formed by crossing Duroc, Poland China and Caruncho. These are very rustic animals with medium prolificacy and good fattening tendency. They are of a whitish colour, small black marks. Its head is medium, with a concave profile, Iberian ears, wide deep chest, back and shoulders that are straight without being wide, wide, deep leg that isn't full, large belly with a small arch and medium bone structure.

1.3.3. Zebu Breeds Selected or Developed in Brazil

At the end of the 19th century, animals started to arrive in Brazil that until then we considered extremely exotic - zebus – and which today are responsible for almost all beef produced in the country from the latitude of São Paulo northwards, either as pure or crossbred animals. Table 12 shows the zebu breeds that were imported and selected in Brazil, as well as those developed in the country from the original breeds. It shows the region of the country where each breed is found as well as the name by which they are known in India.

Table 12 – Zebu breeds selected or developed in Brazil, by Region.

	Brazilian Name	Original Name	Brazilian Region
Breeds selected in Brazil	Nellore	Ongole	Brazil ¹
	Guzerat	Kankrej	Brazil
	Gyr	Gyr	Brazil
	Sindhi	Red Sindhi	Northeast and North
Breeds developed in Brazil	Indubrazil	—	Brazil
	Tabapuã	—	Brazil
	Polled Nellore	Nellore	Brazil
	Polled Gyr	Gyr	Brazil

¹Most zebu breeds are found countrywide with the exception of the Southern region, which has

a temperate climate. On that region, zebu cattle can only be found as crossbreds.

1.3.3.1. Zebu Breeds Selected in Brazil

1.3.3.1.1. Nellore

The Nellore breed belongs to the second Indian group, containing large white or grey cattle with short horns. The Brazilian Nellore population originated from imports in 1930 and more recently from 1960 and 1962. At present, the Brazilian Nellore is tending to become more uniform within the Indian Ongole type. Among the zebu breeds found in Brazil, the Nellore stands out because of its several qualities, which are becoming more appreciated by breeders.

The animals are highly fertile, resistant to parasites and other tropical diseases, show precocity and have excellent maternal ability. Although its use was limited for a long time due to its short ears, similar to European cattle, today it occupies first place, not only in terms of pedigree registers but also by the use on a massive scale of Nellore bulls on females of other breeds. In Brazil, the Nellore is essentially a meat producer. The breed is undergoing a very intense selection, to beef steer production. In this country another breed was developed, polled Nellore, which is hornless.

1.3.3.1.2. Guzerat

The main imports of Guzerat animals were destined for the Cerrado region of the State of Minas Gerais. Later, breeders from Uberaba, in this state, became interested in the breed, which expanded to the North of São Paulo State and from there to other regions of the country. In the region called Triângulo Mineiro, Minas Gerais State, the Guzerat was used in crosses with Gyr and Nellore breeds, giving rise to the Indubrazil. In Brazil, the Guzerat can be found in the Northeast region as well as in the States of Rio de Janeiro, Minas Gerais, São Paulo and Goiás and its use is growing in various regions with good results. The breed was brought to Brazil in the 1870s and the herd book started in 1938.

1.3.3.1.3. Gyr

The Gyr breed was probably first imported around 1906. Nevertheless only from 1920 was it imported in sufficient numbers to affect the national herd, which caused the multiplication of breeders that exist today. In the 1940s, the Polled Gyr was formed to meet market demand, by crossing with the Mocho Nacional and Red Poll (two polled breeds). This variety continued to expand and shows the same traits and functions as the traditional Gyr. In 1976 the pedigree registration of the Polled Gyr started.

1.3.3.1.4. Sindhi

The Sindhi is similar to the Gyr from the West of India, to the Sahiwal, from the Punjab and the red cattle of Afghanistan. Due to movement of nomad tribes it underwent crossing with Gyr in some regions. The animals that arrived in Brazil, around 1906 and 1930, were sent to the Baixada Fluminense region, in Rio de Janeiro State and the municipalities of Novo Horizonte and Jardimópolis, in São Paulo State. In general, they were small, good-looking animals, adequate for regions with shortage of feed, where would be difficult to maintain larger animals. Today there are herds of this breed adapted to the Northeast region.

1.3.3.2. Zebu Breeds Developed in Brazil

1.3.3.2.1. Indubrazil

The Indubrazil was the first zebu breed formed by Brazilian breeders, based on animals brought from India. Initially the farmers from the Triângulo Mineiro gave the name Induberaba to the new breed, but in 1936 it was changed to Indubrazil. Its origin is based on the Gyr, Nellore and Guzerat breeds but the exact contribution of each or other imported zebu breeds is not known.

1.3.3.2.2. Tabapuã

The first polled zebu variety selected in Brazil was the Tabapuã, named such because of the municipality where it was formed in the State of São Paulo. Phenotypically it is similar to the American zebu (Brahman), which led to many Brahman cows being confused with this breed

after dehorning. In its genetic structure it is predominantly Nellore, with some Guzerat and less Gyr.

1.3.4. *In Situ* and *Ex Situ* Conservation

To reduce the extinction of naturalised breeds, the National Research Centre for Genetic Resources and Biotechnology - Cenargen, of the Brazilian Agricultural Research Corporation - Embrapa, included, from 1983, the conservation of animal genetic resources in its conservation programme, which up to that date contemplated only plants. From there the conservation of animal genetic resources began to be carried out by various Research Centres of Embrapa, Universities, State Research Corporations and by private farmers, under the national coordination of Cenargen. The breeds included in the Conservation Programme are listed in Table 12, and presented in item 1.3.2. of this Report.

The conservation programme includes the following stages: (a) identification of populations in advanced state of genetic dilution; (b) phenotypic and genetic characterization of germplasm; and (c) evaluation of production potential. Conservation is carried out in Conservation Nuclei, maintained in the habitats where the animals have been naturally selected (*in situ*), and embryo and semen storage (*ex situ*), is carried out by the Animal Germplasm Bank (BGA), on the Sucupira Experimental Farm, belonging to Cenargen, in Brasília. The conservation nuclei are organized as Research Projects belonging to RENARGEN – National Network for Genetic Resources, and have 10 Action Plans (Table 13), spread over the whole country. The articulation between the conservation nuclei and Cenargen, is carried out by the Germplasm Curator of the Product and the Curators of Germplasm Banks (Leaders of research projects). In the present structure, there are two curators for animals in Cenargen: one for large livestock species (cattle, buffaloes, horses and donkeys) and one for small livestock species (sheep, goats, pigs and poultry).

Table 13 – Action Plans of Animal Conservation Programme of RENARGEN

Nº	Title of the Action Plan
1	Identification of Animal Populations and their Long Term Conservation
2	Genetic Characterisation of Animal Germplasm
3	Conservation Nucleus for Goats
4	Conservation Nucleus for Hair Sheep
5	Conservation Nucleus for Animal Genetic Resources of the Amazon Region
6	Conservation Nucleus for Animal Genetic Resources in the Pantanal
7	Conservation Nucleus for Animal Genetic Resources in Mid Northern Brazil
8	Conservation of Animal Genetic Resources in the Brazilian Southern Fields
9	Conservation Nucleus for Animal Genetic Resources of the Lavrado
10	Conservation Nuclei for Swine and Poultry Genetic Resources

The expansion of Zebu breeds in Brazil is an incontestable reality. At present, about 80% of the Brazilian cattle population is of zebu cattle or their crosses with Criollo or European cattle, introduced more recently. Although to date, only naturalised cattle breeds have been studied in the conservation programme, as they are more threatened with extinction, there is a demand by breeders to include zebu breeds. The Nellore breed is dominating the beef cattle industry in Central Brazil to such an extent that it accounts for 85% of all registers. Despite this predominance, only a small number of bulls of this breed are used, mainly those classified as elite, causing a considerable reduction in genetic variability and the disappearance of some lineages. There is, therefore, the intention, in the near future, to create a Germplasm Bank for the storage of semen, embryos and oocytes of zebu breeds.

To be able to collect semen, embryos and oocytes of domestic animals and/or breeds threatened with extinction, the Conservation Nuclei where this material can be collected have to exist, thereby making the *in situ* conservation a fundamental part of the conservation programme. When there are human and physical resources in the Nucleus for collection and freezing of genetic material, this is carried out on farm and when this is not possible, some animals are temporarily transferred to Sucupira Experimental Farm. Table 14 shows the present situation of the genetic material stored in the Animal Germplasm Bank.

In addition, Brazil has a large Poultry Germplasm Bank, maintained by private breeders for leisure and/or commercial use. This material has not been studied to any great extent and has no known commercial value. The poultry geneticist, different from that of plants, has not been stimulated to include wild ancestors in breeding plans, nor primitive ancestors in modern lineages. Nevertheless, with the rapid advance of molecular biology and genetic engineering these resources are becoming more important and may be used. The maintenance of these germplasm banks may facilitate studies for future use of genetic sources for the improvement of commercial lineages, as well as the production of alternative commercial species for the consumer, as happened with duck, geese, quail, etc., or for leisure, as with ornamental poultry species. For meat and egg production, there are programmes that maintain germplasm banks such as: Embrapa, ESALQ, Paradise Birds Farm, Sulave, Federal University of Santa Maria, and Visconde da Graça Agricultural College, Federal University of Pelotas.

Table 14 – No. of semen doses and embryos in the Animal Germplasm Bank- 2003

Species	Breed	Nº of semen doses	Nº of embryos
Cattle	<i>Crioulo Lageano</i>	8,158	9
	Mocho Nacional	12,447	54
	Caracu	5,826	47
	Curraleiro	9,597	17
	Pantaneiro	9,676	20
	Junqueira	4,417	11
	Patuá	480	-
Goats	Marota	80	-
	<i>Moxotó</i>	794	-
	Canindé	105	-
Sheep	<i>Crioulo Lanado</i>	500	56
Donkeys	<i>Jumento Nordestino</i>	150	-
Horses	Campeiro	-	1
	Pantaneiro	-	5
TOTAL		52,230	220

1.4. EVALUATION OF THE DEGREE OF USE OF ANIMAL GENETIC RESOURCES

1.4.1. Degree of Use of Breeds. Causes. Importance. Trends.

1.4.1.1. Beef Cattle

Of the 52 beef cattle breeds in Brazil (Table 1A of the Annex), 29 are *Bos taurus*, five are naturalised, ten are *Bos indicus* and eight are synthetic. A large part of the *Bos taurus* breeds, especially the French and British, were introduced approximately one century ago, while a more recent initiative brought some Italian breeds. The effective population of a large number of these breeds is stable, while a small number have had an increase in population in recent years. Among these, two should be noted, Aberdeen Angus and Hereford, which have shown excellent results, not only as purebreds but also in crosses and in the formation of synthetics (respectively Brangus and Braford).

The five naturalised breeds of beef cattle descended from animals introduced by the colonizers, about 500 years ago. The only one that is no longer in danger of extinction is the Caracu, which has grown rapidly due to the interest of breeders to use it, not only as a purebred but also in crosses with zebu animals. The other four breeds are still threatened with extinction but conservation work and the establishment of some breeders associations have increased interest, resulting in a slow growth in their effective populations.

All ten zebu breeds in the country are of Asian origin, of which four were selected here (Nelore, Gyr, Guzarat and Sindhi). Another two were developed in the country (Indubrazil and Tabapuã), as well as polled versions of Nelore and Gyr (Nelore Mocho and Gyr Mocho). These breeds presently have pedigree registers independent from the breeds that gave them origin. The breeds Cangaian and Brahman are more recent introductions and the population of the former is decreasing while the latter is increasing.

The last eight breeds are considered synthetic, and are increasing in numbers, with the exception of the Aquitanica and Beefmaster, which have stable populations. All originated through crossbreeding European and zebu breeds, uniting the production of the first group with the rusticity of the second.

1.4.1.2. Dairy Cattle

Of the thirteen milk breeds in Brazil (Table 2A of the Annex), five are of European origin, introduced approximately a century ago (Holstein, Jersey, Brown Swiss, Simmental and Guernsey); one of European origin introduced by the colonisers (Caracu); three are zebu, introduced more recently (Gyr, Guzarat and Sindhi) and the last four are synthetic (Girolando, Guzolando, Lavínia and Pitangueiras).

Among the European breeds, the Holstein is dominant and stabilised numerically. The same can be said for the Jersey, Brown Swiss and Simmental. The Guernsey, on the other hand, is decreasing in numbers, from what was already a small population. As mentioned before, the Caracu population is growing again, and has a lineage selected for milk, called Caracu Caldeano.

Of the three zebu breeds, the Gyr and Guzarat are growing rapidly, mainly due to breeding programmes with Progeny Tests. The Sindhi breed is stable but with a small population.

Lastly, among the four synthetic breeds produced by crossing European and zebu breeds, the Girolando, from a Holstein x Gyr cross is increasing in numbers with a breeding programme

and the Guzolando, from a cross between Holstein x Guzerat, on a smaller scale. The Lavínia, from a cross between Brown Swiss and Guzerat, as well as the Pitangueiras, from a Polled x Guzerat cross, are decreasing in numbers, due mainly to limitations in their productive and reproductive performance, as well as to a lack of publicity about their traits, and are in risk of extinction.

1.4.1.3. Buffaloes

Worldwide there are 18 breeds of buffalo, of which four can be found in Brazil: Carabao, Jafarabadi, Mediterranean and Murrah (Table 3A in the Annex). In Brazil there is a fifth genetic group (Bay Type) not considered a breed by the Brazilian Association of Buffalo Breeders - ABCB. Due to the short time buffaloes exist in the country, compared with other domestic animal species which arrived with the colonisers in the 16th century, no buffalo breed should theoretically be considered naturalised. Nevertheless, two genetic groups, (Carabao and Bay Type) are very well adapted to the Amazon Region, which means that they can be considered, in practice, as naturalised. This region concentrates the largest population of Carabao and practically the only Bay Type herd, belonging to Embrapa Amazônia Oriental. The other breeds found in Brazil (Jaffarabadi, Mediterranean and Murrah) are considered commercial breeds and have significant populations. They can be found not only in the North region but also in the other regions, with emphasis on the Southeast, where there is a greater concentration of industries processing buffalo milk.

1.4.1.4. Horses

Brazil has 23 horse breeds (Table 4A of the Annex), of which 16 are considered exotic and seven naturalised. These are distributed countrywide but the breeders associations are concentrated in the South and Southeast regions, where most of the registered animals are found. In the same way as for the other species, no horses could be found in Brazil before the arrival of the colonisers. Those that arrived soon after the discovery were dispersed over the country and formed breeds that are considered naturalised today. Among these, the Pantaneiro is a breed that is very well adapted to the Pantanal biome. This breed was included in the conservation programme of Embrapa Genetic Resources and Biotechnology, due to the insistence of the breeders in the region and because it is the only one that can withstand local conditions, mainly on the management of beef cattle, the main economic activity in the region. The Marajoara and Lavradeiro breeds have similar histories to the Pantaneiro, as they are also very well adapted to the regions where they were naturally selected. Although the rest of the naturalised breeds were also dispersed as these, by the fact that their adaptation is to regions that do not have such extreme conditions, they have been substituted, little by little, by exotic breeds through absorbent crossbreeding.

In relation to the 16 exotic breeds, Brazil has excellent genetic material, shown by the great capacity it has to become an international reference in breeding this species. More than 20% of the national population has pedigree register and the studs that produce animals for jumping and races are concentrated in the South and Southeast regions.

1.4.1.5. Donkeys

All three donkey breeds found in Brazil are considered naturalised (Table 5A of the Annex). The Northeast region concentrates the greatest population and consequently the largest number of animals is that of the Jumento Nordestino (Northeastern Donkey), also known as “Jegue”. This denomination comes from the English name “jack”, a term used by English engineers when they referred to the donkeys during the construction of railroads in the Northeast

of Brazil. After a large reduction in the population due to implantation of slaughterhouses in the Northeast, that exported donkey meat for the preparation of rations for pets, the population is still decreasing, but with a tendency to stabilize. The other two breeds, the Jumento Pega and Jumento Brasileiro or Paulista, although less numerous than the Nordestino, are found mainly in the Southeast region and their populations are stable.

1.4.1.6. Sheep

Of the 23 breeds of sheep in Brazil (Table 6A of the Annex), thirteen are considered exotic and ten naturalised. The latter group has two types, wool and hair. Of the wool breeds, the Crioulo Lanado, reared in the extreme South of the country, produces naturally coloured wool and is used in craftwork. The hair sheep are found mainly in the Northeast and Centre-west regions, and have excellent quality hides. Of these, only the Somali Brasileira is considered a meat animal, the rest is considered dual purpose (meat and hide). Of the exotic breeds, seven are for meat production, two for wool, one for milk, one for hide and three are considered dual purpose. The distribution of these, by aptitude, is shown in Table 6, item 1.2.3. of this Report.

Due to the fact that the country reduced drastically its wool production in recent years, most wool breeds are stable or falling in numbers. Of all sheep breeds, the Dorper, recently introduced, shows the greatest population growth, due to the interest of breeders carrying out crosses with hair breeds in the Northeast. Contrary to most naturalised breeds, whose populations are stable, the Crioulo Lanado and Santa Inês are expanding rapidly.

1.4.1.7. Goats

Of the 17 breeds of goats found in Brazil (Table 7A of the Annex), ten are considered exotic and seven naturalised. Of the exotic, five are continually introduced, two were introduced in the first half of the 20th century and the last three were introduced recently. The populations of these exotic breeds are mostly stable, and three are in expansion. Due to indiscriminate crossbreeding among naturalised breeds in the Northeast region, purebred herds are becoming more and more scarce. This means that the goat population in the Northeast region (approximately 9 million head) is decreasing, and more and more animals are known as SRD (without defined breed), which means that conservation of pure breeds is a priority in that region of the country.

1.4.1.8. Pigs

Of the 32 pig breeds in Brazil (Table 8A in the Annex), six are for meat, five are mixed, twelve are naturalised (introduced by the colonisers) and nine are synthetic. Of the breeds classified as meat producers, with the exception of the Wessex, which is decreasing in numbers, and the Hampshire, which is stable, the rest are increasing. All mixed breeds, imported from England and United States, that were important until the 1960s, were made extinct in the South and Southeast during that period. This was due to a large volume of imports of meat type genetic material. Today few animals are left. The synthetic breeds are growing in population, except those produced by the JSR Company, which are stable in numbers.

Unfortunately, all naturalised breeds of the lard type are decreasing in numbers, as they have been substituted, little by little, for meat type breeds. This is due to the consumer demanding less fat. An exception, mentioned above, is the Monteiro, a feral population, which is stable, with a tendency to increase. This is due to a market niche, which appeared after the importation of the wild boar, an exotic wild species to which the Monteiro has been compared.

1.4.1.9. Poultry

Most poultry production in the country is based on the chicken breeds shown in Table 9A in the Annex. The breeds brought to Brazil are numerous and, to better visualize, were grouped according to their origin. They can still be found pure, with pedigree control, as six American breeds, separated due to plumage type in white, black, partridge, yellow, red; five English breeds; ten Asian/oriental breeds; three continental European breeds; seven admitted breeds; and seven without classification of origin, as well as one variety of miniature breeds.

In the industrial segment, commercial trade names were grouped by production traits (Table 9A in the Annex). There are seven layers of brown eggs; two colonial layers; seven of white eggs; eleven of meat chickens and four of colonial meat chickens.

As for other types of birds produced in the country, there are breeders of the following species: turkeys, ducks, muscovy ducks, geese, pheasants, quails, guinea fowl and ostrich, which have exchange mechanisms, not only for information as well as for genetic material. The most numerous of these is the quail, whose population is estimated to be 6 around million head, especially destined for egg production and the male destined for slaughter with a live weight of about 180g. It is not possible to estimate population size of the other mentioned species.

1.4.2. Animal Breeding Systems. Genetic Evaluation Systems

1.4.2.1. Beef Cattle

Due to its enormous population (with an estimated population in 2003 of more than 180 million head), the breed diversity and because they exist in all states in the federation, the bovine species is, without doubt, the most studied among all domestic animals in Brazil. Information from about 20 breeding programmes, described in item 2.1 of this report have been analysed and results sent to breeders, helping in herd selection decisions. All breeds were characterised phenotypically a long time ago, but genetic characterisation started more recently. This started with biochemical characterisation and later with molecular markers (PCR and microsatellites). At present, the country is working on genomic studies of this species. The high price of elite animals in auctions, usually in large agricultural fairs, means that advanced biotechnologies are being used more frequently and some private properties have their own teams working with up-to-date reproduction techniques.

1.4.2.2. Dairy Cattle

Practically all milk cattle breeds in use in Brazil are well characterised phenotypically and in general all have some type of production evaluation controlled by their respective associations, which also control the pedigree register. The Guernsey, which is decreasing in population and the Guzolando, which is in formation, are the exceptions. The biochemical characterisation was carried out some time ago and as with beef cattle, molecular work has begun recently. Artificial insemination is a common practice in milk cattle and embryo transfer is being used more often in high producing milk cattle.

1.4.2.3. Buffaloes

Due to the reduced number of buffalo breeds in the country, especially if two are considered naturalised (Carabao and Bay type) with very small population sizes, it was possible to evaluate the buffaloes in the country. With an active breeders association and populations concentrated in two regions, phenotypic data and cytogenetic and characterisation were possible on practically all buffalo breeds. Artificial insemination is used on three breeds that are considered exotic. The major limiting factor for improvement of Asian breeds is the narrow genetic base.

Buffalo breeders have been asking insistently for the liberation of importation of genetic material from India, which is forbidden due to serious sanitary problems in the past with animals from that country.

1.4.2.4. Horses

With the exception of the Lavradeiro, whose breeders' association is in formation, all the other breeds have been characterised phenotypically. The large number of breeder's associations (about 20) shows the appreciation of horses in the country. This means that no Brazilian can imagine including horsemeat in his diet. Contrary to other domestic animals, horses are usually not evaluated for production traits but for specific aptitudes. Functional tests in races; jumping, equestrian competitions (stamina, roping, drum, reins and dressage) as in work tests (driving cattle, traction and exercises) are some ways of evaluating horses.

Recently, the use of horses in leisure activities for people with neurological problems was discovered and created a new aptitude for this species: equine-therapy. This is a therapeutic and educational method, which uses the horse in an interdisciplinary way, including the areas of health, education and riding, aiming at improving the bio-psycho-social development of people with deficiencies and/or special needs. The animal is used as a promoting agent for physical, psychological and educational gain as it requires the use of the whole body of the individual, contributing to the development of muscle tone, flexibility, relaxation, body awareness and improvement of motor coordination and strength.

1.4.2.5. Donkeys

The traits of the three donkey breeds in the country are well known as they have breeder's associations, and therefore already have their phenotypic descriptions elaborated and accepted by the Ministry of Agriculture, Livestock and Food Supply – MAPA (Table 4A in the Annex). The molecular characterisation is in the initial stages. In reproductive terms, both artificial insemination and embryo transfer have been used in the Pega breed, while only artificial inseminations have been used in the other two breeds.

1.4.2.6. Sheep

Because of a strong breeders' association at national level (ARCO), the 23 sheep breeds found in Brazil are characterised phenotypically (Table 6A in the Annex). Of these, 15 (65%) have had production traits analysed. As most exotic breeds are from countries where they still exist and have been exhaustively studied (England, Australia, etc...), Brazilian researchers have not looked to carry out genetic characterisation. The naturalised breeds, as they are threatened with extinction, are being genetically characterised and the results will be used for breeding decisions in conservation nuclei. This will include information on racial purity and selection of animals as germplasm donors. Elite herd owners (known as *cabanheiros* in the South region as well as in Argentina and in Uruguay), usually use artificial insemination with fresh semen from rams within their own herd. The methodology for embryo transfer in this species is well known but little used in Brazil.

1.4.2.7. Goats

All goat breeds in the country (Table 7A of the Annex) have been described phenotypically but their biochemical and molecular characterisation are being carried out more slowly than with cattle. Practically 94% of the population is in the Northeast region, which does not have the same laboratory infrastructure compared to other regions. Most of the animals belong to smallholders and assisted reproduction methods are practically inexistent with these breeds,

although qualified technicians exist, and breeders of most exotic breeds use these to increase milk and meat production.

1.4.2.8. Pigs

Generally, all pig breeds have been characterised phenotypically. The production traits of meat breeds used by the industry are well known, in contrast with naturalised lard type breeds, used mainly in subsistence agriculture. A research project began recently which includes molecular characterisation of both groups. Although pig genetic in the country depends on importation of genetic material, the processed meat industry invests a lot on the selection of animals in the integrated production units, and has technicians in their staff constantly in contact with the farmers. Pig farming in the country uses the most efficient reproduction techniques, including artificial insemination with fresh semen. There is a lot of effort towards *in situ* conservation of naturalised breeds which are ignored by industry due to their fat content and, for this reason, are at risk of extinction. These breeds have genes for resistance and adaptation that are important for future genetic engineering studies when these genes could be transferred to commercial breeds.

1.4.2.9. Poultry

The breeders of this species have a series problem, which is the prohibition of importation of genetic material to reduce inbreeding. Many families of poultry, maintained by the breeders, are becoming extinct due to high consanguinity and difficulty in acquire roosters for reproduction. As a general rule, all families that were introduced at least 20 years ago are at risk of extinction. The largest source of genetic material of these breeds for Brazil has been the neighbouring countries (Uruguay, Argentina and Paraguay), which have easier exchange possibilities with Europe, Asia and United States. In Brazil, the risk of introduction of illness in poultry farming makes it difficult to obtain authorization for importation of genetic material.

1.4.3. Crossbreeding Systems. Proposals

Crossbreeding exists to make use of additive advantages of the breeds and heterosis or hybrid vigour, which would be expressed in the offspring, making animals more rustic, parasite resistant, heat tolerant, as well as productive and reproductively efficient.

1.4.3.1. Beef Cattle

There are two types of crosses used in beef cattle, which vary according to region. In the south of the country, where the climate is temperate, the use of European females predominates crossed with that have at most 3/8 zebu blood. In Central Brazil, with a tropical climate, the opposite occurs, using zebu females crossed with European- cross bulls. In this case, the proportion of European blood in the calf is usually no greater than 3/8. More recently, the Caracu, a naturalised breed, also began to be used in Central Brazil because of its degree of adaptation. Throughout the years, crosses between European and Zebu breeds carried out in the country, produced synthetic breeds. In the South region, the Ibagé was formed, from Nellore bulls crossed with Aberdeen Angus cows. More recently, and to facilitate exchanges with other countries, this breed started to be called Ibagé-Brangus. Similarly in the State of São Paulo, the Canchim was formed from crossing Nellore and Charolais. Both of the above started in the 1940s. A synthetic breed that is generating a lot of interest among breeders, formed by a cross between Hereford and Nellore breeds, was initially called Pampeana and more recently as with the Ibagé, started to be called Pampeana-Braford, facilitating exchange with other countries.

1.4.3.2. Dairy Cattle

It is estimated that 95% of the milk cattle in Brazil is formed by crossbred animals, with varying degrees of blood, predominating the Holstein x Gyr cross and less intensively the Holstein x Guzerat, Brown Swiss x Zebu in general, and triple crosses between the Holstein and Brown Swiss or Jersey with any of the Zebu breeds, Gyr or Guzerat. The crossbreeding strategies used in Brazil depend on the management level and feeding in the production system. For the different milk production systems, the main crossbreeding strategies used include: (a) simple alternate cross (E-Z), where bulls of European (E) and Zebu (Z) bulls are used alternatively, in each generation, establishing a population with the predominance of animals with about 2/3 genes of European breeds and 1/3 Zebu breeds; (b) alternate cross with repetition of European blood (E-E-Z), indicated where 1/2 blood cows are bred to bulls of European breeds for two generations, alternating with a Zebu bull – in this way products vary between 3/7 and 6/7 genes of European blood; (c) absorbent cross, where only bulls of a single breed are used, until a PC (pure by crossing) animal is obtained; (d) formation of a new breed, called synthetic, which consists of the creation of a population with a predetermined degree of crossing, in general 5/8 European and 3/8 Zebu, such as the Girolando breed; and (e) the continual production of 1/2 blood (F_1) females, generally from crosses between European bulls and Zebu cows or vice-versa.

1.4.3.3. Buffaloes

Generally, crossbreeding is not a common practice in buffalo breeding in Brazil. Nevertheless, in some regions, where they are reared extensively, crosses between Murrah and Mediterranean breeds can be found.

1.4.3.4. Horses

Breeders of this species rarely cross horse breeds. This happens, usually on properties with low level of technology, when the farmer decides to use a stallion of breeds such as Manga-Larga-Marchador or Campolina, to improve the whole herd. The use of horses in crosses with donkeys (or vice-versa) is explained below, in the item on donkeys.

1.4.3.5. Donkeys

Crosses of the Northeastern donkey with animals from the Brasileira or Pega breeds are not rare, aiming to increase the size of the former. The main reason for using donkeys in crosses is for the formation of mules, formed by crossing the jackass with a mare, or hinnies, crossing a stallion with a female donkey. The result of a cross between a *Equus caballus* L. (horse) and *Equus asinus* L. (donkey) is a sterile hybrid. Mules are docile animals that are easy to manage and show an incredible versatility for any type of activity, be it work or leisure. In a culture where the horse always had popular preference, because of its presence, intelligence, status and commercial value, there has been a recent increase in the market for mules, with the rediscovery that the qualities that were desired in a horse could easily be found in this hybrid, which has the advantage of resistance. This fact has led to an increase in the quantity and value of animals sold.

1.4.3.6. Sheep

Generally, sheep production is carried out in extensive systems in the country, as in Europe where the herds are kept pure and improvement comes via selection. In the Northeast region, where most breeders have a small number of animals, completely crossbred herds are easy to find which is worrying to researchers who see this practice as a serious threat to pure

breeds. On rural properties of the Northeastern states, which have a significant effective population size, there is a predominance of the Santa Inês

breed, which is, without any doubt, the most popular. In recent years, crossbreeding with Dorper has been carried out, a semi-hair sheep from South Africa on Brazilian Somali females. This cross may be finishing or absorbent for meat production, and the result is a carcass with lower fat content than pure Brazilian Somali.

1.4.3.7. Goats

The major worry in the conservation of goat genetic resources is the miscegenation among breeds, through indiscriminate crossing, generating a huge population known as SRD, or Without Defined Breed. The small number of breeders in the Northeast region who have pure herds of naturalised breeds, tend not to use crossbreeding. The breeders of exotic goats, on the other hand, are always looking for new alternatives to increase production of meat or milk. To increase meat production, naturalised breeds are being crossed, in a small number of cases, with specialised exotic breeds such as the Boer. The industrial cross of this breed with native females can give males ready for slaughter at a mean age of six weeks, while females can be bred at twelve months of age. Artificial insemination is being used on a small scale to increase milk production, using Alpine and Toggenburg breeds.

1.4.3.8. Pigs

In intensive rearing systems, used by the industry for meat breeds, there are crossbreeding systems, which aim to produce an animal to meet customer needs. In this way, more than 90% of the production used F_1 females of the white breeds Landrace and Large White, crossed with pure or synthetic finishing males, especially Duroc, Pietrain and Large White. The F_1 female line gives higher prolificacy to the production system, while the finisher male line imprints greater food conversion and more meat in the carcass of slaughter animals. On the other side, naturalised breeds, of the lard type, are crossed indiscriminately, which is very worrying for researchers, due to the imminent disappearance of these as pure breeds.

CHAPTER 2

ANALYSIS OF CHANGES AND TRENDS IN NATIONAL ANIMAL PRODUCTION AND ITS IMPLICATIONS ON NATIONAL POLICIES, STRATEGIES AND FUTURE PROGRAMMES RELATED TO ANIMAL GENETIC RESOURCES

2.1. POLICIES, STRATEGIES AND BREEDING PROGRAMS FOR ANIMAL GENETIC RESOURCES IN BRAZIL

There are, in Brazil, approximately twenty animal breeding programmes with different focal points and for distinct breeds and species. Most of them are for cattle breeding.

2.1.1. Beef Cattle – Taurine Breeds

2.1.1.1. Promebo®.

The Breeding Programme for Meat Cattle - Promebo was developed by the National Breeders Association - Herd Book Collares and its aim is to obtain genetic gain using secure tools in the choice of improved animals. It is a programme open to any beef breed of European origin and their crossbreds. The main objective of Promebo is to increase selection precision within and between herds, for heritable traits of economic importance such as birth weight, pre-weaning weight gain, post-weaning weight gain, regular reproduction, maternal ability and conformation. The estimates are expressed as Expected Progeny Differences (EPDs). An important feature of Promebo is that the breeders cannot carry out a pre-selection of their animals, i.e. once the breeder decides to take part in the programme; all the animals in his herd have to be included.

2.1.2. Beef Cattle – Zebu Breeds

Given the importance of Zebu breeds to animal production in Brazil, various breeding programmes help breeders in decision making within their herds. Some of these programmes are presented below. In the first group, which includes 13 programmes, the animals receive a CEIP – Special Certificate of Identification and Production, which is issued with the permission of the Ministry of Agriculture, Livestock and Food Supply - MAPA. Although these 13 programmes have a clear predominance of the Nellore breed, some synthetic breeds, which have zebu blood in their formation, were also included. The programmes, with their respective breeds include: (1) South American Nature Genetics, Brangus; (2) Delta G, Hereford; (3) Delta G, Nellore; (4) Delta G, Braford; (5) CFM, Nellore; (6) CFM, Montana composite; (7) Angus Belavista Pecuária, Brangus and Braford; (8) PMGRN, Nellore; (9) Paquetá group, Nellore; (10) Paquetá group, Brangus; (11) Paint, Nellore; (12) Qualitas, Nellore; (13) Pastoril Potrilho, Nellore. The general objective of these programmes is to increase reproductive efficiency and growth rate in beef herds as well as define selection criteria, using classical breeding techniques allied with modern biotechnologies which lead to a significant increase in national productivity. Only those animals, which truly stand out (classified in the top 20%) receive the CEIP.

There are two other programmes for zebu breeders, PMGZ (Breeding Programme for Zebu Cattle), of the Brazilian Association of Zebu Breeders, and Geneplus, coordinated by Embrapa Gado de Corte (EMBRAPA Beef Cattle), which are described below.

2.1.2.1. Breeding Programme for Zebu Cattle - PMGZ

The Breeding Programme for Zebu Cattle - PMGZ, run by the Brazilian Association of Zebu Breeders - ABCZ is analysed by the researchers of Embrapa Gado de Corte, and offers its users the possibility of identifying superior animals calculating Expected Progeny Differences (EPDs) for weight, weight gain at different ages as well as fertility traits and reproductive efficiency, among others. This is a national programme and includes all zebu breeds. It has a huge Data Base with information on more than 1.5 million animals, with about 65,000 new animals being included each year. Its four production tests mean that all Zebu cattle, young and old, can receive genetic evaluation. The breeders easily interpret the information from these, which facilitates decision-making. With the aim to improve Zebu cattle, the ABCZ also collaborates with various societies related to animal research as well a dozen of universities, offering production and genealogy data.

2.1.2.2. Embrapa Beef Cattle Breeding Programme - GENEPLUS

Coordinated by Embrapa Gado de Corte, Geneplus was created in 1995 and consists of software, which allows the formation of a database by the breeder that can then undergo a genetic analysis. It evaluates sires, dams and young animals, not just purebreds but also crossbreds, with respect to their production and reproduction, aiming at greater meat production per hectare. In 2003, the database had 728,000 animals. The information produced helps breeders in the selection of animals for the following traits: reproduction efficiency, weight gain, sexual precocity, finishing score and muscle development. The results are also presented as EPDs, which are calculated for age at first calving, calving interval, gestation period, service period, scrotal circumference as well as weights and weight gains at different ages.

2.1.3. Dairy Cattle

Of the European breeds in the country, only the Holstein has recently acquired a breeding programme, with only a few bulls being progeny tested. Generally the breeders of this breed use genetic material originated and selected in countries with temperate climates, especially the United States of America, Canada and Europe. The probable genotype environment interaction is not taken into account. In the same way, many other breeders of European cattle use imported genetic material.

The zebu breeds, Gyr and Guzarat, also have national breeding programmes, which use progeny tests. Their main objective is to promote genetic improvement of these breeds by identification and selection of bulls that are genetically superior for milk production and its constituents, as well as conformation and management traits. On an annual basis, approximately 15 to 20 young Gyr bulls are tested as well as between eight and ten Guzarat bulls. To date 98 Gyr bulls have been tested, with 90 awaiting test results, totalling 188 bulls. The main trait studied is accumulated 305-day milk production and, each year, approximately 5,000 lactations are analysed. The relationship matrix uses up to three generations of ascendants in the genealogical file.

The programme for the Guzarat breed is more recent, with 23 bulls having genetic values for milk production and constituents and 17 are awaiting test results, totalling 40 bulls. The

progeny test for this breed is integrated with a Multiple Ovulation and Embryo Transfer Nucleus (MOET), which aims to increase selection intensity and therefore speed up selection, with early identification of sires that are genetically superior for milk production. More than 20 families are being evaluated, and 15 have their genetic values available. These are being used intensively in herds of this breed, as are sires which have been progeny tested. Of the synthetic breeds, only the Girolando has a breeding programme, which includes a progeny test. This began recently and tests between six and eight bulls a year. The programme has 26 bulls awaiting test results, which should be published in 2003. The Holstein, Gyr, Guzerat and Sindhi dams also undergo genetic evaluations, using the same techniques used for sire evaluation. The results are sent to the breeders to help in management decisions such as mating and culling.

2.1.4. Buffaloes

2.1.4.1. Promebul

The Buffalo Genetic Improvement Project – Promebul, aims to genetically improve the species, for efficient meat and milk production in different ecosystems, thereby benefiting all segments involved in buffalo production. The traits evaluated include: sexual precocity, fertility, maternal ability, weights at birth and weaning as well as at 12 and 18 months of age, scrotal circumference at 12, 18 and 24 months, longevity, and milk and fat production. The evaluation of progeny at farm level is carried out by the control of development in an official locality, by Central Weight Gain Tests. The database has data on 4,625 dams from 15 herds from six Brazilian states.

2.1.5. Other species

2.1.5.1. Pigs

The genetic base of pigs in Brazil is based on the expansion of meat breeds and synthetics. The latter, generally, are nuclei of companies based in the United States of America, Canada and Europe, which remain linked to the matrix-breeding programme and frequently import animals and/or semen to maintain genetic progress in their herds. Some Brazilian companies maintain their breeding programmes based on the use of genetic material of meat breeds. These are responsible for the whole production pyramid that starts with nucleus herds, through multiplication herds and ends at the termination herds, which is made up of their own integrated farms. In addition, the Brazilian Association of Swine Breeders – ABCS, maintains a programme that includes control of genealogy and production tests (on-farm test and sire test in central station) called SUIGEN. This gives technical support for independent producers of genetic material. This entity also controls programmes of production of synthetic breeds in the country.

2.1.5.2. Poultry

As with pigs, the poultry industry depends on multinational companies which import genetic material for use in the national industry. The commercial production of meat and eggs was generated from a limited genetic base involving two egg-producing breeds (White Leghorn and Rhode Island Red) and two meat-producing breeds (Plymouth Rock and Cornish). These lines are distributed by a few companies to the majority of countries, thereby limiting genetic variability of commercial material and, in consequence, the creation of breeding programmes.

2.2. ASPECTS LINKED TO FEEDING, HEALTH AND MARKET FOR ANIMAL PRODUCTS

2.2.1. Animal Feeding

The beef cattle industry in Brazil is based at pasture. Nevertheless, and although mad cow disease has never been diagnosed in the country, the use of rations containing protein of animal origin was banned in 2001 for ruminant feeding as the national herd may have been at risk. The Instruction of the Ministry of Agriculture, Livestock and Food Supply bans the importation of ruminants, embryos and products of ruminant origin from countries that have registered mad cow disease. The prohibition includes meat and viscera, blood derivatives, blood meal, meat and bone meal, meal from poultry abattoir residues, feather and viscera meal as well as any ingredient or prime material, which contains viscera of animals fed with ruminant protein or fat. The Normative Instruction 15, published in February 2003, determines that the label of products destined for animal feed that contains any source of mammal fat or protein should highlight the following expression: *“Use Prohibited for Ruminant Feeding”*.

Recently, the Ministry for Agriculture, Livestock and Food Supply - MAPA formed a working group with representatives from the Ministry, Embrapa and Universities, which should develop a project identifying bottlenecks and propose measures to intensify inspection of the production, market and use of products destined for animal feed.

2.2.2. Animal Health

The Ministry for Agriculture, Livestock and Food Supply - MAPA, through its 27 Federal Delegacies of Agriculture, decentralized units, each located in a Brazilian state, is responsible for activities and programmes of animal health and rural development. Included in its duties, MAPA has a Secretariat for Agricultural Defence – SDA, which has the mission to assure herd health; the trustworthiness of inputs and services used in agriculture; the identity and hygienic-sanitary security and technology of final agricultural products destined for the consumer. The fact they could receive an institutional seal of quality contributed to an improvement of herd health as well as products and services, encouraging the commercial opening of new markets and offering animals and animal products of certified quality to the Brazilian consumer as well as export markets, through control and eradication of the main diseases that affected Brazilian herds.

The Department of Animal Health/DDA, is a structural part of the Secretariat of Agricultural Defence/SDA, and is the organ responsible for the elaboration of animal health directives which are part of the agricultural policies; for the promotion of and carrying out of prophylactic activities and combating animal diseases, as well as inspection of veterinary products; animal traffic at local, regional or international levels, as well as the activities of official feed quality control and diagnostic laboratories. On the other hand, the DDA is responsible for the supervision of activities of the State delegates for some actions related to animal health.

Among the Animal Health programmes it is worthwhile highlighting at a national level the National Programme for Control of Rabies in Herbivores and other Encephalitis; National Programme for Health Education/PNES; National Programme for Poultry Health/ PNSA; National Programme for Swine Health/ PNSS; National Programme for Control and Eradication of Brucellosis and Tuberculosis/PNCEBT; National Programme for Equine Health and Health Programme for Goats and Sheep/PISCO.

The performance of Brazilian animal production in the international marketplace is due to the joint action of national and state governments with the private sector. With this partnership, the country managed to intensify the National Programme for the Eradication of Foot and

Mouth Disease. Today more than 80% of the cattle herd in Brazil is in the zone free of the disease with vaccination. Recently Brazil was also classified by the Veterinary Committee of the European Union as an area of “negligible” risk for Mad Cow Disease (BSE). The excellent health of the national herd has been a decisive factor for growth in beef exports.

The health question in pigs is monitored from the certification of herds that produce genetic material by the MAPA (GRSC – Certified Swine Sire Herd), to the industrial production that is audited by Official State Programs in Animal Health.

2.3. ANALYSIS OF FUTURE DEMAND AND TRENDS

Although Brazil is a large producer of foodstuffs, the greater part of this is destined for exportation. Present government policies prioritise the development of family agriculture, as it understands that fixing the worker in rural settings avoids rural exodus, as well as reduces job pressure and increases social well being in urban centres. In an aim to establish the technological level necessary for success of the Family Agriculture Program, various State Agriculture Research Institutions proposed a joint work plan. They have hundreds of experimental units in diverse regions of the country, close to the users of services, products and technologies of Family Agriculture. The following basic lines can be highlighted: (a) development of production systems for small properties, involving more than one hundred products including fruit, vegetables, grains and animals, adapted to the various regions of the country; (b) generation and adaptation of agricultural technologies for adding value and at the same time suitable for the smallholder; (c) agro-ecological and socio-economic zoning for main production systems; (d) development of studies in the socio-economic and rural administration areas, aiming to improve managerial capacity of the smallholder; (e) development of projects which supply young fish (alevin), dams and vaccines.

2.3.1. Technological and Consumer Demand Changes and Their Future Impact

Some technological or consumer preference changes will have a large impact on national animal production. Those such as assisted reproduction, traceability, production of early maturing steers and lean or exotic meats are trends, which should be pursued as they add value to the animals and their products.

2.3.1.1. Assisted Reproduction Techniques

Assisted reproduction techniques, especially in beef cattle, are increasing year by year in the country, which is reflected in the increased production of cryopreserved genetic material, not only for the internal but also external market. With the recent declaration of Brazilian zones free of Foot and Mouth Disease by the International Organization of Epizootics – OIE, and the guarantee of fertility and health with which semen is produced in Brazil, official exportations to dozens of countries worldwide occur. There is a trend for this to increase and become more frequent. In the area of embryo transfer, modern techniques are used routinely, multiplying the reproductive power of genetically superior dams and accelerating genetic improvement within the herd. The country is, at present, in second place for the volume of embryo transfers on a worldwide scale (with approximately 82,000 transfers per year). About 400 technicians are involved in carrying out and improvement of techniques linked to transfer, such as sexing embryos, *in vitro* fertilization (IVF), cloning, among others. For IVF, for example, there are already 20 research groups and some private laboratories, which develop techniques in this area, with six laboratories working with cloning.

2.3.1.2. Traceability

A new concept attached to the supply chain of beef, as well as quality, sustainable production techniques, environmental protection and social justice is the traceability of the animal that

generated the product. Due to the requirements of the European Union, which imports 80% of all beef exported from Brazil, this product should be accompanied by detailed information on the history of the animal, such as birthplace, genealogy, management and feeding strategies used, where it was reared and any illnesses, how long they lasted, vaccinations, medications and drugs used, as well as sex, age and slaughter weight. Mechanisms for individual animal monitoring including marking, tattooing, electronic devices in the ear or even chips are being used. At the start of 2002, using technologies generated by EMBRAPA, MAPA launched the Brazilian System of Identification and Certification of Products of Cattle and Buffalo Origin (SISBOV), containing information on all production phases from birth to the slaughterhouse.

2.3.1.3. Early Maturing Steers Programmes

The organic veal programme in the Pantanal is just one of the many programmes that aim to produce early maturing steers that are beginning all over the country. This programme began in 2000 and its main goal is to offer tender meat produced from wholly organic feeds. In this programme, animals are slaughtered between 10 and 12 months of age with a minimum live weight of 180 kg. This is a very important programme for the Pantanal in Mato Grosso do Sul State, since this region is appropriate for raising young but not fattening cattle. Therefore the creation of this programme does not imply on forest devastation to create new cultivated pastures, which increase weed incidence. The trend towards the production of younger animals includes buffalo production with the creation of “baby” buffalo as mentioned earlier.

2.3.1.4. Demand for Low Fat Meats

To meet consumer demands for low fat meats, researchers from Embrapa Suínos e Aves (Embrapa Swine and Poultry), together with the private sector, developed two lines of pigs considered “light” (Embrapa MS58 and MS60). The most recent, the finishing male Embrapa MS60 is characterised by meat percentage in the carcass above 60%, reduced fat cover with excellent conformation, high concentration of meat in the leg and back and shoulder. It has excellent feed conversion, a very important trait for economic return in pig rearing. A special trait of the Embrapa MS60 is that is free of the halothane gene (Hal^{NN}), which means it is more stress resistant and consequently can produce better quality meat. Launched in the second half of the 1990s, at a time when slaughterhouses in the South region of the country officially started grading carcasses, these lines were responsible for adding value to slaughter pigs, produced mainly by small and medium sized farmers.

2.3.1.5. Utilisation of Naturalised Breeds

The emphasis that Brazil has been giving in the last decade to family agriculture, to organic production, to products denominated natural and, to the organisation of small cooperatives has contributed to a review of actual production methods, creating more space for a renewal in the use of naturalised breeds. Research has given support to a return of animal fat to the consumer table, substituting vegetable oils, which had taken their place in the past. Therefore, it is probable that the smallholder will prefer an animal that is intermediary between what the industry demands today and these animals, in other words, produces meat and fat in more adequate proportions for the farmer and his family, as well as local and regional markets. Another contribution of naturalised breeds may be an improvement in meat quality, mainly when consumed “*in natura*”, which has been affected by selection intensity practiced on today’s industrialised animals.

2.3.1.6. Demand for Exotic Meats

An increase in the demand for exotic meats meant that the Monteiro pig, a naturalised breed used only in the Pantanal Mato-grossense, caught the eye of breeders in other regions of the

country. This breed, considered feral, is different as it presents a higher percentage of meat in the carcass than other naturalised breeds. As it is similar to the wild boar (javali), its meat is highly valued and has a high demand in large urban centres where it is consumed in exotic meat restaurants or in agro-tourism establishments. As wild boar meat is difficult to produce, being an animal which is both exotic and wild, and therefore requires a special license from IBAMA, some breeders are testing crossbreds of Monteiro with wild boar, forming the “javonteiro” to meet this market demand. Therefore, they can produce meat that is considered exotic and can demand a much higher price than industrialised meat.

2.3.2. Relation Between Animal Genetic Resources and Market Changes

It is important that techniques developed in conservation work find economic use for each one of the breeds being conserved. Research alone does not conserve breeds and a partnership with private breeders is of fundamental importance for conservation success. Below some successful cases of conservation of breeds from different species in Brazil are presented.

2.3.2.1. Caracu Cattle Breed

If in the 1980s, breeders involved in conservation of animal genetic resources had suggested that beef cattle farmers use animals from naturalised breeds in their herds, they certainly would have been considered retrogrades. Fortunately, time has shown that the adaptation, rusticity, parasite resistance as well as tolerance to heat as well as to some illnesses, shown by many of these breeds, are traits well worth investigating. Therefore, although still on a small scale, a return to the use of some of these breeds can be perceived. A specific case is of the Caracu cattle breed, used as purebreds or in crossbreeding with Zebu cattle, contrary to what happened when Zebu breeds arrived on the continent, which almost led to the extinction of the Caracu.

2.3.2.2. Fat Type Pig Breeds

Due to the variety of adapted types in diverse biomes, territorial size, as well as its grain production capacity, Brazil has a huge potential for pig rearing. The naturalised pig breeds can contribute to breeding programs and the formation of a breed ideal for organic production, or even the production of meat from a “country pig”, as happens with poultry. Demand is increasing and may be used in family agriculture programmes as well as the “Hunger Zero” programme. They are also adequate for use in settlements and smallholdings. There are at least twelve types of naturalised pigs found in Brazil. All are of the lard type, found preferentially on small properties in rural areas.

2.3.2.3. Pantaneiro Horse

The Pantaneiro horse, a breed that has high tolerance to Infectious Equine Anaemia, was threatened with extinction due to indiscriminate crossbreeding with other breeds. Thanks to the formation of the Breeders Association and the inclusion of this breed in the programme of Conservation of Animal Genetic Resources by Embrapa, as well as a series of studies on this breed such as phenotypic and genetic characterisation as well as animal health, this breed has become more important in the Pantanal Mato-grossense. This is the only breed that can be used for working with cattle, the main economic activity in the region.

2.3.2.4. Crioulo Lanado Sheep

As it produces a naturally coloured fleece, varying from white to black, passing through many tones of grey and brown, and is much used in the craft industry, the Crioulo Lanado sheep has once again caught the attention of breeders. The wool is of poor quality compared to specialized breeds and therefore was ignored by the industry. Aiming to increase the use of craft products, the government of Rio Grande do Sul State started courses that taught young rural people to weave wool from, and knit with, the wool from the Crioulo Lanado sheep. This increased the demand for the wool, and was reflected in an increase in the number of nuclei from five to more than thirty. Finally recognized as a breed, this breed has its pedigree controlled by ARCO. It is one more example of successful conservation with the identification of a market niche for a breed that was once threatened with extinction. Recently, Japanese importers have expressed interest in using this wool in their carpet industry.

2.3.2.5. Organic Production

Generally there are high expectations for growth in internal demand for products of animal origin, as well as more responsibility in terms of sustainability, focusing on social questions, environmental preservation, animal well being, food safety and the quality of the final product. On the other hand, the Brazilian government is giving more emphasis to family agriculture, added value at origin, associative movements, organization of small cooperatives and stimulus to family or cooperative agro-industries, as well as the movement towards organic production. It is clear that new production systems should be conceived and stimulated, which deserve attention and research.

CHAPTER 3

EXAMINATION OF INSTALLED NATIONAL CAPACITY AND OF FUTURE NEEDS RELATED TO MANAGEMENT, DEVELOPMENT AND CONSERVATION OF ANIMAL GENETIC RESOURCES

3.1. EDUCATIONAL SYSTEM

3.1.1. Undergraduate Courses in Agricultural Sciences

Higher education in areas related to Agricultural Sciences is quite old in Brazil. Agronomy courses were the first to be created in the country, with the Agronomy Faculty Eliseu Maciel, the oldest in Brazil, founded in 1892, in Pelotas, Rio Grande do Sul. Initially linked to the Ministry of Agriculture, the federal Agronomy faculties were passed to the Ministry of Education. Most of the faculties in the area of Agriculture are linked to the government, either state or federal. Nevertheless there are some that have been created more recently, in private universities, especially in Animal Production and Veterinary Medicine. In 2001, including undergraduates in Agronomy and Veterinary Medicine, a total of 59,745 students were registered. Table 15 shows the total number of undergraduate courses in the various areas linked to Agricultural Sciences.

Table 15 – Number of Higher Education Courses in the Various Areas of Agricultural Sciences (2001)

NAME OF THE COURSE	Number of Courses
Agronomy	98
Veterinary Medicine	100
Animal Production	41
Forestry	24
Agricultural Engineering	18
Fisheries Engineering	8

Source: MEC/ INEP

3.1.2. Post-Graduate Courses in Agricultural Sciences

Brazil has a high number of post-graduate courses in Agricultural Sciences. The number is a direct result of the investment made between the decades of 70 to 90 when a large number of researchers were sent abroad to be trained at post-graduate level, especially in the United States of America and Europe. When these returned with their degrees, it was not only possible to create various post-graduate programs in the country, but also form various research teams in the National Centres for Agricultural Research which were created with the formation of the Brazilian Company for Agricultural Research (EMBRAPA) in 1973. Therefore the formation of human resources for research in Brazil is strongly linked to an extensive program of post-graduation, which follows the American model with masters and doctors programs, lasting on average 2.5 to 5 years respectively. There is a tendency to reduce these times. At the end of 2002, the number of lecturers on post-graduate courses in the various fields of Agronomy, Veterinary Medicine and Animal Production was 3,141, while the number of registered students was 5,383 on Master's courses and 4,019 on Doctor's courses. The number of post-graduate courses in the various areas of Agricultural Sciences can be seen in Table 16, below.

Table 16 - Number of post-graduate programs in the various areas of Agricultural Sciences, by graduate level

AREA	M	D	M/D	Total
Agronomy	34	0	48	82
Feed Science and Technology	14	0	9	23
Agricultural Engineering	4	0	5	9
Veterinary Medicine	13	1	14	28
Forest Resources and Engineering	4	1	5	10
Fish Resources and Engineering	4	0	1	5
Animal Production	12	1	9	22
TOTAL	85	3	91	179

Source: Capes/MEC – Base Year: 2002 M = Masters; D = Doctorate

Biological Sciences have a further 154 post-graduate courses, many of which contemplate areas of Agricultural Sciences, such as Genetics and Molecular Biology, involving genetic characterisation, genome studies, etc..

3.1.3. Agricultural Research Carried out in Brazilian Universities

Research in Brazilian Universities is concentrated basically in public universities, federal and state, which produce about 90% of the national scientific research. The private universities have very little input in this scenario, with few exceptions. Generally, university research is financed with resources outside its annual budget, and they have to provide basic infrastructure such as libraries, computer facilities, physical space for laboratories and human resources, financed through CAPES, linked to the Education Ministry. The most important sources of support for university research are through the Ministry of Science and Technology /MCT, through CNPq and FINEP, as well as state foundations for funding and support of research, which has allowed the national scientific base to expand both qualitatively and quantitatively. Unfortunately, few state foundations for funding and support of research exist that apply substantial resources in research, although more frequently, this is being demanded as a counterpart for federal financing.

3.2. RESEARCH AND DEVELOPMENT ACTIVITIES IN AGRICULTURE IN BRAZIL

Research and Development activities in Brazil have always been essentially public duties. Science and Technology in the rural sector have been developed mainly in public education and research centres, with a high concentration in federal institutions, with a much more discrete participation by the private sector and institutions linked to agricultural services. Some areas linked to the sector, in defined fields of strategic research, in technological development, production and even industrial policy, have been financed directly by the Ministry of Agriculture, Fisheries and Supply. The contribution of Science and Technology to the sector has mainly been to the large post-graduate system and financing of research institutions.

3.2.1. Brazilian Agricultural Research Corporation - EMBRAPA

Created on the 26th of April, 1973, the Brazilian Agricultural Research Corporation - Embrapa has the mission to develop solutions for the sustainable development of Brazilian agribusiness by generating, adapting and transferring knowledge and technologies for the benefit of society. It works through 37 research centres, three services and eleven central units, being present in almost all Brazilian states, in the most varied ecological conditions. To become one of the largest research institutions in the tropical world, the company invested, above all, in training human resources. Today it has 8,800 employees, of which about 2,300 are researchers. Of these, 45% have a master's degree and 53% a doctorate. The Corporation has an annual budget of approximately US\$ 230 million.

Embrapa has three types of Agricultural Research Centres: Product Centres, Thematic Centres and Ecoregional Centres. Of the Product Centres, four work with one or two animal species, and were strategically placed in regions of the country where these species are economically important. Thus, Embrapa has national research centres for animal species including the following: beef cattle, in Campo Grande, Mato Grosso do Sul; dairy cattle in Juiz de Fora, Minas Gerais; goats and hair sheep, in Sobral, Ceará; and pigs and poultry, in Concórdia, Santa Catarina. Of the Thematic Centres, the only one which works with animals is the National Research Centre for Genetic Resources and Biotechnology – Cenargen, located in Brasília, Federal District. Cenargen is the centre that coordinates activities linked to conservation of genetic resources, through a research network called the National Network for Genetic Resources – RENARGEN. Finally, there are centres for research in specific environments (Ecoregional research centres), many of which also work with animal species: in the Mid-North region, in Teresina, Piauí, where work is carried out with beef cattle, goats and hair sheep; Pantanal, in Corumbá, Mato Grosso do Sul, with beef cattle, horses, pigs and wild animals from the region; Tabuleiros Costeiros, in Aracaju, Sergipe, with hair sheep; the Cerrados, in Brasília, Federal District with cattle; the Southeast, in São Carlos, São Paulo, with beef and dairy cattle, as well as horses; and the Southern Fields, in Bagé, Rio Grande do Sul, with beef and dairy cattle and sheep. In the Amazon Region there are two centres working with animals: Roraima, with horses, and one in the Eastern Amazon region, in Belém, Pará, with buffaloes, horses and wild animals from that region.

3.2.1.1. National Research Centre for Genetic Resources and Biotechnology - CENARGEN

CENARGEN is a thematic centre that has 122 researchers. The Centre aims to conserve and characterise genetic resources (plants, animals and micro-organisms), as well as develop biotechnologies. The animal research team, which has 12 researchers, has specialists in conservation *per se*, genetic characterisation and animal reproduction. Of these, seven have doctor's degrees, four are at present studying for their doctorates in research lines associated with animal genetic characterisation, and one has a master's degree.

As well as the Animal Germplasm Bank (shown above in Table 14), located at the Sucupira Experimental Farm, a 1,800 hectare property, located approximately 30 km from the base unit, there is also the Animal Genetic Laboratory, three Animal Reproduction Laboratories and a modern Genome Platform which has begun analyses on cattle breeds.

Thanks to a close partnership with the University of Brasília, various master's dissertations using CENARGEN's infrastructure have been developed with breeds threatened with extinction.

Over the years, various international courses have been offered in CENARGEN, many in partnership with FAO. Annually, two courses at master's level are offered in the Centre, one on conservation and one on animal reproduction. Lastly, many technical courses on embryo transfer and *in vitro* fertilization are offered each year, which shows the interest in using the technologies generated in the Centre.

3.2.2. National System for Agricultural Research

The National System for Agricultural Research - SNPA, is mainly made up of federal and state public institutions, which, in a cooperative manner, carry out research in different geographic areas and fields of scientific knowledge. The SNPA is coordinated by EMBRAPA, and the following State Research Corporations are part of this system: PESAGRO – Agricultural Research Company for the State of Rio de Janeiro; EPAMIG - Agricultural Research Company for the State of Minas Gerais; EMPAER - Mato-Grossense Corporation for Research and Rural Extension; APTA – São Paulo State Agency for Agribusiness Technology; IAPAR - Paraná State Agronomy Institute; FEPAGRO – State Agricultural Research Foundation for the State of Rio Grande do Sul; INCAPER – Institute for Research and Rural Extension for the State of Espírito Santo; AGÊNCIA RURAL – Agency for Rural Development of the State of Goiás; EMEPA – Agricultural Research Company for the State of Paraíba; EBDA – State of Bahia Company for Agricultural Development; EMDAGRO – Agricultural Development Company for the State of Sergipe; EPAGRI - Agricultural Research and Rural Extension Company for the State of Santa Catarina; IDATERRA – Agrarian Development,

Research, Technical Assistance and Rural Extension Institute for the State of Mato Grosso do Sul; EMPARN - Agricultural Research Corporation for the State of Rio Grande do Norte; and IPA - Agricultural Research Corporation for the State of Pernambuco. Figure 2 shows the distribution of the Research Centres of Embrapa, as well as of the State Research Corporations.



Figure 3. Distribution of institutions linked to the SNPA

Several technologies generated by Embrapa, as well as by institutions linked to the SNPA have changed the face of Brazilian Agriculture. A group of technologies for the incorporation of the savannahs into the production system has made the region responsible for 40% of grain production in the country, one of the largest agricultural frontiers in the world. Soybean was adapted to Brazilian conditions and today the country is the world's second largest producer. The supply of beef and pig meat was multiplied three times, while poultry experienced a ten-fold increase. Milk production increased from 7.9 billion litres in 1975, to 21 billion litres in 2002 and vegetable production increased from 9 million tonnes over an area of 700 thousand hectares, in 1980, to 15.7 million tonnes in 806.8 thousand hectares in 2002. Specific research programmes have also managed to organise technologies and production systems to increase the efficiency of family agriculture and incorporate small farmers into agribusiness, guaranteeing an improvement in their income and well-being.

3.3. INFORMATION SYSTEMS AND COMMUNICATION SERVICES.

3.3.1. Electronic Information Methods

Many electronic information sites exist in Brazil, which contemplate Animal Genetic Resources. Most governmental organisms, universities, scientific societies, as well as sections of the press linked to the agricultural sector, have specific homepages as can be seen in Table 17.

Table 17 – Electronic addresses with information on Animal Genetic Resources

TYPE OF SERVICE	Web Page
Governmental	www.cenargen.embrapa.br ; www.agricultura.gov.br ; www.izsp.gov.br ; www.mct.gov.br ; www.cnpq.br ; www.finep.gov.br ; ipe.ibict.br/fomento ; www.fapesp.br ; www.ebda.ba.gov.br ; www.sdr.ce.gov.br ; www.emater.df.gov.br ; www.empaer.pantanal.br ; www.emater.mg.gov.br ; www.pr.gov.br/emater ; www.epagri.rct-sc.br ; www.cati.sp.gov.br ; www.prodase.com.br/emdagro ; www.agenciarrural.go.gov.br ; www.seagri.ba.gov.br ; www.sdr.ce.gov.br ; www.pr.gov.br/seab ; www.fisepe.pe.gov.br/sprra ; www.ibama.gov.br ; www.agricultura.sp.gov.br
Universities and Institutes	www.unb.br ; www.usp.br ; www.unesp.br ; www.ufmg.br ; www.ufg.br ; www.ufv.br ; www.ufrgs.br ; www.unifap.br ; www.fua.br ; www.ufpa.br ; www.ufg.br ; www.ufmt.br ; www.ufms.br ; www.ufal.br ; www.ufba.br ; www.ufc.br ; www.ufla.br ; www.ufmg.br ; www.ufu.br ; www.ufrj.br ; www.uff.br ; www.ufrj.br ; www.ufpr.br ; www.ufsm.br ; www.ufsc.br ; www.unicamp.br ; www.uece.br ; www.uem.br ; www.uerj.br ; www.uel.br
Electronic Journals and Newspapers	www.sbz.org.br ; www.globorural.globo.com ; www.animalpet.com.br ; www.rbspa.ufba.br ; www.cbpa.org.br ; www.scielo.br/scielo ; www.abcz.com.br/revista ; www.revistadaterro.com.br ; www.vet.ufg.br ; www.revistadbo.com.br ; www.esalq.usp.br ; www.aviculturaindustrial.com.br ; www.suinculturaindustrial.com.br ;
Others	www.wwf.org.br ; www.brasilnature.org.br ; www.finatec.org.br ; www.cna-rural.com.br ; www.faeg.com.br ; www.famasul.com.br ; www.faemg.org.br ; www.faep.com.br ; www.senar.com.br ; www.fundacaoabc.com.br ; www.sidronet.com.br/fundacaoms ; www.fundecitrus.com.br ; www.abmr.com.br ; www.leitebrasil.com.br ; www.cfmv.org.br ; www.sindiracoes.com.br ; www.abepet.com.br ; www.andav.com.br ; www.apacame.org.br ; www.setorpesqueiro.com.br ; www.aenda.org.br ; www.andef.com.br ; www.sbbiotec.org.br ; agronet.hypermart.net ; www.snagricultura.org.br ; www.zootecnista.com.br

The Integrated Information System on Finance for Science and Technology (Prossiga) of the Ministry of Science and Technology (MCT) has information on research activities being carried out in the country by funding agencies. Their main public includes researchers, university lecturers and managers. It is a cooperative system which integrates the main federal and state financing agencies for science and technology: CNPq, FINEP, CAPES, FAPERGS, FAPESP, FAPEMIG, FAPERJ, FACEPE and FUNCAP. These agencies send their data to Prossiga on a monthly basis, thereby guaranteeing that the information is up-to-date. The system can be searched for information by agency, type of funding, name of institution, name of researcher, topic, area of knowledge, city, state, etc.

The National Catalogue Collection of Serial Publications - NCC, coordinated by the Brazilian Institute for Information in Science and Technology - IBICT, is a cooperative network of information sources of Brazilian institutions. It allows access to scientific and technical periodical publications and unites information on hundreds of catalogues, produced by the main libraries in the country, in a single national catalogue with public access. The NCC aims to optimise the available resources of libraries and documentation services, which participate in the network and improve the services for the final user. It does this by making available the means for: the diffusion, identification and localization of science and technology serials, both national and foreign, available in the country; the establishment of coordinated acquisition policies; the exchange between libraries, through the bibliographical commute system and the standardization of title entries. The NCC is open to free participation of libraries that have automated relevant stocks of serial publications in science and technology.

The Bibliographical Commute Program (COMUT), created in 1980 by the Ministry of Education, through CAPES, and at present organized by IBICT, SESU (MEC) and FINEP (MCT), aims to give the country an efficient means of access to information. COMUT allows the academic and research communities' access to documents in all areas of knowledge (through copies of papers from technical-scientific journals, theses and congress proceedings), exclusively for academic reasons, in strict observation of the Authorial Right Law. This works through a network of libraries, called base libraries, which have adequate bibliographical, human and technological resources to respond to its users requests.

3.3.2 Printed Information

3.3.2.1. Scientific information

Brazil has some serial publications in different areas of knowledge linked more specifically to Agricultural Sciences or related subjects. The main serials are presented below, sorted alphabetically by subject, which use the *referee* system and rigorous editorial boards.

Agrarian Sciences in General: Brazilian Archives of Biology and Technology; Ciência Rural; Pesquisa Agropecuária Brasileira - PAB.

Biological Sciences in General: Bragantia; Brazilian Archives of Biology and Technology; Brazilian Journal of Biology; Brazilian Journal of Medical and Biological Research; História, Ciências, Saúde: Manguinhos; Interciência; Revista Brasileira de Biologia.

Genetics: Brazilian Journal of Genetics.

Veterinary Medicine: Arquivo Brasileiro de Medicina Veterinária e Zootecnia; Biological Control; Brazilian Journal of Veterinary Research and Animal Science; Pesquisa Agropecuária Brasileira; Pesquisa Veterinária Brasileira e Revista Brasileira de Ciência Avícola (Brazilian Journal of Poultry Science); Jornal Brasileiro de Patologia e Medicina Laboratorial; Modern Pathology.

Zoology: Iheringia. Série Zoologia; Neotropical Entomology; Papéis Avulsos de Zoologia.

Animal Production: Arquivo Brasileiro de Medicina Veterinária e Zootecnia; Brazilian Journal of Veterinary Research and Animal Science; Revista Brasileira de Ciência Avícola (Brazilian Journal of Poultry Science); Revista Brasileira de Zootecnia (Brazilian Journal of Animal Science).

3.3.2.2. Statistical Information

The Brazilian Institute of Geography and Statistics - IBGE is the main Brazilian organization, responsible for making available up-to-date information on territory, demographics, price indices, industry, commerce, harvest forecast, agriculture, animal production, horticulture, silviculture, logging, population, family budget and national accounts. This information is available through the Data Base known as SIDRA (IBGE Agricultural Research Company for System of Automatic Recovery), by electronic means or its Annual Statistics, published every year. Some private companies have launched publications in recent years that have very updated information and are frequently consulted by animal farmers. Among these there is ANUALPEC, a yearly statistics book produced specifically for the animal production sector by FNP Consultoria; and the Brazilian Annual of Animal Production, produced by the Jornal Gazeta.

3.4. LEGISLATION & REGULATIONS APPLICABLE TO CONTROL OF GENETIC RESOURCES

As signatory of the Convention on Biological Diversity - CBD and as one of the countries with highest mega-diversity in the world, Brazil has tried to adapt its public policies to the requirements for use and conservation of biological resources, highlighting the proposal of National Policy on Biodiversity, which is in discussion in Brazilian society.

Political, judicial and economic instruments that allow the conservation and access to national genetic patrimony, the protection and access to associated traditional knowledge, as well as a just

and equitable division of benefits from their utilization should support the sustainable use of Brazilian biodiversity. An important step in the consolidation of pertinent basic legislation was attained with a joint action of the Civil House of the Presidency of the Republic, sectors of civil society, the scientific community and the Environment Ministry, resulting in legal texts such as the Provisional Measure N° 2186-16 and Decree N° 3945, both from 2001. Provisional Measure N° 2186-16 regulates items of the Federal Constitution and from the Convention on Biological Diversity, while Decree N° 3945 defines the composition and establishes rules for the workings of the Council for Gestation of Genetic Patrimony - CGEN, organ responsible for coordinating the implantation of policies for genetic patrimony and establishing technical rules for their management.

3.5. PRIVATE ORGANIZATIONS LINKED TO AGRICULTURE

3.5.1. National Confederation of Agriculture and Animal Production of Brazil – CNA

The National Confederation of Agriculture and Animal Production of Brazil (CNA), has, together with public and private sectors, ample recognition as go-between for the rural class in discussions and decisions which affect agriculture. The technical area of the CNA works in defence of the rural production class, with emphasis on the following themes: agrarian policy; agricultural policy; taxation; rural retirement fund; rural workers legislation as well as internal and external markets.

The union system, which unites farmers in Brazil, has a pyramidal form, based on approximately 2000 unions. These unions are represented by 27 state federations, which have the CNA as their highest representation. The CNA, as system leader, is recognized as the only legally constituted go-between for the category. This structure gives the system high capillarity, with more than one million associates, voluntarily joined to the Unions, in the whole national territory. Like the CNA, the federations act in their states, stimulating the strengthening of rural unionism. The unions carry out direct support actions for the farmer, looking for solutions to local problems, in an associative manner.

3.5.2. Breeders' Associations

Support infrastructure also includes breeders associations, which, at both regional and national level, have an important role to play in the supply of animal production. There is a large number of breeders' associations. Once defined the basic production traits (descriptors) for each breed, they are submitted to the Ministry of Agriculture, Livestock and Food Supply - MAPA. After its approval, the association becomes official, and gains a general register from MAPA, which, thereafter, has control over actions of the association, which follows the evolution of pedigree registers. Below, the manner in which the associations are organized is presented, in a resumed form, for each of the species included in this Report. The complete list of breeders associations is presented in the Annex.

3.5.2.1. Cattle

In the South Region, there is an association, which carries out pedigree registration and production tests on 20 breeds of European origin, called the National Breeders Association - Herd Book Collares, based in Pelotas, State of Rio Grande do Sul. As well as this, there are a further 19 breeders associations distributed throughout the country, which are responsible for the pedigree registration of nineteen European breeds and their synthetics. There are also some affiliated associations, created to publicize these European breeds. In the Southeast region, there is the Zebu Breeders' Association, based in Uberaba, State of Minas Gerais, responsible for pedigree registration and central production tests on all Zebu breeds found in the country. As with the

European breeds, there are various affiliated associations, responsible for publicity of each of the zebu breeds.

3.5.2.2. Buffaloes

This species has a single association, based in the State of São Paulo, responsible for pedigree registration of all buffalo breeds found in the country, called the Brazilian Association of Buffalo Breeders – ABCB.

3.5.2.3. Horses

There are 20 horse breeders associations, responsible for pedigree registration of the horse breeds found in Brazil. Among these, the National Breeders Association - Herd Book Collares registers two breeds, while the Brazilian Association for Pony Horse Breeders registers five breeds. Each of the remaining 18 associations registers a single breed. As with other animal species, there are some affiliated associations involved with breed publicity.

3.5.2.4. Donkeys

There are only three donkey breeds found in the country. Each has a specific breeders association, responsible for the pedigree registration of each specific breed.

3.5.2.5. Sheep

ARCO – Brazilian Association of Sheep Breeders, based in Bagé, Rio Grande do Sul is the association responsible for the pedigree registration of sheep breeds in Brazil. As with other species, there are affiliated associations throughout the country, which publicize the breeds.

3.5.2.6. Goats

The Brazilian Goat Breeders Association – ABCC, based in Recife, State of Pernambuco, is responsible for the pedigree registration of goat breeds found in the country. Nevertheless many affiliated associations that publicize the breeds are to be found throughout the country. Some of these are also involved in publicizing hair sheep breeds.

3.5.2.7. Pigs

The Brazilian Pig Breeders Association – ABCS is based in Estrela, State of Rio Grande do Sul, and is responsible for pedigree registration of all pig breeds in Brazil.

3.5.2.8. Poultry

There are three important associations linked to poultry breeding in Brazil: UBA – Brazilian Poultry Union; ABEF – Brazilian Poultry Exporters Association and APINCO – Brazilian Association of Meat Poultry Producers. As well as these, there are state aviculture associations, which unite producers. More recently, specific associations were created for the publicity of ostrich and emus.

3.5.3. Animal Reproduction Companies

One way of verifying the importance of animal production in Brazil is to look at the number of animal reproduction companies, the diversity of breeds using artificial insemination, as well as the number of semen doses sold each year.

Brazil has at present 86 Artificial Insemination Centres officially recognised by the Ministry of Agriculture, Livestock and Food Supply - MAPA. Forty six of them are located in the South region, 22 in the Southeast region, ten in the Centre-west region, seven in the Northeast region, and the

last one in the North region. Of these, 42 are registered to work with cattle semen, while 35 work with pig semen, five with sheep semen, and four with goat semen.

In 2002 over 7.0 million doses of semen were sold, 3% higher than the previous year. For beef cattle, the increase was 8.8% compared to 2001. The Nellore breed had the largest slice of the market, with more than 2 million doses, 46.3% of the total. In second place is the Aberdeen Angus breed (19.2%), followed by Simmental (3.9%) and Guzarat (3.1%). Of the dairy breeds, the Holstein breed was first with 60.9% of total semen doses sold, followed by Milking Gyr (17.1%), Jersey (15.4%) and Brown Swiss (2.6%). Due to the success of the Zebu breeds selected in the country, a huge international demand has opened up, mainly from countries found between the tropics, which are looking for genetic material (semen, oocytes and embryos) in the Brazilian Insemination Centres.

Modern animal reproduction techniques are used routinely in Brazil, multiplying the reproductive power of dams of superior quality and accelerating herd improvement. The country has 24 Centres for Embryo Transfer recognised by MAPA. Of these, 20 are registered as producers of cattle embryos; two are for horse embryos, while one works with sheep embryos and the last with goat embryos. The majority of these (90%) are distributed among the South, Southeast and Centre-west regions.

In order to understand the importance of embryo transfer, it can be noted that Brazil is placed second worldwide in terms of volume of transfers, with approximately 82,000 transfers per year. It is estimated that approximately 400 Brazilian technicians are involved in this market, as well as in improvement of techniques linked to animal reproduction such as: embryo sexing, splitting, *in vitro* fertilization and cloning. There are about 20 teams and over 100 researchers working with IVF and six laboratories developing research with cloning.

Brazil has various scientific societies linked to animal production. The Brazilian Society for Animal Production (SBZ) is the oldest, created in 1951 and affiliated with the *Asociación Latino Americana de Producción Animal* – ALPA. Of the other scientific societies in this area, we can mention the Brazilian Society for Embryo Transfer - SBTE, affiliated to the *International Embryo Transfer Society* – IETS; the Brazilian College for Animal Reproduction (CBRA) and Brazilian Society for Animal Breeding (SBMA). These four societies are very active, have annual congresses, which unite a great part of technicians working in the Brazilian agricultural sector.

CHAPTER 4

DETERMINATION OF NATIONAL PRIORITIES FOR CONSERVATION AND USE OF ANIMAL GENETIC RESOURCES

4.1. NATIONAL STRATEGIES AND PROGRAMMES IN ANIMAL PRODUCTION RELATED TO ANIMAL GENETIC RESOURCES

As mentioned in item 1.3.4. of this Report, there exists the Genetic Resources Programme, within the National Network of Genetic Resources – RENARGEN. One of the Component Projects of RENARGEN is called “Conservation and Use of Animal Genetic Resources”, and had 10 Action Plans, which can be found in Table 13.

4.2. ORIENTATION AND STRENGTHENING CONSERVATION ACTIVITIES (*IN SITU* AND *EX SITU*).

The formation of partnerships among Centres of Embrapa, Universities, State Research Corporations, along with private breeders, as mentioned in RENARGEN (item 1.3.4 of this Report), as well as post-graduate training of human resources of those working intensely with naturalised breeds in *in situ* and *ex situ* conservation work, has generated various masters dissertations. These studies have increased knowledge of these breeds, which, for a long time, were confined to marginal regions, in extreme climates, where they were naturally selected. With the present trend of a return to organic exploration, a deeper knowledge of the production and resistance traits of these breeds will allow for their use in sustainable production systems in the short term

4.3. NATIONAL PRIORITIES FOR CONSERVATION AND USE OF ANIMAL GENETIC RESOURCES

4.3.1. General Priorities

Some of the more important priorities for the Conservation and Use of Animal Genetic Resources are common to all species, as follows:

- Genetically characterise the naturalised breeds and, if possible, compare them with those in other Latin-American countries (Criollo breeds) as well as with those from the Iberian Peninsula (autochthon breeds), which gave them origin.
- Increase the stock of genetic material of breeds threatened with extinction, stored in the Animal Germplasm Bank at Embrapa.
- Stimulate the creation of breeders associations of naturalised breeds, which still haven't managed to be formed.
- Maintain Conservation Nuclei of naturalised breeds and form new nuclei, as a means of assuring the maintenance of pure populations.
- Carry out studies that allow for the insertion of naturalised breeds in sustainable production systems.
- Mobilize representative sectors in Science and Technology to obtain more funding for research in this area.
- Look for economic niches for naturalised breeds, showing breeders that, as long as they are well used, these breeds can bring economic returns.
- Alert society on the importance of animal genetic resources, showing the importance of conservation of their adaptive traits.
- Make available the transfer of knowledge and technological solutions for the different segments of the supply chain, including:
 - Animal well-being;
 - Environmental impact;

- Management of pastures and feed supplementation.

4.3.2. Species Priorities

As well as the priorities above, there are others that are specific to the different species, and they are listed below:

Cattle

- Eradicate or reduce diseases, which interfere with the exportation of *in natura* meats and develop and/or improve integrated control strategies for parasites and/or illnesses, to guarantee higher productivity and better control of the final product and its hide.
- Establish an effective carcass grading and hide classification system.
- Promote incentives to programmes and production systems that improve the integration between milk and beef cattle production.
- Create a system of tracing and certification of products of animal origin.
- Increase agro-ecological works, to subsidize rational exploration, in accordance with the production potential of cattle reared in each region of the country.
- Make it possible for small and medium sized herds to have access to the quality meat markets.
- Elevate the quality of meat, aiming for greater food security for the population, as well as greater hide quality, and higher profits in the supply chain in general and the farmer in particular.

Buffaloes

- Liberate the importation of genetic material of buffaloes from Asia, to increase the low genetic variability in the country, and improve the narrow genetic base.
- Orientate buffalo breeders to organize commercialisation and promotion of products of this species (meat and milk products).
- Establish a supply chain for buffaloes, putting their products on the market, with the respective certification.
- Complete the genetic characterisation of buffalo breeds, to turn their conservation more efficient.

Horses

- Train technicians, breeders and active owners in horse rearing, recycling or making available new technologies, especially those of animal reproduction, to increase the quality and competitiveness of the national horse. This priority should be carried out integrating partners from government (research and teaching), breeders associations and turf entities.
- Make genetic material from animals evaluated as “racers” available to breeders and horse owners.
- Increase funding for equines in partnership with breeders associations among which are included naturalised breeds.
- Stimulate the exportation of lineages of national equines reared in Brazil which are of international interest. These include the English Thoroughbred and Brazilian Showjumper.
- Study how the mechanism of tolerance to infectious equine anaemia works as presented by the Pantaneiro and Lavradeiro, two naturalised breeds.

- Identify and evaluate genetic material, with emphasis on paternity tests, so that pedigree registers are trustworthy, conferring greater trustworthiness and facilitating access to international markets.
- Determine which breeds of horses and donkeys are more suitable to the formation of mules, for each region of the country.

Sheep

- Concentrate efforts on spreading technology, aiming at an improvement in the management levels of sheep rearing in the Northeastern region of Brazil. With new market opportunities, medium and large farmers are now carrying out sheep production, which until recently, was practiced almost exclusively by smallholders.
- Reformulate sanitary policies applied to sheep, aiming to control of diseases and ecto and endoparasites. In this aspect, naturalised breeds have much to contribute due to their high degree of adaptation to local conditions.
- Continue publicity of naturally coloured wool, produced by the Crioulo Lanada sheep, reared in the extreme south of the country and used in craftwork. This special trait is, without doubt, one of the main reasons why this breed was not made extinct.
- Development of processes to improve use of meats considered inferior, for the production of sausages, hamburgers and others.
- The quality of hides of naturalised sheep breeds is well known. Unfortunately, injuries caused to the animals decrease the value of the skins. In this way, there is a need to work at two levels: on-farm (improving installations, using correct management and correct hide removal) and off-farm (in the abattoirs and tanneries), increasing hide price on the internal and external markets.

Goats

- Most of the priorities listed for sheep apply to goat breeds. There is also a need to look for higher producing milk breeds, as the demand for goat milk products is growing in the country, especially in large urban centres, although slowly,

Pigs

- Identify nuclei for rearing naturalised breeds.
- Register farmers who promise not to get rid of nuclei of naturalised breeds with first communicating the controlling organization, to allow possible distribution of the genetic material, avoiding its disappearance.
- Promote the exchange of genetic material between farmers, increasing genetic variability.
- Help to promote the use of naturalised breeds in agro-tourism projects, as well as offer differentiated products, such as those on the Iberian Peninsula.

Poultry

- Maintain genetic diversity of all poultry species, including wild. It is important to remember that the Brazilian Institute for the Environment and Renewable Resources - IBAMA, a Governmental Organization, has been preserving wild bird species. It would be a huge contradiction if, on the other hand, the production sector was allowed to eradicate naturalised breeds.
- Maintain a Germplasm Bank free of fungi, Salmonella and Leucosis, with monitored competitiveness, as is being carried out by Embrapa Suínos e Aves with lineages created by that Research Centre.

- Make pure breeds available for use in alternative production (organic) systems, improved for traits of immediate interest.
- Increase the incentives to farmers involved in conservation of naturalised breeds since industry pressure for production of improved animals is large, causing extinction of the former.
- Genetically characterise pure, non-selected populations to identify genes responsible for adaptation traits developed in these breeds.
- Make available the exchange of genetic material with other countries, aiming to maintain genetic variability and maintain animal health.

4.3.3. Conservation Priorities

Of the priorities mentioned above those that are fundamental for the continued success of the conservation programme in Brazil include:

- Characterisation in genetic and phenotypic terms of all naturalised breeds;
- Stimulate the formation of an Ibero-American project to compare Brazilian breeds with those in other Latin-American countries (Criollo breeds) as well as with those from the Iberian Peninsula (autochthonous breeds), which originated them.
- Accelerate the collection and storage of genetic material in the Brazilian Animal Germplasm Bank.
- Look for ways to insert naturalised breeds into sustainable production systems, including family agriculture systems within the present goals of the Brazilian government.
- Determine economic niches for naturalised breeds to increase economic returns for breeders and smallholders.
- Use traits inherent to naturalised breeds, such as resistance and rusticity, as priorities in all production systems, to improve animal well-being and environmental sustainability.

CHAPTER 5

EXISTING INTERNATIONAL COOPERATION AND RECOMMENDATIONS FOR ITS PROMOTION IN RELATION TO DOMESTIC ANIMAL BIODIVERSITY

5.1. COOPERATION AND INTERACTION AMONG COUNTRIES, AS WELL AS NATIONAL AND FOREIGN ORGANISATIONS, WITH RESPECT TO FINANCING, PRODUCTION AND DEVELOPMENT OF AGRICULTURAL RESEARCH

In the areas of international relations, the contribution of the Ministry of Foreign Affairs - MRE in the formulation of foreign policy should be highlighted, especially in questions related to Science and Technology, defending Brazilian position in the negotiation and implementation of bilateral and multilateral programmes.

International cooperation is an essential capacity of companies, universities and research institutes, allying the well-being of the instrument for the promotion of development of countries and the use of technical and commercial national population to competitive demands of the new world economy. Whether occurring directly between institutions in different countries, or through an intermediary such as an international organization, which may give financial or administrative support to the planned activities, international cooperation acts, above all, as a safe and efficient instrument for the approximation and improvement of political-economic ties between the countries involved.

The Brazilian Agency of Cooperation - ABC is part of the structure of the Ministry of Foreign Affairs and its aim is to coordinate and supervise programmes and projects of International Technical Cooperation in which Brazil participates. The programmes and projects are negotiated and implemented as Agreements signed by Brazil with partner countries and International Organizations. ABC is oriented by Brazilian foreign policy, coming from the MRE and by national development priorities defined in the various plans and programmes of various sectors of the Government. The technical cooperation programmes and projects are developed following two major types: horizontal cooperation and foreign cooperation. Horizontal cooperation refers to technical cooperation implemented by Brazil with other developing countries. Foreign cooperation covers bilateral and multilateral technical cooperation received by Brazil.

Basically, three types of cooperation can be defined. Depending on the flow of knowledge they can be classified as: (a) Cooperation Received, in which the internal necessity or demand is met; (b) Cooperation Given, where external needs or demands are met; and (c) Mutual Co-operation which consists of the exchange of knowledge and products, benefiting both parts. Based on political criteria, these can be classified as: bilateral cooperation – between governments and institutions in two countries – and multilateral – when they involve international organizations or various countries.

5.1.1. Received Technical Cooperation, Bilateral or Multilateral

Brazil maintains various bilateral and multilateral agreements or treaties. In terms of Multilateral Technical Cooperation Received (CTRM) the agreement signed in 1959 with BID – Interamerican Development Bank; the agreement signed in 1984 with IICA – Interamerican Institute for Cooperation in Agriculture; the agreement signed in 1992 with the European Economic Community and the agreement signed in 1964 with the OAS – Organization of American States. As for Bilateral Technical Cooperation Received (CTRB), Brazil signed

agreements with the following countries: Germany, Canada, Spain, United States, France, Italy, Japan, Norway, Netherlands, Portugal and United Kingdom.

5.1.2. Technical Cooperation Between Developing Countries/CTPD.

Brazil has technical cooperation agreements with countries on various continents, as follows:

Africa: South Africa (in negotiation), Angola, Algeria, Benin, Cape Verde, Ivory Coast, Egypt, Gabon, Ghana, Guinea Bissau, Mali, Morocco, Mozambique, Namibia, Nigeria, Kenya, Sao Tome and Principe, Senegal, Togo, Zaire and Zimbabwe.

Latin America and Caribbean: Argentina, Bolivia, Costa Rica, Chile, Colombia, Cuba, El Salvador, Ecuador, Guatemala, Guyana, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Dominican Republic, Suriname, Uruguay and Venezuela.

Asia and Eastern Europe: Saudi Arabia, China, Iraq, Israel, Kuwait, Lebanon, Palestine, Russia (in negotiation) and Thailand.

5.2. INTERNATIONAL COOPERATION IN EMBRAPA

The variety of agricultural research projects carried out by the many Research Centres of Embrapa can be measured by the variety of international technical cooperation agreements signed by this Corporation. There have been 275 agreements with 56 countries and 155 international Research Organisations, mainly involving research partnerships. To help with this effort, two laboratories were installed with support from the World Bank. These develop research in groundbreaking technology, are located in two different countries: the first in the Department of Agriculture, in Washington, United States of America, and the second in the Agropolis, Montpellier, France. These laboratories allow researchers to have access to the highest technology in areas such as natural resources, biotechnology, as well as computing and precision agriculture.

5.3. RECOMMENDATIONS FOR PROMOTION OF INTERNATIONAL COOPERATION IN LIVESTOCK BIODIVERSITY

For Brazil, the highest priority for international cooperation in terms of conservation of animal genetic resources would be a partnership in terms of genetic characterisation, involving breeds from the Iberian Peninsula. For example, the cattle breeds included in the programme for Conservation of Animal Genetic Resources of CENARGEN, which originated from animals brought by the Portuguese colonisers to Brazil soon after the discovery. These animals have become adapted to the various ecological niches in Brazil over the last five centuries, acquiring traits such as tolerance to heat, some illnesses, as well as parasite resistance. Unfortunately, the importation of more productive breeds, that do not have these adaptation traits, meant the almost extinction of the older breeds. If not for the pioneering work started in the 1970s by the Institute of Animal Production – IZSP, located in the State of São Paulo, the Caracu breed could be extinct today.

The researcher's vision meant the breed was not only preserved but also used by private breeders. Thanks to that work, a considerable number of farmers started to use the Caracu in crossbreeding, in contrast to what had happened at the start of the 20th century, when this breed almost disappeared. The breeders are managing to combine the rusticity of the Zebu with the adaptive properties of the breeds introduced by the Portuguese.

Although the breeds existing in Brazil today are, theoretically, distinct from those that gave them origin in Portugal, there is an incredible phenotypic similarity between them. The Curraleiro breed is supposed to be a descendant of the Mirandesa, and the Crioulo Lageano has traces of Barrosã and Mertolenga as the principal components of its formation. Genetic characterisation work carried out in both countries could indicate how similar (or distinct) they really are. In this way, bilateral projects between Brazil and Portugal or Brazil and Spain would serve to: (a) integrate research

teams of participating countries; (b) permit that the research teams get to know animals included in the respective conservation programs; and (c) standardise techniques used in genetic characterisation, as well as markers used, so that the results found in different countries could be compared.

To illustrate better this possible partnership, it is important to mention that in the past Brazilian researchers observed that the Caracu, considered a naturalised Brazilian breed, is descendant from Portuguese breeds such as the Mirandesa, Minhota, Barrosã, Arouquesa and Mertolenga, all of them considered as autochthonous breeds in their country of origin. All of these breeds still exist today in the North of Portugal, and the Minhota can also be found in Spain, where it is known as the Rubia Gallega. The similarity between the breeds in Hispano-America, can be explained by the geographical proximity of their origins, as until 1178, Spain and Portugal were a single country. In Table 18, phenotypic similarities or parentage are compared between cattle breeds of Portugal and Spain, which gave rise to most of the Criollo breeds found in Latin America and the Caribbean.

Table 18 – Similarities between Portuguese and Spanish cattle breeds

PORTUGAL	SPAIN	ORIGIN
Barrosã	Cachena or Pisca	<i>Bos taurus mauritanus</i>
Minhota or Galega	Rubia Gallega	<i>Bos taurus aquitanicus</i>
Arouquesa	Cachena or Pisca	<i>Bos taurus aquitanicus</i>
Mirandesa	Alistana-Sanabresa Caldelana Frieiresa Verinesa Vianesa	<i>Bos taurus ibericus</i>
Brava	Lídia	
Aracena	Berrenda en Negro	
Alentejana	Retinta	<i>Bos taurus turdetanus</i>
Algarvia		
Mertolenga	Berrenda en Colorado Salineira Andaluza	<i>Bos taurus aquitanicus</i>

With so many similarities between the cattle from Portugal and Spain, and knowing that Latin-American countries received animals from these two countries soon after the Discovery of America, a project, such as that mentioned above involving Brazil and Portugal or Brazil and Spain, could be wider, and include teams from different Ibero-American countries. Some African countries could be included also, for their proximity to the Iberian Peninsula, as well as the fact that they were stopovers for the ships on-route to the American continent, and may have some breeds of interest for this type of study.

A project of this size may be elaborated to train human resources in genetic characterisation of Ibero-American breeds. This project could, for example, be submitted to the European Community and have as its main objective greater knowledge of the genetic diversity of cattle in Ibero-American countries. The results could generate exchange of germplasm, not only between countries on the American continent but between these countries and those of the Iberian Peninsula or Africa, after solving health problems that affect these exchanges. This example, for the cattle

species, can be repeated for other species of animals found on the American continent descendant from those brought from the Iberian Peninsula.

5.4. INTERNATIONAL INITIATIVES TO UNITE TEAMS WORKING WITH CONSERVATION OF ANIMAL GENETIC RESOURCES

Some initiatives have been taken in this sense, such as the creation of the Ibero-American Federation for Criollo and Autochthonous Breeds – FIRC; the Ibero-American Programme of Science and Technology for Development – CYTED; and Rare Breeds International – RBI.

5.4.1. Ibero-American Federation for Criollo and Autochthonous Breeds – FIRC

The creation of the Ibero-American Federation for Criollo and Autochthonous Breeds – FIRC was an initiative of Spanish breeders and Ibero-American researchers who used the Spanish Federation of Breeders Associations – FEAGAS, as the embryo. Several contacts occurred between parties interested in Criollo and autochthonous breeds, in Spain, as well as several Latin American countries, usually after scientific events, before the Federation was formed. FIRC was made official, as well as its objective and statute discussed, by Spanish breeders linked to FEAGAS, together with a representative of the Spanish Agriculture Ministry, in a meeting with the participation of researchers from Argentina, Brazil, Colombia, Cuba and Mexico. One of the main products of FIRC has been the organization of International Congresses, with the participation of researchers and breeders involved with autochthonous and Criollo breeds. In 2003, the 6th Congress was held in Recife, Brazil.

5.4.2. Ibero-American Programme of Science & Technology for Development – CYTED

The Ibero-American Programme of Science and Technology for Development – CYTED, was created in 1984, through an initiative of the Spanish Government and implemented through the “Marco Agreement”, when 21 Ibero-American countries decided for the founding of a multilateral programme to fund scientific and technological cooperation, aiming for technological innovation. International organizations such as BID, CEPAL, OEA and UNESCO participate as observers and, since 1992, CYTED has been integrated in the cooperation programmes of the Meetings of the Ibero-American Heads of State and Government. The 21 countries that participate in CYTED are: Argentina, Bolivia, Brazil, Colombia, Costa Rica, Cuba, Chile, Ecuador, El Salvador, Spain, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Portugal, Dominican Republic, Uruguay and Venezuela.

The objectives of CYTED are: (a) promote cooperation as a strategic instrument to improve and complement national capacity in Science & Technology; (b) internationalise national innovation systems; (c) contribute to institutional modernization; and (d) favour the development of an Ibero-American scientific community. To meet these objectives, the Programme concentrates on multilateral research and development activities, funding applied research and technological development to obtain results that can be transferred to productive systems and social policies of Ibero-American countries. The activities of the programme are developed in 16 thematic Areas or Sub-Programmes, of which Brazilian researchers coordinate four. The thematic area under which conservation of animal genetic resources is classified is that of “Biological Diversity”, which has a network, co-ordinated by Professor Juan Vicente Delgado Bermejo, of the University of Cordoba, Spain. Groups of researchers from almost all 21 countries in CYTED are involved in this network.

5.4.3. Rare Breeds International - RBI

Like FIRC, *Rare Breeds International* – RBI was founded following a successful model, the *Rare Breeds Survival Trust* – RBST, from England. This non-governmental organization is responsible for the control of domestic animal breeds threatened with extinction in Great Britain and maintains an Animal Germplasm Bank. One of its annual events is an Agricultural Show called *Show & Sale*, which most breeders of animals threatened with extinction participate. Here, the animals are sold and bought, supervised by the RBST, which aims to indicate sires that have the least genetic relationship to animals in the herd that will receive them, thereby avoiding inbreeding problems which are common in breeds of low effective population numbers. With the support of the RBST, the RBI was founded to join researchers and institutions linked to conservation worldwide to discuss the subject in different forums and elaborate common projects. The last RBI World Congress took place in 2000 in Brasilia, co-ordinated by Embrapa Genetic Resources and Biotechnology and the Faculty of Agronomy and Veterinary Medicine of the University of Brasilia.

5.5. POSSIBILITIES OF INTERNATIONAL COOPERATION IN ANIMAL GENETIC RESOURCES THAT COULD BE OFFERED BY BRAZIL

Due to the large quantity of courses in the different areas of Agrarian Sciences mentioned in Chapter 3 of this report, Brazil has the conditions to offer formal training at both undergraduate and postgraduate level to technicians from various countries, especially Hispanic language countries or Portuguese speakers from Africa. Some Brazilian universities already offer specific courses on conservation of animal genetic resources. The master's course in Agrarian Sciences of the University of Brasilia (UnB), offered in partnership with the three Research Centres of Embrapa located in the Federal District has a research area specific to the Conservation and Use of Animal Genetic Resources. Since 2000, ten masters dissertations based on naturalised breeds have been defended at that University, with five more in course.

Another type of international cooperation would be training courses. Requests for technical visits and research periods at EMBRAPAs Research Centres are common. The visiting scientists originate from several countries, especially from Latin America and the Caribbean or Portuguese speaking African countries. Each centre has different aims, and each works with one or two specific species.

Brazil could also offer international consultations, in the area of conservation of animal genetic resources as well as in animal reproduction, since there are teams in the country developing up-to-date research in these areas.

CHAPTER 6

ANNEXES TO THE COUNTRY REPORT

6.1. TABLES

To better describe the breeds/species in this Report, a table was created for each species, presented in the Annex. In the tables, as well as listing all breeds found in Brazil, a description of various aspects such as: Degree of Adaptation; Population Trends; Type of Exploration; Intensity of Use, in each region of the country; Use as Purebred or in Crossbreeding; Types of characterisation; Selection; Reproductive Technologies; and Conservation type.

The abbreviations used to describe each of these items are presented below.

♦ A = Adaptation	L = Locally adapted; If Exotic, classified within one of the following categories: A = Anterior introduction (in the first half of the XX century); C = Continually introduced; R = Recently introduced.
♦ T = Trend	A = Ascending; S = Stable; D = Descending
♦ I = Intensity of use	L = Large use; M = Moderately used; S = Small use; T = Threatened; E = Extinct.
♦ U = Utilization	P = Purebred; C = Crossbreeding; PC = Purebred and crossbreeding
♦ E = Exploration	SS = Subsistence; S = Small scale (less than 50% of production sold); M = Medium scale (more than 50% of production sold); L = large scale (100% of production sold).
♦ Characterisation	D = Phenotypic Description; P = Production Evaluation; C = Cytogenetic characterisation; B = Biochemical Characterisation; M = Molecular Characterisation.
♦ Selection	Q = Quantitative; M = Molecular.
♦ Multiplication	AI = Artificial Insemination; ET = Embryo transfer; IVF = <i>In Vitro Fertilization</i> .
♦ Conservation	<i>In situ</i> or <i>Ex situ</i>

Table 1A – Information about beef cattle breeds raised in Brazil

BREEDS	A	T	E	Utilization/Region										Characterisation							Selection				Multiplication				Conservation	
				S			SE			CW			NE			N		D	P	C	B	M	Q	M	AI	ET	IVF	In situ	Ex situ	
				I	U	I	U	I	U	I	U	I	U																	
Exotic Bos taurus																														
Aberdeen Angus	C	A	L	L	PC	M	PC	M	C	S	C	S	C	S	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ayrshire	A	D		T	C	-	-	-	-	-	-	-	-	-	-	X														
Belgian Blue	R	S		S	P	S	C	S	C	-	-	-	-	-	-	X	X							X	X				X	
Blonde d'Aquitaine	C	A	L	S	PC	M	PC	S	C	S	C	S	C	S	C	X	X	X						X	X				X	
Charolais	C	A	L	L	PC	M	PC	S	C	S	C	S	C	S	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chianina	C	S		S	PC	S	C	S	C	S	C	S	C	S	C	X	X	X						X	X				X	
Devon	C	A	L	L	P	M	C	M	C	S	C	S	C	S	C	X	X	X						X	X				X	
Danish	A	D		T	PC	-	-	-	-	-	-	-	-	-	-	X														
Flemish	C	D	M	S	P	-	-	-	-	-	-	-	-	-	-	X														
Galloway	A	D		T	C	-	-	-	-	-	-	-	-	-	-	X														
Gelbvieh	C	S		M	PC	S	C	S	C	S	C	S	C	S	C	X	X	X						X	X				X	
Hereford	C	A	L	L	PC	M	PC	M	C	M	C	S	C	S	C	X	X	X	X					X	X				X	
Herens	A	D		T	C	-	-	-	-	-	-	-	-	-	-	X														
Limousin	C	S		M	PC	M	C	M	C	S	C	S	C	S	C	X	X	X	X					X	X				X	
Lincoln Red	C	D	M	S	P	-	-	-	-	-	-	-	-	-	-	X														
Maine Anjou	A	D		S	C	-	-	-	-	-	-	-	-	-	-	X								X					X	
Marchigiana	C	A		M	PC	S	C	S	C	S	C	S	C	S	C	X	X						X	X					X	
Normande	C	D	L	M	PC	M	PC	S	PC	S	C	S	C	S	C	X							X	X					X	
Brown Swiss(beef)	C	A		M	PC	S	C	S	C	S	C	S	C	S	C	X	X						X	X					X	
Piedmontese	C	A		M	C	S	C	S	C	S	C	S	C	S	C	X	X	X					X	X					X	
Pinzgauer	C	D	L	M	PC	M	PC	M	PC	-	-	-	-	-	-	X							X						X	
Red Poll	C	D	M	M	PC	M	PC	M	PC	S	C	S	C	S	C	X							X						X	
Salers	R	D	M	S	PC	S	C	-	-	-	-	-	-	-	-	X														
Shorthorn	C	S	L	M	PC	S	C	S	C	-	-	-	-	-	-	X													X	
Simmental	C	A		M	PC	M	C	M	C	M	C	M	C	M	C	X	X	X	X				X	X					X	

Table 2A – Information about dairy cattle breeds raised in Brazil

BREEDS	A	T	E	Utilization/Region										Characterisation						Selection				Multiplication			Conservation	
				S		SE	CW	NE		N		D	P	C	B	M	Q	M	AI	ET	IVF	In situ	Ex situ					
				I	U	I	U	I	U																			
										I	U													I	U	I	U	
Exotic Bos taurus																												
Holstein	C	S	M	L	P	L	PC	M	PC	S	PC	S	C	X	X	-	X	X	-	X	X	-	X					
Jersey	C	S	M	L	PC	M	PC	S	PC	S	PC	S	C	X	X	-	X	X	-	X	X	-	X					
Brown Swiss(milk)	C	S	M	M	P	M	PC	S	C	S	PC	S	C	X	X	-	-		-	X	-	-	X					
Guernsey	A	D	M	T	-	T	-	T	-	T	-	T	-	X	-	-	-	-	-	-	-	-	X					
Simmental	C	S	M	M	P	M	C	M	C	S	C	S	C	X	X	-	-		-	X	X	-	X					
“Local” Bos taurus																												
Caracu	L	S	M	S	P	M	P	S	PC	T	-	S		X	X	-	X	X	-	X	-	-	X					
Zebu																												
Gyr	L	A	M	S	PC	L	PC	L	PC	M	PC	S	PC	X	X	-	X	X	-	X	X	-	X					
Guzerat	L	A	M	S	PC	L	PC	M	PC	M	PC	S	PC	X	X	-	X	X	-	X	X	-	X					
Red Sindhi	L	S	M	T	-	S	P	T	-	M	P	M		X	X	-	-		-	-			X					
Synthetic																												
Girolando	L	A	M	S	C	L	C	L	C	M	C	M	C	X	X	-	X	X	-	X	X	-	X					
Guzolando	L	A	M	S	C	M	C	M	C	S	C	S	C	X	-	-	-		-	X	-	-	X					
Lavínia	L	D	M	T	-	T	-	T	-	T	-	T	-	X	X	-	-		-	-	-	-	X					
Pitangueiras	L	D	M	T	-	S	C	T	-	S	C	T	-	X	X	X	X		-	-	-	-	X					

Regions: S = South SE = Southeast CW = Centre-West NE = Northeast N = North

Table 3A – Information about buffalo breeds raised in Brazil

				Utilization/Region								Characterisation								Selection				Multip	
				SE				CW		NE		N													
BREEDS	A	T	E	S		I		U	I	U	I	U	I	U	D	P	C	B	M	Q	M	A	E		
Exotic																									
Jaffarabadi	A	D	M	S	PC	M	PC	S	PC	S	P	S	PC	X	X	X	-	-	X	-	-	-	-		
Mediterranean	A	A	M	M	PC	M	PC	S	PC	M	PC	L	PC	X	X	X	-	X	X	-	-	X	X		
Murrah	A	A	M	M	PC	L	PC	M	PC	M	PC	L	PC	X	X	X	-	X	X	-	-	X	X		
“Local”																									
Carabao	L	D	S	T	P	-	-	-	-	-	-	T	P	X	X	X	-	X	X	-	-	-	-		
Tipo Baio	L	D	S	-	-	-	-	-	-	-	-	T	PC	X	X	X	-	X	X	-	-	-	-		

Regions: S = South SE = Southeast CW = Centre-West NE = Northeast N = North

Table 4A – Information about horse breeds raised in Brazil

BREEDS	A	T	Ap	Utilization/Region										Characterisation				Selection			Multiplication			Conservation				
				S	SE			CW			NE			D	C	B	M	Q	M	AI	ET	IVF	In situ	Ex situ				
					I	U	I	U	I	U	I	U	N															
Exotic																												
Appaloosa	C	S	T	S	M	S	-	-	-	-	X								X									
Arabian	C	A	T	M	L	M	S	S	S	X	X								X									
Breton	C	S	W	S	S	S	-	-	-	-	X								X									
Morgan	C	S	T	S	S	S	E	E	E	X	X								X									
Paint	C	S	T	S	M	S	-	-	-	X	X								X									
Percheron	C	S	TW	S	S	-	-	-	-	X	X								X									
Pony	C	S	TW	M	M	M	-	-	-	X	X								X									
Pure Bred Spanish	C	S	T	S	L	S	-	-	-	X	X								X									
Thoroughbred	C	A	T	L	L	M	M	M	M	X	X								*	*	*							
Lusitano	C	A	T	M	L	S	-	-	-	X	X								X									
Quarter Horse	C	A	T	L	L	L	L	L	S	X	X								X									
Trotter	C	D	T	S	S	S	E	E	E	X	X								X									
Brazilian Commercial																												
Brasileiro de Hipismo	L	A	T	L	L	M	S	S	S	X	X								X									
Campolina	L	S	TW	M	L	S	M	S	S	X	X								X									
Mangalarga	L	A	TW	L	L	L	L	L	L	X	X								X									
Mangalarga Marchador	L	A	TW	M	L	M	M	M	S	X	X								X	X								
“Local”																												
Campeiro	L	D	W	S	-	-	-	-	-	X	X								X						X			
Crioulo	L	A	TW	L	L	S	-	-	-	X	X																	
Lavradeiro	L	D	W	S	-	-	-	-	-										X					X				
Marajoara	L	S	W	-	-	-	-	-	L	X	X								X					X				
Nordestino	L	D	W	-	-	-	T	-	-	X	X								X									
Pantaneiro	L	S	W	-	-	L	-	-	-	X	X								X					X			X	
Puruca	L	S	W	-	-	-	-	-	M	X	X								X									

Regions: S = South SE = Southeast CW = Centre-West NE = Northeast N = North
Note: Aptitude was included only for horses and is represented by Ap. Depending on Ap., breeds were classified as T for tests such as races, showjumping and functional and W for work (with cattle, heavy draught, etc). * The Association for Thoroughbred prohibits the use of reproductive technologies such as Artificial Insemination and Embryo Transfer.

Table 6A – Information about sheep breeds raised in Brazil

BREEDS	A	T	Utilization/Region																Characterisation							Selection			Reproduction			Conservation																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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Regions: S = South SE = Southeast CW = Centre-West NE = Northeast N = North

Table 7A – Information about goat breeds raised in Brazil

BREEDS	A	T	E	Utilization/Region												Characterisation						Selection			Multiplication			Conservation				
				S			SE			CW			NE			N			D	P	C	B	M	Q	M	AI	ET	IVF	In situ	Ex situ		
				I	U	I	I	U	I	U	I	U	I	U	I	U	I	U														
Exotic																																
Anglo-nubian	A	S	M	I			S	PC	S	PC	L	PC	S	PC	S	PC	X	X							X							
Saanen	C	S	L	M	PC	PC	L	PC	M	PC	M	PC	S	PC	S	PC	X	X							X	X						
Brown Alpine	C	S	L	M	PC	PC	L	PC	M	PC	M	PC	S	PC	S	PC	X	X							X	X						
Toggenburg	C	S	L	M	PC	PC	L	PC	M	PC	S	PC	S	PC	S	PC	X	X							X	X						
British Alpine	C	S	L	I			S	PC	I		S	PC	I		S	PC	X	X							X							
American Alpine	C	S	L	I			S	PC	I		S	PC	I		S	PC	X	X							X							
Murcia-Granada	A	D	M	I			I		I		S	PC	I		S	PC	X								X							
Boer	R	A	L	S	PC	S	PC	S	PC	S	PC	S	PC	S	PC	S	X	X							X	X						
Savannah	R	A	L	I			S	PC	I		S	PC	I		S	PC	X	X							X							
Kalahari	R	A	L	I			S	PC	I		S	PC	I		S	PC	X	X							X							
“Local”																																
Azul	L	D	SS	I			I		I		T	PC	I		T	PC	X								X					X		
Canindé	L	D	SS	I			I		I		T	PC	I		T	PC	X	X							X					X		
Gurgueia	L	D	SS	I			I		I		T	PC	I		T	PC	X								X							
Marota	L	D	SS	I			I		I		T	PC	I		T	PC	X	X							X					X		
Moxotó	L	D	SS	I			I		I		T	PC	I		T	PC	X	X							X					X		
Repartida	L	D	SS	I			I		I		T	PC	I		T	PC	X	X							X					X		
Graúna	L	D	SS	I			I		I		T	PC	I		T	PC	X								X							

Regions: S = South SE = Southeast

CW = Centre-West NE = Northeast

N = North

*I = Breed practically inexistent in the region

Synthetic																
Agroceres	C	A	L	L	C	L	C	L	C	S	C		X	X	X	X
Dalland	C	A	L	L	C	L	C	L	C	S	C		X	X	X	X
Dan Bred	C	A	L	L	C	L	C	L	C	S	C		X	X	X	X
Embrapa MS 60	C	A	L	L	C	L	C	L	C	S	C		X	X	X	X
Genetiporc	C	A	L	L	C	L	C	L	C	S	C		X	X	X	X
JSR	C	S	L	L	C	L	C	L	C	S	C		X	X	X	X
Pen Ar Lan	C	A	L	L	C	L	C	L	C	S	C		X	X	X	X
Sadia	C	A	L	L	C	L	C	L	C	S	C		X	X	X	X
Seghers	C	A	L	L	C	L	C	L	C	S	C		X	X	X	X
Regions: S = South SE = Southeast CW = Centre-West NE = Northeast N = North																

¹Imports of genetic material of the Yorkshire breed have been introduced into herds of Large White and registered as such.

²The mixed breeds are characterised as being intermediate between meat and lard types. They were extinct in the South and Southeast around 1960 when many imports of genetic material of meat type breeds occurred. Examples of the Large Black may still be found in Maranhão State.

³The naturalised breeds, as known as national, produce a lot of lard (Lard Type).

Observation:

- Meat type breeds are characterised as to their use as purebreds, but all are being used in crosses to produce pigs for slaughter;
- Synthetic breeds are in fact commercial names from animal breeding companies, which produce genotypes of lineages of males and females, sent to farmers for, in guided crosses, produce pigs for slaughter.

Table 9A – Information about poultry species/breeds raised in Brazil

CHICKEN BREEDS	A	T	E	Utilization/Region										Characterization						Selection			Multiplication			Conservation		
				S		SE		CW		NE		N		D	P	C	B	M	Q	M	AI	ET	IVF	In situ	Ex situ			
				I	U	I	U	I	U	I	U	I	U															
Chicken																												
American Breeds																												
New Hampshire	L	D	S	S	PC	S	PC	S	P	S	P	S	P	X	X					X							1100	
	R	D	S	T	P	T	P							X					X								80	
	R	D	S	T	P	T	P							X					X								180	
	R	D	S	E		E								X						X								
White Plymouth Rock	L	A	S	T	C	T	C	S	P	S	P	S	P	X	X	X				X							180	
Barred Plymouth Rock	L	A	S	M	PC	M	PC	S	P	S	P	S	P	X	X				X							3000		
Buffed Plymouth Rock	R	D	S	E		S	E							X					X									
Partridge Plymouth Rock	R	D	S	E		S	E							X					X									
Rhode Island Red	L	A	S	M	PC	M	PC	S	P	S	P	S	P	X	X	X			X							600		
Miniature																												
Rhode Island Red	L	A	S	M	PC	M	PC	S	P	S	P	S	P	X	X	X			X							600		
Wyandote	R	D	S	T	P	T	P							X					X							180		
English Breeds																												
White Cornish	R	D	S			S	P							X						X							50	
Dark Cornish	R	D	S			S	P							X						X							50	
Australorp	R	D	S			S	P							X						X								
Black Orpington	R	D	S			S	P							X						X						1000		
Buff Orpington	R	D	S			S	P							X						X						1000		
Partridge Sussex	R	D	S	E		S	P							X	X					X								
Light Sussex	R	D	S			S	P							X	X					X						800		
Speckled Sussex	R	D	S	E		S	P							X	X					X								
Redcap	R	D	S			S	P							X						X								
Miniature																												
White Cornish	R	D	S			S	P							X						X							50	
Dark Cornish																											50	

Asian Breeds																
Light Brahma	R	D	S												X	50
Dark Brahma	R	D	S												X	50
Buff Brahma	R	D	S												X	50
Blue Cochin	R	D	S												X	50
White Cochin	R	D	S												X	50
Buff Cochin	R	D	S												X	50
Partridge Cochin	R	D	S												X	50
Black Cochin	R	D	S												X	50
Miniature																
Blue Cochin	R	D	S												X	250
White Cochin	R	D	S												X	250
Buff Cochin	R	D	S												X	250
Partridge Cochin	R	D	S												X	250
Black Cochin	R	D	S												X	250
Mediterranean Breeds																
White Minorca	R	D	S												X	30
Black Minorca	R	D	S												X	30
White Leghorn	L	D	S	L	P	S	P	S	P	S	P	X	X		X	100
Partridge Leghorn	L	D	S	L	P	S	P	S	P	S	P	X	X		X	200
Miniature																
Partridge Leghorn	L	D	S	L	P	S	P	S	P	S	P	X	X	X	X	50
Continental Breeds																
Polish	R	D	S	T											X	100
Faverolles	R	D	S	T											X	100
Hamburghs	R	D	S	T											X	100
Oriental Breeds																
Aseel	L	A	⁸⁸ S	T	C	M	C								X	200
Malay	L	A	S	E	C	M	C								X	50
Shamo	L	S	M	M	P	M	P								X	1000
Yokohama	R	D	S	E		S	P								X	100
Phoenix	R	D	S	E		S	P								X	50

Commercial Brands of colonial/free-range layers																			
Embrapa	L	A	L	L	C	L	C								X	X	X		X
Black Free-range	L		L	L	C	L	C								X	X	X		X
		A																	
Commercial Brands of white egg layers																			
² Lohmann	C	S	L	L	C	L	C	L	C	L	C	L	C	L	C	X	X	X	X
² Babcock	C	S	L	L	C	L	C	L	C	L	C	L	C	L	C	X	X	X	X
² Hisex	C	S	L	L	C	L	C	L	C	L	C	L	C	L	C	X	X	X	X
² Hy-Line	C	S	L	L	C	L	C	L	C	L	C	L	C	L	C	X	X	X	X
² Dekalb	C	D	L	L	C	L	C	L	C	L	C	L	C	L	C	X	X	X	X
² H&N	C	D	L	L	C	L	C	L	C	L	C	L	C	L	C	X	X	X	X
² Embrapa	L	S	L	L	P										X	X	X	X	X
Commercial Brands of industrial meat chickens																			
³ Ross	L	S	L	L	P	L	P	L	P	L	P	L	P	L	P	X	X	X	X
³ Cobb	C	S	L	L	P	L	P	L	P	L	P	L	P	L	P	X	X	X	X
³ Hubbard	C	D	L	L	P	L	P	L	P	L	P	L	P	L	P	X	X	X	X
³ Hybro	C	A	L	L	P	L	P	L	P	L	P	L	P	L	P	X	X	X	X
³ Arbor Acres	C	D	L	L	P	L	P	L	P	L	P	L	P	L	P	X	X	X	X
³ Avian	C	S	L	L	P	L	P	L	P	L	P	L	P	L	P	X	X	X	X
³ Vedette	C	S	L	L	P	L	P	L	P	L	P	L	P	L	P	X	X	X	X
³ MPK	C	S	L	L	P	L	P	L	P	L	P	L	P	L	P	X	X	X	X
³ Indian River	C	D	L			L	P									X	X	X	X
³ Chester	L	S	L	L	P											X	X	X	X
Commercial Brands of colonial/free-range/organic chickens																			
French free-range	L	A	L	L	P	L	P								X	X	X		X
Paraíso Pedrez	L	A	L	L	P	L	P								X	X	X		X
Frango Gaúcho	L	A	L	L	P	L	P								X	X	X		X
Embrapa	L	S	L	L	P										X	X	X		X
Other Poultry Species																			
Swan	R	D	S			S	P								X				X

6.2. FIGURES OF THE ANNEX



Af (Rainforest Tropical)
 Am (Rainy Tropical of Monsoon)
 Aw (Rainy Tropical of Savannah)
 Aw' (Rainy Tropical with two Rain Seasons)
 As (Rainy Tropical with Dry Summer)
 BSh' (Semiarid Tropical of Steppe Very Hot)
 Cfa (Subtropical climate) Mild Temperature
 Cfb (Rainy Subtropical with Fresh Summer)
 Cwb (Subtropical with Dry Winter and Fresh Summer)
 Cwa (Subtropical with Dry Winter and hot Summer)

A - The Temperature of the Coldest Month is Higher than 18 °C
 B - The Rainfall is Lower than the Drought Limit
 C - The Coldest Month Temperature is Between 18 °C and -3 °C

Figure 1A - Climate Distribution in Brazil

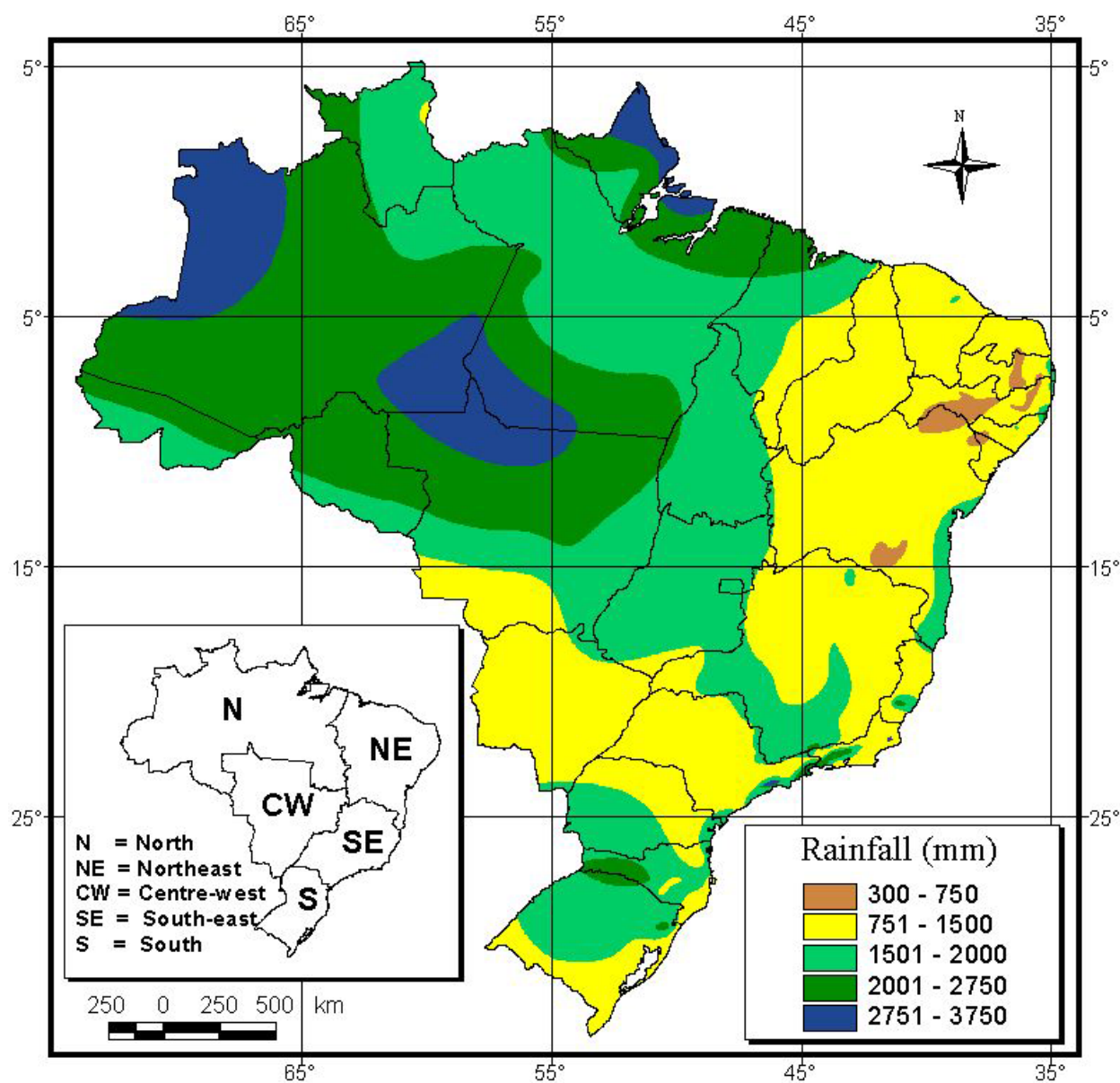


Figure 2A - Rainfall Distribution in Brazil

6.3. BREEDERS' ASSOCIATIONS

CATTLE

ABCB - Associação Brasileira de Criadores de Beefalo

e-mail: beefalobrasil@openlink.com.br

ABCBA - Associação Brasileira Criadores- Blond D'aquitaine

e-mail: blondebr@zaz.com.br

ABCB BB – Associação Brasileira de Criadores de Blanc Bleu Belge

<http://www.newsline.com.br/abcbbbb/>

ABCB RH - Associação Brasileira Criadores de Bovinos da Raça Holandesa

e-mail: srg.scl@gadoholandes.com.br

ABCC - Associação Brasileira de Criadores de Caracu

<http://www.abccaracu.com.br>

ABCC - Associação Brasileira de Criadores de - Charolês

<http://www.charoles.org.br>

ABCC - Associação Brasileira de Criadores de – Chianina

e-mail: glaucio@overnet.com.br

ABCCAN - Associação Brasileira de Criadores – Canchim

<http://www.canchim.com.br>

ABCGIL Associação Brasileira de Criadores de Gir Leiteiro

Tel: (31) 221-0833 - Fax:225-4858

ABCM - Associação Brasileira de Criadores – Marchigiana

<http://www.marchigiana.org.br>

ABCRS - Associação Brasileira de Criadores da Raça Simental

<http://www.spponline.com.br/simentalsimbrasil>

ABCZ - Associação Brasileira de Criadores de Zebu

<http://www.abcz.org.br>

ABI - Associação Brasileira de Brangus Ibagé

<http://www.abrangus.com.br>

ACBB - Associação dos Criadores de Brahman do Brasil

e-mail: abrahman@zaz.com.br

ACGB - Associação dos Criadores de Guzerá do Brasil

<http://www.guzera.org.br>

ACNB - Associação dos Criadores de Nelore do Brasil

<http://www.nelore.org.br>

Associação Brasileira de Brangus

<http://www.brangus.org.br>

Associação Brasileira de Criadores de Braford

<http://www.braford.com.br>

Associação Brasileira de Criadores de Beefmaster
www.beefmasterbrasil.com

Associação Brasileira de Criadores de Devon
<http://www.herdbook.org.br>

Associação Brasileira de Criadores de Gado Pardo Suíço
<http://www.pardo-suico.com.br>

Associação Brasileira de Criadores de Gelbvieh
Tel: (43) 348-2427

Associação Brasileira de Criadores de Pitangueiras
Tel: (11) 3872-0905

Associação Brasileira de Criadores de Red Poll
Tel: (55) 422-1542

Associação Brasileira de Criadores Gado Guernsey
Tel: (21) 627-1422

Associação Brasileira de Criadores Hereford e Braford
<http://www.hereford.com.br>

Associação Brasileira de Gado Jersey no Rio Grande do Sul
<http://www.conesul.com.br/cascalho/jersey-rs>

Associação Brasileira dos Criadores de Aberdeen Angus
<http://www.angus.org.br>

Associação Brasileira dos Criadores de Limousin
<http://www.limousin.com.br>

Associação Brasileira dos Criadores de Piemontês
<http://www.piemontes.com.br>

Associação Brasileira dos Criadores de Tabapuã
<http://www.tapapua.org.br>

Associação Brasileira Santa Gertrudis
<http://www.santagertrudis.com.br>

Associação de Criadores de Simental Fleckvieh RS
<http://www.staiger.com.br/>

Associação dos Criadores de Gado Jersey do Brasil
<http://www.gadojerseybr.com.br/>

Associação dos Criadores de Gado Jersey do Estado do Rio de Janeiro
Tel: (21) 2507-5146

Associação Mineira dos Criadores de Nelore
e-mail: sede@nelore-mg.org.br

Associação Nacional de Criadores de Normando

<http://www.herdbook.org.br>

Associação Nacional dos Criadores de Indubrasil

e-mail: indubrasil@terra.com.br

ASSOGIR - Associação Brasileira dos Criadores de Gir

e-mail: assogir@cnpaf.embrapa.br

ASSOLEITE –Associação Brasileira de Criadores de Girolando

<http://www.girolando.com.br>

Herd Book Collares - Associação Nacional de Criadores

<http://www.herdbook.org.br>

Núcleo Brasileiro de Criadores de Pardo-Suiço Corte

<http://pardo-suicocorte.com.br/>

Núcleo dos Criadores de Girolando de Brasília

<http://www.girolandobrasilia.com.br/>

BUFFALOES

Associação Brasileira dos Criadores de Búfalo – ABCB

<http://www.bufalo.com.br>

HORSES

ABCC - Associação Brasileira dos Criadores Cavalos de Corrida

e-mail: sbb@studbook.com.br

ABCCA - Associação Brasileira dos Criadores do Cavalo Árabe

<http://www.abcca.com.br>

ABCCC - Associação Brasileira de Criadores de Cavalos Crioulos

<http://www.abccc.com.br/>

ABCCM - Associação Brasileira dos Criadores de Cavalos da Raça Morgan

Tel: (53) 225-8906

ABCCMM - Associação Brasileira dos Criadores do Cavalo Mangalarga Marchador

<http://www.abccmm.org.br/>

Abccponei - Associação Brasileira dos Criadores do Cavalo Pônei

<http://www.bhnet.com.br/~ponei/>

ACPCCP - Associação dos Criadores e Proprietários de Cavalos de Corrida do Paraná

<http://www.acpccp.com.br>

ANCA - Associação Nacional do Cavalo de Apartação

<http://www.cavalodeapartacao.com.br/>

ANCR - Associação Nacional dos Cavalos Rédeas

<http://www.redeas.org.br>

Associação Brasileira de Criadores do Cavalo Pura Raça Espanhola

Av. Francisco Matarazzo 455 - CEP 05031-900 São Paulo/SP

Associação Brasileira dos Criadores da Raça Marajoara
Tel: (91) 231.6414

ABQM - Associação Brasileira de Criadores de Cavalo Quarto de Milha
<http://www.abqm.com.br>

Associação Brasileira de Criadores de Cavalos Appaloosa
<http://www.appaloosa.com.br>

Associação Brasileira de Criadores de Cavalos da Raça Mangalarga
<http://www.cavalomangalarga.com.br>

Associação Brasileira de Criadores de Cavalos Pantaneiro
Tel: (65) 721-1436

Associação Brasileira dos Cavaleiros de Hipismo Rural
abhir@dialdata.com.br

Associação Brasileira dos Criadores de Cavalos de Hipismo
<http://www.brasileirodehipismo.com.br>

Associação Brasileira dos Criadores de Cavalos Campolina
<http://www.campolina.org.br>

Associação Brasileira dos Criadores de Cavalo Campeiro
R Marechal Floriano, 217 - CEP 89520-000 – Curitiba - SC

Associação Brasileira dos Criadores de Cavalos Nordestino
Tel: (81) 227-1856

Associação Brasileira dos Criadores do Cavalo Bretão
Tel: (19) 867-1855

Associação Brasileira dos Criadores do Cavalo de Puro Sangue Lusitano
Tel: (11) 3873-2766

Associação Brasileira dos Criadores do Cavalo Paint
<http://www.abcpaint.com.br>

Associação Brasileira dos Criadores do Cavalo Trotador
Praça dos Trotadores 01-Vila Guilherme - CEP 05000-000 - São Paulo - SP

Federação Brasileira do Cavalo Andaluz
Tel: (11) 872.9706

Núcleo de Criadores de Cavalos Crioulos
<http://www.cavalocrioulo.cjb.net/>

Núcleo Paulista dos Criadores do Cavalo Pônei
www.ponei.org.br

DONKEYS

Associação Brasileira dos Criadores de Jumento da Raça Pega
<http://www.abcjpega.com.br/>

Associação Brasileira dos Criadores de Jumento Nordestino

Tel: (84) 231-1212 r 31/32

Associação de Criadores de Jumentos Brasileiro
<http://www.mulas.com.br/racas/jumentobr.html>

SHEEP

ABCD - Associação Brasileira dos Criadores de Deslanados
<http://www.baydenet.com.br/users/ocapana>

ARCO - Associação Brasileira dos Criadores de Ovinos
 Tel: (53) 242 2422 / 242 2871

ASCEM- Associação dos Criadores do Estado do Maranhão
 e-mail: ascem@hcg.com.br

ASPACO - Associação Paulista de Criadores de Ovinos
 Tel: (14) 941 3600

Associação Brasileira de Criadores de Ile-De-France
 Tel (51) 225 8761

Associação Brasileira de Criadores de Corriedale
 Tel: (53) 222 1957

Associação Brasileira de Criadores de Ovinos Hampshire Down
 Tel: (51) 593 2299

Associação Brasileira de Criadores de Suffolk
 Tel (51) 332 2738

Associação Brasileira dos Criadores de Border Leicester
 Tel: (51) 341 2566

Associação Brasileira dos Criadores de Ovinos da Raça Morada Nova
 Tel: (88) 422 1234

Associação Brasileira dos Criadores de Romney Marsh
 Tel: (53) 242 4867

Associação Catarinense de Criadores de Ovinos
 Tel: (49) 222 4400

Associação de Criadores de Ovinos da Paraíba
 Tel: (83) 321-5490

Associação de Criadores de Ovinos de Pernambuco
 Tel: (81) 228-2606

Associação de Ovinos do Rio Grande do Norte
 Tel: (84) 221-1741

Associação dos Agropecuaristas e Ovinocaprinocultores da Zona Norte do Ceará
 e-mail: washingt@fortalnet.com.br

Associação dos Criadores de Caprinos e Ovinos de Sergipe
 Av João Ribeiro, 428 3a - CEP 49040-000 – Aracajú - SE

Associação dos Criadores de Ovinos Capixaba
 R Limeira, 120 - CEP 29100-000 - Vila Velha - ES

Associação dos Criadores de Ovinos de Alagoas
R Graciliano Ramos, 133 - CEP 57602-130 - Palmeira dos Índios - AL

Associação dos Criadores de Ovinos de Goiânia
Parque Agropecuário Padre Ludovico - CEP 74653-200 – Goiânia - GO

Associação dos Criadores de Ovinos do Estado de Minas Gerais
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Tel: (21) 714-8454

Associação dos Criadores de Ovinos Paulista
Tel: (11) 3854-1792

Associação Sulina de Criadores de Karakul
Tel: (51) 228 0155

Brastexel
Tel: (51) 211 0930

OVINOPAR - Associação Paranaense de Criadores de Ovinos
Tel: (42) 723 6090

GOATS

ABCC - Associação Brasileira dos Criadores de Caprinos
Tel: (81) 228-2606 Fax: 228-3281

ABCCAA - Associação Brasileira dos Criadores de Cabra Alpina Americana
<http://www.abccaa.com.br>

ACCOB – Associação dos Criadores de Caprinos e Ovinos de Brasília
e-mail: srdf@tba.com.br

ACCOBA – Associação de Criadores de Caprinos e Ovinos da Bahia
e-mail: accoba@e-net.com.br

ASCEM - Associação dos Criadores do Estado do Maranhão
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Associação de Criadores de Caprinos e Ovinos de Alagoas
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Associação de Criadores de Ovinos e Caprinos do Estado do Ceará
Tel.: (85) 911 0645

Associação dos Caprinocultores do Rio Grande do Sul
e-mail: caprisul@ig.com.br

Associação dos Criadores Caprinos do Estado de Mato Grosso do Sul
Rua San Remo 3423 - Jardim Vilas Boas - CEP 79051-230 - Campo Grande - MS

Associação dos Criadores de Cabras Leiteiras

Tel.: (11) 262 8980

Associação dos Criadores de Caprinos do Estado de Minas Gerais

Av dos Andares, 1220 sala 121 2a - CEP 30161-000 - Belo Horizonte - MG

Associação dos Criadores de Caprinos do Estado de Santa Catarina

Av Lédio São Martins, 421 sala 402 - CEP 88102-000 - São José - SC

Associação dos Criadores de Caprinos do Estado do Rio de Janeiro

Tel: (21) 714-8454

Associação Goiana dos Criadores de Caprinos e Ovinos

Tel.: (62) 223 8507

Associação Norte-riograndense de Criadores de Ovinos e Caprinos

Tel: (84) 221.1741

Associação Paraibana Criadores de Ovinos E Caprinos

Tel: (83) 321.5490

Associação Paranaense de Caprinocultores

Rua Gonçalves Dias, 97 - CEP 80240-340 – Curitiba - PR

Associação Sergipana dos Criadores de Caprinos e Ovinos

Tel: (79) 224 6600

CAPRIPAULO - Associação Paulista de Criadores de Caprinos

Tel: (11) 262-8980

PIGS

ABCS - Associação Brasileira de Criadores de Suínos

<http://www.abcs.com.br/>

ASEMG - Associação dos Suinocultores do Estado de Minas Gerais

<http://www.asemg.com.br>

Associação Brasileira da Indústria de Produtos Derivados de Suínos

Tel: (11) 212-7666

Associação Brasileira dos Exportadores de Carne Suína

Praça Olavo Bilac, 28 Sala 92 - CEP 20041-010 - Rio de Janeiro - RJ

Associação Brasileira Exportadores de Carne Suína

Tel: (21) 493-5007

Associação Criadores de Suínos do Rio Grande do Norte

Av Bernardo Vieira, 124 - CEP 59051-001- Natal - RN

Associação de Criadores de Suínos do Rio de Janeiro

Tel: (21) 233-3772

Associação de Criadores de Suínos do Rio Grande do Sul

Tel: (51) 712-1014 / 712-1413

Associação de Criadores de Suínos Piauiense

Rua Sete de setembro, 150 – Norte - CEP 64000-210 – Teresina - PI

Associação dos Criadores de Suínos de Mato Grosso

e-mail: acrismat@zaz.com.br

Associação dos Criadores de Suínos de Mato Grosso do Sul
Tel: (67) 671-1122

Associação Catarinense dos Criadores de Suínos
Tel: (49) 442-0414

Associação dos Criadores de Suínos de Pernambuco
Tel: (81) 227.2044

Associação dos Criadores de Suínos do Ceará
Tel: (85) 248-5368 Fax: 248-2756

Associação dos Criadores de Suínos do Espírito Santo
Tel: (27) 229-5408

Associação dos Criadores de Suínos Paulista
Tel: (19) 651-1233

Associação dos Suinocultores do Alto Parnaíba Gerais
<http://www.astap.com.br>

Associação dos Suinocultores do Vale do Piranga - MG
e-mail: assuvap@newgetel.com.br

Associação Goiana de Suinocultores
<http://www.ags.com.br>

Associação Paranaense de Suinocultores
e-mail: aps.pr@ns.per.com.br

Associação Paulista dos Criadores de Suínos
<http://www.suinopaulista.com.br>

Associação Regional Suinocultores do Sudoeste
R Maranhão, 362 - CEP 85601-310 - Francisco Beltrão - PR

Associação Suinocultores da Paraíba
R Manoel Madruga, 190 – CEP 58020-190 - João Pessoa -PB

Associação de Criadores de Suínos de Santa Catarina
Tel: (49) 442-0414

POULTRY

ABEF - Associação Brasileira dos Exportadores de Frango
<http://www.abef.com.br>

ACAB - Associação dos Criadores de Avestruz do Brasil
<http://www.acab.org.br>

AGCE - Associação Gaúcha dos Criadores de Emas
<http://www.vetorialnet.com.br/~pinheir/>

APA - Associação Paulista dos Avicultores
<http://www.apa.com.br>

APINCO - Associação Brasileira de Produtores de Pinto de Corte
Tel: (11) 241-0233

Associação Cearense de Avicultura

<http://www.aceav.com.br>

Associação de Abatedouros Agrícolas do Paraná
Tel: (41) 224-8737

Associação de Avicultura Catarinense
Tel: (48) 222-8734

Associação de Avicultura da Bahia
Tel: (75) 244-2026

Associação de Avicultura de Pernambuco
Tel: (81) 228-3465

Associação de Avicultura de São Paulo
Tel: (11) 832-1422

Associação de Avicultura de Goiânia
Tel: (62) 203-3665

Associação de Avicultura de Sergipe
Tel: (79) 241-4444

Associação de Avicultura do Distrito Federal
Tel: (61) 349-5898

Associação de Avicultura do Espírito Santo
Tel: (27) 268-5182

Associação de Avicultura do Estado da Paraíba
Av Vigário Calixto, 2903 – CEP 58104-480 – Campina Grande - PB
Tel/fax: (83) 341-3177

Associação de Avicultura do Pará
Tel: (91) 255-3014

Associação de Avicultura do Rio Grande do Norte
Tel: (84) 223-3100

Associação de Avicultura do Piauí
Tel: (86) 232-6628 - Fax: 232-1604

Associação de Avicultura Fluminense
Av Brás de Pina, 2540 - CEP 21235-600 - Rio de Janeiro - RJ

Associação de Avicultura Gaúcha
Tel: (51) 225-2936 / 228-4564 - Fax: 225-2936

Associação de Avicultura Nordestina
Tel: (81) 228-3465

AVIMIG - Associação dos Avicultores de Minas Gerais
<http://www.avimig.com.br>

UBA - União Brasileira de Avicultura
<http://www.rudah.com.br/uba>

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