منظمة الأغذية والزراعة للأمم المتحدة
联合国粮食及农业组织
Food and Agriculture Organization of the United Nations
Organisation des Nations Unies pour l'alimentation et l'agriculture
Продовольственная и сельскохозяйственная организация Объединенных Наций
Organización de las Naciones Unidas para la Alimentación y la Agricultura

Country report

supporting the preparation of *The Second Report on the State of the World's Animal Genetic Resources for Food and Agriculture*, including sector-specific data contributing to *The State of the World's Biodiversity for Food and Agriculture* - 2013 -

Country: Brazil

I. EXECUTIVE SUMMARY

Please provide an executive summary (not more than two pages) that will allow national and international stakeholders to gain a quick overview of the content of the country report.
The executive summary should contain information on:

- key trends and driving forces affecting animal genetic resources management in your country;
- strengths, weaknesses and gaps in capacity to manage animal genetic resources in your country;
- key constraints and challenges with respect to animal genetic resources management in your country;
- priorities and strategic directions for future action (focusing particularly on the next ten years).

Brazil had no livestock species when the Portuguese settlers arrived in the year 1,500. In the following voyages, they brought their autochthonous breeds, of different species, from the Iberian Peninsula. Brazilian locally adapted livestock breeds were developed from those introduced into Brazil through successive trips of the colonizers. Over the last centuries, they were submitted to natural selection, to the point where they developed important adaptive traits to certain ecological niches in the country. By the end of the 19th century, exotic breeds of the different species began to be imported and, gradually, substituted the locally adapted ones to such an extent that the majority of them are in danger of extinction.

To reduce the extinction of locally adapted breeds, in 1983 the National Research Center for Genetic Resources and Biotechnology - Cenargen, of the Brazilian Agricultural Research Corporation - Embrapa, included 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 Centers of Embrapa, Universities, State Research Corporations and by private farmers, under the national coordination of Cenargen. The animal conservation program includes the following stages:
1. identification of populations in advanced state of genetic dilution;
2. phenotypic and genetic characterization;
3. in situ and *ex situ in vitro* conservation; and
4. evaluation of their production potential.
Conservation of animal genetic resources is being carried out in Conservation Nuclei, maintained in the habitats where the animals have been naturally selected, while embryos and semen are being stored at the Animal Germplasm Bank (AGB) in Brasilia. The conservation Nuclei also serve to increase awareness about the importance of conserving each one of the locally adapted breeds.

In 2009, Embrapa which is the branch of the Ministry of Agriculture, Livestock and Food Supply responsible for the agricultural research in the country, has established a National Platform of Genetic Resources, changing the it was

managing genetic resources. This Platform, coordinated by Cenargen, includes a further 35 research centers of Embrapa, and 70 partner institutions. The overall management of animal genetic resources is dealt with by the Animal Genetic Resources Network, which is one of the four Networks of this Platform. The other three Networks deal with: Plant Genetic Resources, Genetic Resources of Microorganisms, while the last one deals with cross sectorial matters such as Curatorship, Documentation, Quarantine, Exchange and Legislation. It is important to mention that the Plant Network of this Platform includes forest genetic resources, while the Animal Network includes aquatic genetic resources.

There has been a marked increase in productivity of commercial breeds in recent years due to the implementation of breeding programmes. Brazil has a large number of highly trained specialists in the area of animal breeding, in most regions of the country, which has led to the successful implementation of these breeding programmes. These programmes are responsible for placing the country as the world's largest exporter of beef and poultry meat.

As a result of this success in breeding programmes, zebu breeds selected in Brazil have been successfully exported to neighboring countries as well as to developed ones, such as United States of America and Australia. International artificial insemination companies have been established in Brazil to export this genetic material. There is also a lot of interest in locally adapted Santa Ines sheep to African countries as well as to countries of some regions in the Americas that require heat tolerant breeds. In terms of imports, Brazil is highly dependent on commercial lines of poultry and swine.

Genetic characterization of livestock in Brazil began in 1998 and has developed in time with international changes in the area. Brazil has recently participated in all major international consortia for genetic characterization of major livestock species, such as cattle, sheep, goats and pigs.

Reproductive and molecular biotechnologies are playing an important role in increasing productivity in Brazil. Although AI is well established and used, the growing utilization of Fixed Time Artificial Insemination (FTAI), has given a new impulse in AI utilization in the country. Therefore, research is concentrated on the adaptation and incorporation of this technology into the routine of different management systems of AnGR. The use of Embryo Transfer in cattle has gradually decreased, but research is still being done aiming to better select recipients and to maintain pregnancy. On the other hand, there is an ongoing search for molecular markers to select the best embryo donors. Brazil in the largest world producer of IVF bovine embryos, however there are still many problems to be solved. Much research are being developed regarding oocyte donors, culture systems, oocyte quality, embryo quality, markers for embryo and oocyte selection, among others. A major concern is the cryopreservation of IVF embryos and oocytes. Studies in IVF protocols are also beginning with sheep, goats, pigs and horses (especially with ICSI).

In the last decade, there has been an increase in the integration of Crop-Livestock-Forest. It is estimated that Brazil has about 110 million hectares with cultivated pastures where about 70% have some degree of degradation, with low productive capacity for fodder and consequently low production of meat and/or milk and high rates of soil and water losses (erosion), with negative effects on the economy and environment. These areas can be recovered with the adoption of an integration of Crop-Livestock-Forest (iLPF, in Portuguese), which consists of the implementation of different production systems for grains, fiber, meat, milk, and other agro-energy crops, in the same areas, with sequential or rotational periods, leveraging synergies among them. The Ministry of Agriculture signs technical cooperation agreements with agencies, organizations and public and private institutions as a strategy for staff training and as a way to encourage the practice of iLPF among farmers. This integration has been very positive for livestock, since there has been an increase in the available area, without any deforestation, as well as a decrease in the emission of green house gases.

Brazil has very good infrastructure for the management of animal genetic resources, at public as well as in the private sector. Many large farms, working with elite herds have established their own advanced reproduction laboratories. The high number of post-graduate courses in Agricultural Sciences 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 Centers created with the formation of Embrapa, in 1973, and in the universities. 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 includes Research Corporations from the different states of the country. A large number of Breeders' Associations also play an important role in the management of animal genetic resources and have a high integration with researchers and universities.

As it will be seen in this report, Brazil has created a complete and up to date infrastructure for research and policy development in the area of animal genetic resources. Stakeholders have access to information and technical development s, but there is a need for higher integration of all actors of the production and research systems to further

advance on the conservation, characterization and utilization of animal genetic resources in Brazil. There is no conservation without utilization.

II. DATA FOR UPDATING THE PARTS AND SECTIONS OF *THE STATE OF THE WORLD'S ANIMAL GENETIC RESOURCES FOR FOOD AND AGRICULTURE*

FLOWS OF ANIMAL GENETIC RESOURCES

1. Studies of gene flow in animal genetic resources have generally concluded that most gene flow occurs either between developed countries or from developed countries to developing countries. Does this correspond to the pattern of gene flow into and out of your country?

For developed countries, exceptions to the usual pattern would include significant imports of genetic resources from developing countries. For developing countries, exceptions would include significant exports of genetic resources to developed countries, and/or significant imports and/or exports of genetic resources to/from other developing countries.

- ○ yes
- ○ no
- ◉ yes but with some significant exceptions

1.1. If you answer “no” or “yes but with some significant exceptions”, please provide further details. Please include information on: which species are exceptions and which regions of the world are the sources and/or destinations of the respective genetic material.

Zebu breeds selected in Brazil have been successfully exported to neighboring countries as well as to developed ones, such as USA and Australia. International artificial insemination companies have been established in Brazil to export this genetic material. There is also a lot of interest in locally adapted Santa Inês sheep to African countries as well as to countries of some regions in the Americas that require heat tolerant breeds. In terms of imports, Brazil is highly dependent on commercial lines of poultry and swine.

2. Have there been any significant changes in patterns of geneflow in and out of your country in the last ten years?

- ○ yes
- ◉ no

2.1. If yes, please indicate whether this view is based on quantified data (e.g. import and export statistics collected by the government).

- ○ yes
- ○ no

2.2. If yes, please provide references (preferably including web links) (if relevant, indicate which types of animal genetic resources are covered).

2.3. Please also describe the changes, indicating the species involved, the direction of the changes, and the regions of the world to and from which the patterns of imports and exports have changed.

3. Please describe how the patterns of geneflow described under Questions 1 and 2 affect animal genetic resources and their management in your country.

Note: Please answer this question even if the pattern of geneflow into and out of your country corresponds to the “usual” pattern described in the first sentence of Question 1 and/or has not changed significantly in the last ten years.

There is an increased interest in the use of Zebu crosses in areas where British and/or Continental breeds of cattle had

previously dominated.

LIVESTOCK SECTOR TRENDS

4. Please indicate the extent to which the following trends or drivers of change have affected or are predicted to affect animal genetic resources and their management in your country and describe these effects.

Note: Relevant impacts on animal genetic resources and their management might include, for example, changes in the type of animal genetic resources kept (e.g. different breeds or species), changes in the uses to which animal genetic resources are put, changes in the geographical distribution of different types of animal genetic resources, increases or decreases in the number of breeds at risk of extinction, changes in the objectives of breeding programmes, changes in the number or type of conservation programmes being implemented, etc. In the text sections, please briefly describe the changes. If possible, provide some concrete examples of the challenges or opportunities presented by the respective drivers and the actions taken to address these challenges or opportunities. If relevant, you may also indicate why a given driver is not affecting animal genetic resources and their management in your country. For a general discussion of drivers of change, please see The State of the World's Animal Genetic Resources for Food and Agriculture (Part 2, Section A) (http://www.fao.org/docrep/010/a1250e/a1250e00.htm).

Drivers of change	Impact on animal genetic resources and their management over last ten years	Future impact on animal genetic resources and their management (predicted for the next ten years)	Describe the effects on animal genetic resources and their management
Changing demand for livestock products (quantity)	high	medium	In the last 10 years there has been an increase in the demand of animal products due to an increase in the purchasing power of the Brazilian population. There has been a higher demand for chicken meat.
Changing demand for livestock products (quality)	medium	high	With an increase in their purchasing power, the Brazilian population has been demanding higher quality animal products: chicken meat sold in different cuts (chicken thighs, chicken breasts, etc) instead of the whole chicken; pork with less fat (Embrapa has developed a light pig, to meet this demand); more tender beef cuts; milk with different fat percentages, etc. In the last years, there has been also an increase in the demand for organic or natural products.
Changes in marketing infrastructure and access	low	low	For many decades Brazil has a very good infrastructure for marketing and retailing.
Changes in retailing	low	low	Same as above.
Changes in international trade in animal products (imports)	low	low	In terms of animal products Brazil imports only a small number of high quality goods, such as foie gras, goat and sheep cheeses, as well as some special cuts of lamb and beef, mainly from Uruguay and Argentina.
Changes in international trade in animal products (exports)	high	high	The importance of Brazil as exporter of animal products is increasing steadily every year. The number of countries that import from Brazil is also increasing. The main exported animal products are beef (number 1 exporter, to 142 countries); chicken meat (number 1 exporter, to >150 countries); pork (4th largest exporter); raw leather; and in terms of milk products, there has been an effort by cooperative to increase their exports, which presented a sharp decrease in recent years.

Drivers of change	Impact on animal genetic resources and their management over last ten years	Future impact on animal genetic resources and their management (predicted for the next ten years)	Describe the effects on animal genetic resources and their management
Climatic changes	low	medium	Climatic changes should increase the interest in tolerant breeds (locally adapted) for crossbreeding, but there may be some productivity problems, since they are not as productive as the commercial ones.
Degradation or improvement of grazing land	low	low	
Loss of, or loss of access to, grazing land and other natural resources	none	low	In recent years there has been an increased interest (for agricultural purposes) of areas traditionally used for livestock production, thereby decreasing the area available for this enterprise.
Economic, livelihood or lifestyle factors affecting the popularity of livestock keeping	none	low	Increased rural evasion may affect smallholders in areas of marginal production.
Replacement of livestock functions	none	none	
Changing cultural roles of livestock	none	none	
Changes in technology	high	high	High demand for increased productivity, even in marginal areas, is leading to the increased use of new technologies in all areas of the production chain. The use of in vitro fertilization and sexed semen has increased in recent years.
Policy factors	low	low	
Disease epidemics	none	low	Some changes may occur due to climatic factors.

OVERVIEW OF ANIMAL GENETIC RESOURCES

5. Please provide the number of locally adapted and exotic breeds kept in your country.

Data on the number of breeds is needed in order to calculate the percentage of breeds subject to the various management activities that are covered in this questionnaire. In line with the request of the Commission on Genetic Resources for Food and Agriculture at its Fourteenth Regular Session (CGRFA-14/13/Report, paragraph 31), FAO will implement the "locally adapted" vs. "exotic breed" classification system in the Domestic Animal Diversity Information System (DAD-IS). Once countries have fully updated their breed lists and classified all breeds in DAD-IS, it will be possible to use these data to obtain the numbers of breeds in each category.

Species	Locally adapted breeds	Exotic breeds
Cattle (specialized dairy)	1	12
Cattle (specialized beef)	6	45
Cattle (multipurpose)	0	0
Sheep	10	15
Goats	7	10
Pigs	12	20
Chickens	8	88

Species	Locally adapted breeds	Exotic breeds
Buffaloes	2	3
Horses	8	16
Asses	3	0

CHARACTERIZATION

To provide further details of your country's activities in the field of characterization, surveying and monitoring, please go to Strategic Priority Area 1 of the "Progress report on the implementation of the Global Plan of Action for Animal Genetic Resources 2007–2013" (below).

6. Please provide an overview of the current state of characterization in your country by indicating the extent to which the activities shown in the following table have been carried out.

Note: Please focus on characterization studies that have been conducted within the last ten years (baseline surveys of population size may have been conducted in the more distant past). Recall that some types of characterization study on your country's breeds may have been conducted outside your country. For the first two columns, please insert the number of breeds; for columns 3 to 8 please choose one of the following categories: none; low (approximately <33%); medium (approximately 33–67%); high (approximately >67%).

Species	Baseline survey of population size	Regular monitoring of population size	Phenotypic characterization	Molecular genetic diversity studies – within breed	Genetic diversity studies based on pedigree	Molecular genetic diversity studies – between breed	Genetic variance component estimation	Molecular genetic evaluation
Cattle (specialized dairy)	5	10	high	high	high	high	high	high
Cattle (specialized beef)	26	26	high	high	high	high	high	high
Cattle (multipurpose)	0	0	high	high	high	high	high	high
Sheep	25	25	high	high	low	high	medium	none
Goats	8	0	high	high	low	medium	low	none
Pigs	0	0	high	high	high	high	medium	medium
Chickens	0	0	high	high	none	low	low	none
Asses	0	0	medium	medium	medium	low	none	none
Horses	6	6	high	high	high	medium	medium	none
Buffaloes	2	0	high	medium	medium	medium	medium	low

INSTITUTIONS AND STAKEHOLDERS

To provide further details of your country's activities in the field of institutions and stakeholders, please go to Strategic Priority Area 4 of the "Progress report on the implementation of the Global Plan of Action for Animal Genetic Resources 2007–2013" (below).

7. Please indicate the state of your country's capacities and provisions in the following areas of animal genetic resources management.

	Score
Education	high
Research	high
Knowledge	high
Awareness	medium
Infrastructure	high
Stakeholder participation	medium
Policies	medium
Policy implementation	low
Laws	low
Implementation of laws	low

8. Please provide further information regarding your country's capacities in each of the above-mentioned areas of management. If relevant, please indicate what obstacles or constraints your country faces in each of these areas and what needs to be done to address these constraints. You may also provide information on any particular successes achieved in your country in any of these areas and on the reasons for these successes.

	Description
Education	Brazil has a high number of post-graduate courses in Animal Sciences. The number is a direct result of the investment made in the decades of 70 to 90 when a large number of researchers and professors were sent abroad to be trained at post-graduate level, especially in the United States and Europe. When these returned with their degrees, it was possible to create various post-graduate programs in the country. The Brazilian system follows the American model with M.Sc. and Ph.D. programs, lasting on average 2 to 4 years, respectively.
Research	To become one of the world's largest research institutions in the tropical area, the Brazilian Agricultural Research Corporation - Embrapa also invested in training its human resources. Presently, among its 10,000 employees, 25 % are researchers, and the majority with a Ph.D. degree. Embrapa has 42 research centers that cover the whole country, with the National Research Center for Genetic Resources and Biotechnology (Cenargen) being responsible for co-ordinating the Brazilian Platform of Genetic Resources. Among the other 41 research centers, five work specifically with different animal species: Beef cattle; Dairy cattle; Sheep and Goats; Swine and Poultry; and Fisheries and Aquaculture. There is another group of Embrapa Research Centers, known as Eco-Regional Centers, that work with livestock on the following specific Regions/Biomes of the country: Southeatern, South, Pantanal, Coastal Tablelands, Mid-North, Eastern Amazon, Semi-Arid, and Lavrado (Roraima). They are all involved in the Brazilian Animal Network of Animal Genetic Resources. Besides Embrapa, research with Animal Genetic Resources is also being done at state public institutions.
Knowledge	Starting in the 80's there has been a complete change in the way livestock-keepers are conducting their selection. Previously the selection was based on phenotypic traits instead on production traits. Since the publication of Sires Summaries there has been a complete change in this situation, and today livestock-keepers are eager to know the results of such analyses, to direct the selection of their herds. The negative side of this new picture, is that there has been a huge concentration on some elite sires, with a drastic decrease in the genetic diversity in some important commercial breeds.

	Description
Awareness	In Brazil there has many ways to increase the awareness of stakeholders about the importance of Animal Genetic Resources. Field Days are common in Embrapa research centers, showing the newest results to stakeholders. But in recent years, there has been an increase in the interest of the media about this topic. The largest Brazilian TV network (TV Globo) has been a very powerful partner with its daily TV Show known as Globo Rural presenting the work done by Embrapa with AnGR, and this is done nationally, reaching millions of viewers.
Infrastructure	Brazil has very good infrastructure for the management of animal genetic resources, at public as well as in the private sector. Many large farms, working with elite herds have established their own advanced reproduction laboratories.
Stakeholder participation	The participation of stakeholders is directly proportional to the importance of their Breeders' Associations. Active and present Breeders' Associations, stimulate larger participation of stakeholders. A very good example is the Brazilian Zebu Breeders Association (ABCZ, in Portuguese), that is always organizing events with the participation of national and foreign researchers, keeping breeders always updated in new technologies and management methods.
Policies	The Ministry of Agriculture has many Thematic Chambers formed by the different stakeholders, where the policies are discussed. Among those Thematic Chambers, six deal with animals: 1. Beef; 2. Milk and Dairy Products; 3. Sheep and Goats; 4. Pigs and Poultry; 5. Horses and Asses; and 6. Honey and other Honeybee Products.
Policy implementation	The implementation is done though the publication of Normative Instructions on the Official Press (DOU), a newspaper published daily by the Federal Government, with decisions by the President of the country and by all Ministries.
Laws	As a 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. The National Policy on Biodiversity approved in 2002, established protected areas, known as Conservation Units, with a total surface of 1,337,000 km^2, distributed all over the country. Unfortunately, these Conservation Units do not include livestock, but only plants and wildlife.
Implementation of laws	

9. What steps have been taken in your country to engage or empower the various stakeholders in animal genetic resources management (e.g. establishment of livestock keepers' organizations, development of biocultural community protocols)?

Note: Biocultural community protocol: a document that is developed after a community undertakes a consultative process to outline their core cultural and spiritual values and customary laws relating to their traditional knowledge and resources. For a discussion of the potential role of biocultural community protocols in the conservation of animal genetic resources, please see the guidelines In vivo conservation of animal genetic resources (http://www.fao.org/docrep/018/i3327e/i3327e.pdf).

In Brazil, Breeders' Associations for the commercial breeds have existed for, in some cases, up to 100 years. Many of them are extremely interested in conservation of germplasm. For smaller breeds, however, Breeders' Associations are more recent. Despite their young age, many of those have had significant impacts on breed conservation and expansion.

BREEDING PROGRAMMES

Note: Breeding programmes: systematic and structured programmes for changing the genetic composition of a population towards a defined breeding goal (objective) to realize genetic gain (response to selection), based on objective performance criteria. Breeding programmes typically contain the following elements: definition of breeding goal; identification of animals; performance testing; estimation of breeding values; selection; mating; genetic gain and transfer of genetic gain. Breeding programmes are usually operated either by a group of livestock breeders organized in a breeders' association, community-based entity or other collective body; by a large commercial breeding company; or by the government.

To provide further details of your country's activities in the field of breeding programmes, please go to Strategic Priority Area 2 of the "Progress report on the implementation of the Global Plan of Action for Animal Genetic Resources 2007–2013" (below).

10. Who operates breeding programmes in your country?

Note: the objective of this question is to identify which stakeholders lead or organize the breeding programmes that exist in your country. Stakeholder participation in the implementation of the various elements of breeding programmes is covered under Question 15. If you wish to provide further information on the activities of the various stakeholder groups (including collaborative activities on an international scale), please provide it in the text section of Question 15.

Species	Government	Livestock keepers organized at community level	Breeders' associations or cooperatives	National commercial companies	External commercial companies	Non-governmental organizations	Others
Cattle (specialized dairy)	yes	yes	yes	yes	no	no	no
Cattle (specialized beef)	yes	yes	yes	yes	yes	no	no
Cattle (multipurpose)	yes	yes	yes	yes	no	no	no
Sheep	yes	yes	yes	no	no	no	no
Goats	yes	yes	yes	no	no	no	no
Pigs	yes	yes	yes	yes	yes	no	no
Chickens	yes	yes	yes	yes	yes	no	no
Buffaloes	yes	yes	yes	no	no	no	no
Asses	no	yes	yes	no	no	no	no
Horses	yes	yes	yes	yes	no	no	no

10.1. If you choose the option "others", please indicate what kind of operator(s) this refers to.

11. For how many breeds in your country are the following activities undertaken?

Note: Please do not include activities that are only undertaken for experimental purposes, i.e. include only activities that directly serve or involve livestock keepers. However, please include activities even if they do not at present form part of a breeding programme. The intention is to obtain an indication of whether the "building blocks" of a breeding programme are available or being developed in your country. Loc = Locally adapted breeds; Ex = Exotic breeds.

Species	Tools															
	Animal identification		Breeding goal defined		Performance recording		Pedigree recording		Genetic evaluation (classic approach)		Genetic evaluation including genomic information		Management of genetic variation (by maximizing effective population size or minimizing rate of inbreeding)		Artificial insemination	
	Loc	Ex	Loc	Ex	Loc	Ex	Loc	Ex	Loc	Ex	Loc	Ex	Loc	Ex	Loc	Ex
Cattle (specialized beef)	5	37	1	10	4	37	3	23	2	8	0	4	3	10	2	37
Cattle (specialized dairy)	5	3	1	3	3	3	1	3	1	3	1	2	1	3	2	2
Sheep	8	23	2	2	5	12	8	23	8	23	1	0	5	2	3	7
Goats	6	12	0	4	2	6	2	12	0	4	0	3	3	4	2	3
Horses	3	15	0	0	1	15	3	15	0	0	0	0	0	4	1	5
Buffaloes	2	3	0	3	0	0	0	3	0	0	2	0	0	0	0	3
Asses	1	1	0	1	0	0	0	1	0	0	2	1	0	0	0	0
Pigs	0	3	0	3	0	0	0	3	0	3	3	3	0	0	0	3

12. Please indicate how many of the breeds in your country are subject to breeding programmes applying the following breeding methods.

Note: Loc = Locally adapted breeds; Ex = Exotic breeds.

Species	Breeding method			
	Straight/pure-breeding only		Straight/pure-breeding and cross-breeding	
	Loc	Ex	Loc	Ex
Cattle (specialized dairy)	1	3	0	3
Cattle (specialized beef)	3	17	2	6
Sheep	1	2	0	3
Goats	0	4	0	2
Pigs	0	0	0	5
Buffaloes	0	3	0	0
Horses	1	1	0	3
Asses	2	0	2	0

13. Please indicate the state of research and training in the field of animal breeding in your country.

Species	Training	Research
Cattle (specialized dairy)	high	high
Cattle (specialized beef)	high	high
Cattle (multipurpose)	high	high
Sheep	high	high
Goats	high	high
Pigs	high	high
Chickens	high	high
Buffaloes	medium	medium
Asses	low	low
Horses	high	high

14. Please indicate the extent to which livestock keepers in your country are organized for the purposes of animal breeding.

Species	Organization of livestock keepers
Cattle (specialized dairy)	high
Cattle (specialized beef)	high
Cattle (multipurpose)	high
Sheep	medium
Goats	medium
Pigs	high
Chickens	high
Buffaloes	medium
Asses	low
Horses	high

15. Please indicate the level of stakeholder involvement in the various elements of breeding programmes in your country.

Note: If your country has different types of breeding programme, the level of involvement of the various stakeholders may vary from one type of programme to another. In answering this question please try to indicate the overall degree of involvement of the various stakeholder groups.

Cattle (specialized dairy)	Government	Research organizations	Breeders' associations or cooperatives	Individual breeders/livestock keepers	National commercial companies	External commercial companies	Non-governmental organizations	Others
Setting breeding goals	high	high	high	low	high	medium	none	none
Animal identification	high	high	high	high	high	low	none	none
Recording	high	high	high	high	high	none	none	none
Provision of artificial insemination services	low	low	high	high	high	low	none	none
Genetic evaluation	high	high	high	high	high	low	none	none

Cattle (specialized beef)	Government	Research organizations	Breeders' associations or cooperatives	Individual breeders/livestock keepers	National commercial companies	External commercial companies	Non-governmental organizations	Others
Setting breeding goals	high	high	high	low	high	medium	none	none
Animal identification	high	high	high	high	high	medium	none	none
Recording	high	high	high	high	high	none	none	none
Provision of artificial insemination services	low	high	high	high	high	low	none	none
Genetic evaluation	high	high	high	high	high	low	none	none

Sheep	Government	Research organizations	Breeders' associations or cooperatives	Individual breeders/livestock keepers	National commercial companies	External commercial companies	Non-governmental organizations	Others
Setting breeding goals	high	high	medium	low	low	low	low	low
Animal identification	high	high	high	high	low	low	low	low
Recording	high	high	medium	medium	low	low	low	low
Provision of artificial insemination services	high	low	low	low	low	low	low	low
Genetic evaluation	high	high	low	low	low	low	low	low

Goats	Government	Research organizations	Breeders' associations or cooperatives	Individual breeders/livestock keepers	National commercial companies	External commercial companies	Non-governmental organizations	Others
Setting breeding goals	high	high	medium	low	low	low	low	low
Animal identification	high	high	high	high	low	low	low	low
Recording	high	high	medium	medium	low	low	low	low
Provision of artificial insemination services	high	low	low	low	low	low	low	low
Genetic evaluation	high	high	low	low	low	low	low	low

Pigs	Government	Research organizations	Breeders' associations or cooperatives	Individual breeders/livestock keepers	National commercial companies	External commercial companies	Non-governmental organizations	Others
Setting breeding goals	medium	medium	high	low	high	high	low	low
Animal identification	medium	medium	high	medium	high	high	low	low
Recording	medium	medium	medium	medium	high	high	low	low
Provision of artificial insemination services	low	low	high	low	high	high	low	low
Genetic evaluation	medium	medium	high	low	high	high	low	low

Chickens	Government	Research organizations	Breeders' associations or cooperatives	Individual breeders/livestock keepers	National commercial companies	External commercial companies	Non-governmental organizations	Others
Setting breeding goals	none	none	high	high	high	high	low	low
Animal identification	none	none	none	none	none	high	low	low
Recording	none	none	medium	medium	high	high	low	low
Provision of artificial insemination services	none	none	high	low	high	high	low	low
Genetic evaluation	none	low	high	high	high	high	low	low

Buffaloes	Government	Research organizations	Breeders' associations or cooperatives	Individual breeders/livestock keepers	National commercial companies	External commercial companies	Non-governmental organizations	Others
Setting breeding goals	low	high	medium	medium	high	low	none	none
Animal identification	low	high	high	high	high	low	none	none
Recording	low	high	high	high	high	low	none	none
Provision of artificial insemination services	low	low	medium	medium	high	low	none	none
Genetic evaluation	low	medium	medium	medium	high	low	none	none

Horses	Government	Research organizations	Breeders' associations or cooperatives	Individual breeders/livestock keepers	National commercial companies	External commercial companies	Non-governmental organizations	Others
Setting breeding goals	high	high	high	high	low	low	none	none
Animal identification	medium	high	high	high	low	low	none	none
Recording	low	high	high	high	low	low	none	none
Provision of artificial insemination services	none	low	high	high	low	low	none	none
Genetic evaluation	none	high	high	high	low	low	none	none

15.1. If you choose the option "others", please indicate what kind of operator(s) this refers to.

15.2. Please provide further information on the roles that the stakeholders identified in the table play in the implementation of the various activities. If relevant, please also provide further information on the organizational roles played by the stakeholders identified in Question 10.

16. Does your country implement any policies or programmes aimed at supporting breeding programmes or influencing their objectives?

Species	Policies or programmes
Cattle (specialized dairy)	yes
Cattle (specialized beef)	yes
Cattle (multipurpose)	yes
Sheep	yes
Goats	yes
Pigs	yes
Chickens	yes
Asses	no
Buffaloes	yes
Horses	yes

16.1. Please describe these policies or programmes, indicating whether or not they include any measures specifically aimed at supporting breeding programmes for locally adapted breeds or any measures specifically aimed at supporting breeding programmes for exotic breeds (including breed-replacement programmes). Please indicate whether different types of programme are promoted in different production systems (and describe the differences).

Species	Description of policies or programmes
Cattle (specialized dairy)	Research organizations at country and state levels as well as federal and state universities, together with the Breeders' Associations, are responsible for many of the activities necessary for the development of the breeding programs. These include specific funding, maintenance of the programs as well as development of policies for the selection of animals. In several cases, these are at a local level, where the breed has a small geographic distribution or where there are production systems in different regions of the country.
Cattle (specialized beef)	same as above
Cattle (multipurpose)	same as above
Sheep	same as above
Goats	same as above
Pigs	same as above
Chickens	same as above
Buffaloes	same as above
Horses	same as above

17. Please describe the consequences of your country’s breeding policies and programmes, or lack of breeding policies and programmes, for your country’s animal genetic resources and their management.

Species	Description of consequences
Cattle (specialized dairy)	There has been a marked increase in productivity in these breeds in recent years due to the implementation of breeding programs. Brazil has a large number of highly trained specialists in the area of animal breeding, in most regions of the country, which has led to the successful implementation of these breeding programs.
Cattle (specialized beef)	same as above
Cattle (multipurpose)	same as above
Sheep	same as above
Goats	same as above
Pigs	same as above
Chickens	same as above
Buffaloes	same as above
Horses	same as above

18. Please describe the main constraints to the implementation of breeding programmes in your country and what needs to be done to address these constraints. You may also provide information on any particular successes achieved in your country with respect to the establishment and operation of breeding programmes and on the factors that have contributed to these successes.

The main constraints include, lack of farmer awareness and commitment to recording, low level of education in poorer regions of the country, and the cost of recording for the smallholders, especially for locally adapted breeds. Success includes the change from selection for qualitative (p.ex. ear size in zebu cattle) to quantitative traits and productivity.

19. Please describe future objectives, priorities and plans for the establishment or further development of breeding programmes in your country.

Species	Description of future objectives, priorities and plans
Cattle (specialized dairy)	Brazil has applied to enter Interbull evaluations. Objectives include increased productivity and dam longevity within the herd. Improvements in animal identification and recording are also highlighted.
Cattle (specialized beef)	Objectives include increased productivity, meat quality and dam longevity within herd. Improvements in animal identification and recording are also highlighted. In zebu cattle, meat tenderness is fundamental to maintain exportation levels, especially to countries with higher quality requirements.
Cattle (multipurpose)	
Sheep	Objectives include increased productivity, meat quality and dam longevity within the herd. Improvements in animal identification and recording are also highlighted. Meat tenderness and fat cover are fundamental in hair sheep breeds. Pelt quality is another important trait for hair sheep breeds.
Goats	Objectives include increased productivity and dam longevity within the herd. Improvements in animal identification and recording are also highlighted.
Pigs	Objectives include increased productivity within the herd. Improvements in animal identification and recording are also highlighted. Reduction of fat levels to an optimum level is one of the main objectives, especially for locally adapted breeds, who present a high fat percentage.
Chickens	Main objectives are defined by international companies.
Buffaloes	Objectives include increased productivity and dam longevity within the herd. Improvements in animal identification and recording are also highlighted.
Horses	One of the main objectives is to maintain unique traits in the locally adapted breeds as well as an increase in their use in sports and leisure activities.

CONSERVATION

To provide further details of your country's activities in the field of conservation, please go to Strategic Priority Area 3 of the "Progress report on the implementation of the Global Plan of Action for Animal Genetic Resources 2007–2013" (below).

20. Please provide an indication of the extent to which your country's breeds are covered by conservation programmes.

Please focus on at-risk breeds and breeds for which there are serious grounds for concern about their potential to fall into the at-risk category in the near future. Countries should not reduce their scores because of a lack of conservation programmes for breeds that are clearly not at risk. The main purpose of this question is to obtain an indication of the extent to which your country's conservation programmes meet the objective of protecting breeds from extinction. If your country has no official national criteria for classifying breed risk status or lacks the relevant data for identifying which breeds are at risk, please base your answers on estimations. Please also note that Question 8 of the "Progress report on the implementation of the Global Plan of Action for Animal Genetic Resources – 2007 to 2013" (below) requests countries to provide information on the criteria they use to assess the risk status of animal genetic resources.

Note: n/a = no programmes implemented because all breeds of this species present in the country are secure.

Species	In situ conservation	Ex situ in vivo conservation	Ex situ in vitro conservation
Cattle (specialized dairy)	high	high	high
Cattle (specialized beef)	high	high	high
Cattle (multipurpose)	high	high	high
Sheep	high	high	high
Goats	high	high	high
Pigs	high	medium	low
Chickens	low	low	low
Buffaloes	high	high	low
Asses	low	low	low
Horses	high	high	medium

21. Does your country use formal approaches to prioritize breeds for conservation?

- (•) yes
- ( ) no

21.1. If so, which of the following factors are considered?

Note: See Sections 2 and 3 of the FAO guidelines In vivo conservation of animal genetic resources (http://www.fao.org/docrep/018/i3327e/i3327e.pdf).

	Considered in formal prioritization approaches
Risk of extinction	yes
Genetic uniqueness	yes
Genetic variation within the breed	yes
Production traits	yes
Non-production traits	yes
Cultural or historical importance	yes
Probability of success	yes

22. Please indicate which of the following methods are used as elements of in situ conservation programmes in your country and which operators are managing them.

Note: Operators: the sector(s) that initiate(s) and manage(s) the respective activities. If both sectors undertake the respective activity, please answer "yes" in both rows. Please answer "yes" if the respective sector only works with some of the species targeted. If necessary, details of which sector addresses which species can be provided in the textual response. Information on what kinds of public- or private-sector organizations undertake the activities can also be provided, if necessary, in the textual response. Species targeted: Please answer "yes" if there are any such activities targeting the respective species, whether they are undertaken by the public sector, private sector or both.

Operators / Species targeted	Promotion of niche marketing or other market differentiation	Community-based conservation programmes	Incentive or subsidy payment schemes for keeping at-risk breeds	Development of biocultural community protocols	Recognition/award programmes for breeders	Conservation breeding programmes	Selection programmes for increased production or productivity in at-risk breeds	Promotion of at-risk breeds as tourist attractions	Use of at-risk breeds in the management of wildlife habitats and landscapes	Promotion of breed-related cultural activities	Extension programmes to improve the management of at-risk breeds	Awareness-raising activities providing information on the potential of specific at-risk breeds
Public sector	no	no	no	no	no	yes	yes	yes	yes	yes	yes	yes
Private sector	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Cattle (specialized dairy)	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Cattle (specialized beef)	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Cattle (multipurpose)	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Sheep	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Goats	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Pigs	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Chickens	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Buffaloes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Horses	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

22.1. Please provide further details of the activities recorded in the table and any other in situ conservation activities or programmes being implemented in your country.

23. Does your country have an operational in vitro gene bank for animal genetic resources?

In vitro gene bank: a collection of documented cryoconserved genetic material, primarily stored for the purpose of medium- to long-term conservation, with agreed protocols and procedures for acquisition and use of the genetic material.

- (•) yes
- ( ) no

23.1. If your country has no in vitro gene bank for animal genetic resources, does it have plans to develop one?

- ( ) yes

○ no

23.2. If yes, please describe the plans.

24. If your country has an in vitro gene bank for animal genetic resources, please indicate what kind of material is stored there.

	Stored in national genebank
Semen	yes
Embryos	yes
Oocytes	no
Somatic cells (tissue or cultured cells)	yes
Isolated DNA	yes

25. If your country has an in vitro gene bank for animal genetic resources, please complete the following table.

Species	Number of breeds for which material is stored	Number of breeds for which sufficient material is stored	Does the collection include material from not-at-risk breeds?	Have any extinct populations been reconstituted using material from the gene bank?	Have the gene bank collections been used to introduce genetic variability into an in situ population?	Have the gene bank collections been used to introduce genetic variability into an ex situ population?	Do livestock keepers or breeders' associations participate in the planning of the gene banking activities?
Cattle (specialized dairy)	0	0	no	no	no	no	no
Cattle (specialized beef)	6	2	no	no	yes	no	yes
Cattle (multipurpose)	0	0	no	no	no	no	no
Sheep	4	0	no	no	yes	no	no
Goats	5	0	no	no	yes	no	no
Pigs	1	0	no	no	no	no	no
Chickens	0	0	no	no	no	no	no
Asses	2	0	no	no	no	no	no
Horses	4	0	no	no	no	no	yes

25.1. Please provide further details of the activities recorded in the table (including any examples of the use of gene bank material to reconstitute populations or introduce genetic variability) and any other in vitro conservation activities or programmes being implemented in your country.

26. Does your country have plans to enter into collaboration with other countries to set up a regional or subregional in vitro gene bank for animal genetic resources?

- ○ yes
- ◉ no

26.1. If yes, please describe the plans, including a list of the countries involved.

27. If there have been any cases in your country in which breeds that were formerly classified as at risk of extinction have recovered to a position in which they are no longer at risk, please list the breeds and describe how the recovery was achieved.

By far, the best recovery has been of the one of the Caracu cattle. After the creation of the respective Breeders' Associations, other two cattle breeds also presented an increase in their populations: Curraleiro-Pé Duro and Criollo Lgeano. The Pantaneiro horse is another example of breed with a very active Breeders'Association. The last one is the Criolla Lanada sheep breed that has been recognized by the Brazilian Sheep Breeders' Association, that congregates all sheep breeds in the country.

REPRODUCTIVE AND MOLECULAR BIOTECHNOLOGIES

28. Please indicate the level of availability of reproductive and molecular biotechnologies for use in livestock production in your country.

Note: low = at experimental level only; medium = available to livestock keepers in some locations or production systems; high = widely available to livestock keepers.

	Biotechnologies								
Species	Artificial insemination	Embryo transfer	Multiple ovulation and embryo transfer	Semen sexing	In vitro fertilization	Cloning	Genetic modification	Molecular genetic or genomic information	Transplantation of gonadal tissue
Cattle (specialized dairy)	high	high	high	high	high	high	medium	high	low
Cattle (specialized beef)	high	high	high	high	high	high	medium	high	low
Sheep	high	high	high	none	medium	low	none	high	low
Goats	medium	high	high	none	medium	low	medium	medium	low
Pigs	high	high	high	none	none	none	none	high	low
Asses	none	none	none	none	none	none	none	none	low
Buffaloes	medium	low	low	none	low	none	none	low	low
Horses	high	high	high	none	low	medium	none	low	low

28.1. Please provide additional information on the use of these biotechnologies in your country.

29. If the reproductive and/or molecular technologies are available for use by livestock keepers in your country, please indicate which stakeholders are involved in providing the respective services to the livestock keepers.

	Stakeholders					
	Public sector	Breeders' associations or cooperatives	National non-governmental organizations	Donors and development agencies	National commercial companies	External commercial companies
Artificial insemination	yes	yes	no	yes	yes	yes
Embryo transfer	yes	yes	no	yes	yes	no
In vitro fertilization	yes	yes	no	yes	yes	no
Semen sexing	yes	no	no	yes	yes	yes
Embryo Cryopreservation	yes	yes	no	yes	yes	yes
Cloning	yes	no	no	yes	yes	no

29.1. Please provide additional information on the roles that the providers identified in the table play in the provision of biotechnology services in your country.

30. Please indicate which biotechnologies your country is undertaking research on.

Biotechnologies	Public or private research at national level	Research undertaken as part of international collaboration
Artificial insemination	yes	yes
Embryo transfer or MOET	yes	yes
Semen sexing	yes	yes
In vitro fertilization	yes	yes
Cloning	yes	yes

Biotechnologies	Public or private research at national level	Research undertaken as part of international collaboration
Genetic modification	yes	yes
Use of molecular genetic or genomic information for estimation of genetic diversity	yes	yes
Use of molecular genetic or genomic information for prediction of breeding values	yes	yes
Research on adaptedness based on molecular genetic or genomic information	yes	yes

30.1. Please briefly describe the research.

Artificial Insemination: Although well established and used in Brazil, the growing utilization of fixed time artificial insemination (FTAI), has given a new impulse in the AI utilization. Therefore, the research today is concentrated in the adaptation and incorporation of this technology on the routine of different managements systems of AnGR.

Embryo Transfer and MOERT: The use of this technology in cattle has gradually decreased, but research is still being done aiming to better select recipients and to maintain pregnancy. On the other hand, there is ongoing search for molecular markers to select the best embryo donors. For other species such as sheep, the studies are focused on protocol of synchronization and ovarian superstimulation.

Semen Sexing: Sexed sperm is routinely used in Brazil for IVF, but there still problems for its use in AI and ET.

In vitro fertilization (IVF): Brazil in the biggest producer of IVF bovine embryos in the world, however there are still many problems to be solved. Much research are being developed regarding oocyte donors, culture systems, oocyte quality, embryo quality, markers for embryo and oocyte selection, among others. A major concern is the cryopreservation of IVF embryos and oocytes. Studies in IVF protocol are also beginning with sheep, goats, pigs and horses (especially with ICSI).

Cloning by nuclear transfer: Main studies in this area are related to cell reprogramming (epigenetic studies), and transcriptome analysis of embryos to find out how to increase the efficiency of this technique.

Genetic modification: Studies in goats have resulted in the birth of the first transgenic (TG) animal in Brazil. Most of the research is being done with cattle, in which nuclear transfer using the transgenic cell is used to produce the TG embryos. Due to the low efficiency of this technique, research is being done to transfer the new DNA to the embryo or zygote using lentiviral and retroviral vectors.

31. Please estimate the extent to which artificial insemination (using semen from exotic and/or locally adapted breeds) and/or natural mating is used in your country's various production systems.

Note: low = approximately <33% of matings; medium = approximately 33–67% of matings; high = approximately >67% of mating; n/a = production system not present in this country.

Cattle (specialized beef)	Ranching or similar grassland -based production systems	Pastoralist systems	Mixed farming systems (rural areas)	Industrial systems	Small-scale urban or peri-urban systems
Artificial insemination using semen from locally adapted breeds	none	none	none	none	none
Artificial insemination using nationally produced semen from exotic breeds	medium	none	none	medium	none
Artificial insemination using imported semen from exotic breeds	low	none	none	medium	none
Natural mating	low	high	high	none	high

Cattle (specialized dairy)	Ranching or similar grassland -based production systems	Pastoralist systems	Mixed farming systems (rural areas)	Industrial systems	Small-scale urban or peri-urban systems
Artificial insemination using semen from locally adapted breeds	none	none	none	none	none
Artificial insemination using nationally produced semen from exotic breeds	none	none	low	medium	none
Artificial insemination using imported semen from exotic breeds	high	none	medium	medium	none
Natural mating	none	high	low	none	high

Sheep	Ranching or similar grassland -based production systems	Pastoralist systems	Mixed farming systems (rural areas)	Industrial systems	Small-scale urban or peri-urban systems
Artificial insemination using semen from locally adapted breeds	low	none	none	n/a	none
Artificial insemination using nationally produced semen from exotic breeds	low	none	medium	n/a	none
Artificial insemination using imported semen from exotic breeds	low	none	low	n/a	none
Natural mating	low	high	low	n/a	high

Goats	Ranching or similar grassland -based production systems	Pastoralist systems	Mixed farming systems (rural areas)	Industrial systems	Small-scale urban or peri-urban systems
Artificial insemination using semen from locally adapted breeds	low	none	low	n/a	none
Artificial insemination using nationally produced semen from exotic breeds	low	none	low	n/a	none
Artificial insemination using imported semen from exotic breeds	none	none	none	n/a	none
Natural mating	medium	high	medium	n/a	high

Pigs	Ranching or similar grassland -based production systems	Pastoralist systems	Mixed farming systems (rural areas)	Industrial systems	Small-scale urban or peri-urban systems
Artificial insemination using semen from locally adapted breeds	none	none	none	none	none
Artificial insemination using nationally produced semen from exotic breeds	none	none	none	none	none
Artificial insemination using imported semen from exotic breeds	none	none	none	high	none
Natural mating	high	high	high	none	high

Buffaloes	Ranching or similar grassland -based production systems	Pastoralist systems	Mixed farming systems (rural areas)	Industrial systems	Small-scale urban or peri-urban systems
Artificial insemination using semen from locally adapted breeds	none	none	none	none	none
Artificial insemination using nationally produced semen from exotic breeds	medium	none	medium	medium	none
Artificial insemination using imported semen from exotic breeds	none	none	none	none	none
Natural mating	medium	high	medium	medium	high

Horses	Ranching or similar grassland -based production systems	Pastoralist systems	Mixed farming systems (rural areas)	Industrial systems	Small-scale urban or peri-urban systems
Artificial insemination using semen from locally adapted breeds	none	none	none	n/a	none
Artificial insemination using nationally produced semen from exotic breeds	low	none	low	n/a	none
Artificial insemination using imported semen from exotic breeds	low	none	low	n/a	none
Natural mating	medium	high	medium	n/a	high

32. Please provide further details on the use of reproductive and molecular biotechnologies in animal genetic resources management in your country. Please note any particular constraints to implementing these activities and any problems associated with their use. Please indicate what needs to be done to address these constraints and/or problems. You may also provide information on any particular successes achieved in your country in the use of biotechnologies in animal genetic resources management and on the factors that have contributed to these successes.

In 2012, 12.3 million doses of cattle semen have been sold in Brazil. Of this total, 7.4 million doses were for beef cattle and 4.9 million doses for dairy cattle. In terms of origin of the semen, 6.5 million doses were produced nationally, while 5.8 million doses were imported. In vitro fertilization is widespread in the country, and Brazil produces 1/3 of all embryos produced worldwide. The last available figures show a production of 350,762 embryos (in 2011), of which 90% were produced in vitro. Seventy six percent were collected from beef breeds and 24% from dairy breeds. Only 15% of these embryos were from *Bos taurus* breeds, and 85% of *Bos indicus* origin, showing the huge importance of these in the Brazilian cattle industry.

III. DATA CONTRIBUTING TO THE PREPARATION OF *THE STATE OF THE WORLD'S BIODIVERSITY FOR FOOD AND AGRICULTURE*

INTEGRATION OF THE MANAGEMENT OF ANIMAL GENETIC RESOURCES WITH THE MANAGEMENT OF PLANT, FORESTRY AND AQUATIC GENETIC RESOURCES

1. Please indicate the extent to which the management of animal genetic resources in your country is integrated with the management of plant, forestry and aquatic genetic resources. Please describe the collaboration, including, if relevant, a description of the benefits gained by pursuing a collaborative approach.

	Extent of collaboration	Description
Development of joint national strategies or action plans	extensive	In 2009, the Brazilian Agricultural Research Corporation - Embrapa which is the branch of the Ministry of Agriculture, Livestock and Food Supply responsible for the agricultural research, established the National Platform of Genetic Resources. This Platform is coordinated by the National Research Center for Genetic Resources and Biotechnology - Cenargen, and it includes other 35 research centers of Embrapa, and 70 partner institutions. Cenargen has the mandate to coordinate programs to conserve genetic resources, including animals, plants and microorganisms. The overall management of animal genetic resources is dealt with by the Animal Genetic Resources Network, which is one of the four Networks of this Platform. The other three networks deal with: Plant Genetic Resources, Genetic Resources of Microoganisms, while the last one deals with cross sectorial matters such as Curatorship, Documentation, Quarantine, Exchange and Legislation.
Collaboration in the characterization, surveying or monitoring of genetic resources, production environments or ecosystems	limited	In its eco-regional research centers Embrapa can survey at the same time plants and animals of interest for agriculture or that present some economical
Collaboration related to genetic improvement	none	
Collaboration related to product development and/or marketing	none	
Collaboration in conservation strategies, programmes or projects	extensive	As mentioned on other topics of this table, conservation strategies, programmes or projects are discussed within the Brazilian Platform of Genetic Resources.
Collaboration in awareness-raising on the roles and values of genetic resources	extensive	Same as above
Training activities and/or educational curricula that address genetic resources in an integrated manner	limited	During the training activities, organized by Embrapa's Curatorship System, there are general topics that are of interest to researchers working with animals, plants and microorganisms, as well as specific topics for researchers of the different Networks.
Collaboration in the mobilization of resources for the management of genetic resources	extensive	The mobilization of financial resources is discussed by all leaders of the Action Plans of National Platform, but weach one of the Networks of the Platform can search for outside money, presenting projects to other financing agencies or to the private sector.

2. Please describe any other types of collaboration.

3. If relevant, please describe the benefits that could be achieved by strengthening collaboration in the management of genetic resources in the animal, plant, forest and aquatic sectors in your country. If specific plans to increase collaboration are in place, please describe them and the benefits foreseen

As mentioned before, there is already a strong collaboration in the management of genetic resources, that includes genetic resources in the animal, plant, forest, microorganisms and aquatic sectors. (See Executive Summary).

4. Please describe any factors that facilitate or constrain collaborative approaches to the management of genetic resources in your country.

5. If there are constraints, please indicate what needs to be done to overcome them.

ANIMAL GENETIC RESOURCES MANAGEMENT AND THE PROVISION OF REGULATING AND SUPPORTING ECOSYSTEM SERVICES

6. Do your country's policies, plans or strategies for animal genetic resources management include measures specifically addressing the roles of livestock in the provision of regulating ecosystem services and/or supporting ecosystem services?

Regulating ecosystem services: "Benefits obtained from the regulation of ecosystem processes" – Millennium Ecosystem Assessment. 2005. Ecosystems and human well-being: synthesis. Washington D.C., Island Press (available at http://millenniumassessment.org/documents/document.356.aspx.pdf), page 40. Supporting ecosystem services: "Services necessary for the production of all other ecosystem services" – Millennium Ecosystem Assessment. 2005. Ecosystems and human well-being: synthesis. Washington D.C., Island Press (available at http://millenniumassessment.org/documents/document.356.aspx.pdf), page 40.

- ○ yes
- ◉ no

6.1. If yes, please describe these measures and indicate which supporting and/or regulating ecosystem services are targeted, and in which production systems.

Examples of supporting and regulatory ecosystem services provided by livestock might include the following: provision or maintenance of wildlife habitats (e.g. via grazing); seed dispersal (e.g. in dung or on animals' coats); promoting plant growth (e.g. stimulating growth via grazing or browsing); soil formation (e.g. via the supply of manure); soil nutrient cycling (e.g. via supply of manure); soil quality regulation (e.g. affecting soil structure and water-holding capacity via trampling or dunging); control of weeds and invasive species (e.g. via grazing or browsing invasive plants); climate regulation (e.g. by promoting carbon sequestration through dunging); enhancing pollination levels (e.g. by creating habitats for pollinators); fire control (e.g. by removal of biomass that may fuel fires); avalanche control (e.g. grazing to keep vegetation short to reduce the probability that snow will slide); erosion regulation (e.g. indirect via fire control services); maintenance of water quality and quantity (e.g. indirect effect via erosion control); management of crop residues (e.g. consumption of unwanted crop residues by animals); pest regulation (e.g. by destruction of pests or pest habitats); disease regulation (e.g. by destruction of disease vectors or their habitats); buffering of water quantities – flood regulation (e.g. indirect effect via fire and erosion control).

6.1.1 Please describe what the outcome of these measures has been in terms of the supply of the respective ecosystem services (including an indication of the scale on which these outcomes have been obtained).

6.1.2 Please describe what the outcome of these measures has been in terms of the state of animal genetic resources and their management (including an indication of the scale on which these outcomes have been obtained).

7. Do your country's policies, plans or strategies for animal genetic resources management include measures specifically addressing environmental problems associated with livestock production?

Examples might include choosing to use particular species or breeds because they are less environmentally damaging in a given ecosystem or adapting breeding goals to produce animals that have some characteristic that makes them more environmentally friendly.

- ○ yes
- ◉ no

7.1. If yes, please describe these measures and indicate the environmental problems that are targeted, and in which production systems.

7.1.1 Please describe what the outcome of these measures has been in terms of the reduction of the respective environmental problem (including an indication of the scale on which these outcomes have been obtained).

7.1.2 Please describe what the outcome of these measures has been in terms of the state of animal genetic resources and their management (including an indication of the scale on which these outcomes have been obtained).

8. Please describe any constraints or problems encountered or foreseen in the implementation of measures in your country aimed at promoting the provision of regulating and supporting ecosystem services or reducing environmental problems.

9. Please provide examples of cases in which the role of livestock or specific animal genetic resources is particularly important in the provision of regulating and/or supporting ecosystem services in your country. Please also describe any examples in which diverse animal genetic resources are important in terms of reducing the adverse environmental effects of livestock production.

10. Please describe the potential steps that could be taken in your country to further expand or strengthen positive links between animal genetic resources management and the provision of regulating and/or supporting ecosystem services or the reduction of environmental problems. If your country has specific plans to take further action in this field, please describe them.

11. Please provide any further information on the links between animal genetic resources management in your country and the provision of supporting and/or regulating ecosystem services and/or the reduction of environmental problems.

IV. PROGRESS REPORT ON THE IMPLEMENTATION OF THE *GLOBAL PLAN OF ACTION FOR ANIMAL GENETIC RESOURCES* – 2007 TO 2013

Note: Please provide further details in the text boxes below each question, including, if relevant, information on why no action has been taken.

STRATEGIC PRIORITY AREA 1: CHARACTERIZATION, INVENTORY AND MONITORING OF TRENDS AND ASSOCIATED RISKS

- The state of inventory and characterization of animal genetic resources
- The state of monitoring programmes and country-based early warning and response systems
- The state of international technical standards and protocols for characterization, inventory, and monitoring

1. Which of the following options best describes your country's progress in building an inventory of its animal genetic resources covering all livestock species of economic importance (SP 1, Action 1)?

Glossary: An inventory is a complete list of all the different breeds present in a country.

- (•) a. Completed before the adoption of the GPA
- ( ) b. Completed after the adoption of the GPA
- ( ) c. Partially completed (further progress since the adoption of the GPA)
- ( ) d. Partially completed (no further progress since the adoption of the GPA)

Please provide further details:

2. Which of the following options best describes your country's progress in implementing phenotypic characterization studies covering morphology, performance, location, production environments and specific features in all livestock species of economic importance (SP 1, Actions 1 and 2)?

- (•) a. Comprehensive studies were undertaken before the adoption of the GPA
- ( ) b. Sufficient information has been generated because of progress made since the adoption of the GPA
- ( ) c. Some information has been generated (further progress since the adoption of the GPA)
- ( ) d. Some information has been generated (no further progress since the adoption of the GPA)
- ( ) e. None, but action is planned and funding identified
- ( ) f. None, but action is planned and funding is sought
- ( ) g. None

Please provide further details:

The National Center for Genetic Resources (Cenargen) of the Brazilian Corporation of Agricultural Research (EMBRAPA) was created in 1974. At the beginning, EMBRAPA included only Plant Genetic Resources in its National Research Program. So, the phenotypic characterization of Brazilian locally adapted breeds started in 1983, right after the insertion of AnGR in the Brazilian Program of Genetic Resources, coordinated by Cenargen. In terms of commercial breeds, a lot has been done by other EMBRAPA Research Centers as well as by Universities and Breeders' Associations.

3. Which of the following options best describes your country's progress in molecular characterization of its animal genetic resources covering all livestock species of economic importance (SP 1)?

- (•) a. Comprehensive studies were undertaken before the adoption of the GPA
- ( ) b. Sufficient information has been generated because of progress made since the adoption of the GPA
- ( ) c. Some information has been generated (further progress since the adoption of the GPA)
- ( ) d. Some information has been generated (no further progress since the adoption of the GPA)
- ( ) e. None, but action is planned and funding identified
- ( ) f. None, but action is planned and funding is sought

- ○ g. None

Please provide further details:

Locally adapted breeds of seven different species, contemplated on the Brazilian Animal Genetic Resources Network, have been genetically characterized. The locally adapted breeds already genetically characterized belong to the following species: Cattle, Horses, Donkeys, Buffaloes, Sheep, Goats and Pigs. Genetic characterization of avian species is just starting. Some wildlife species with economic potential are also being genetically characterized. Once again, a lot of work has been done with commercial breeds of the different important species raised in Brazil, by EMBRAPA, Universities and Breeders` Associations.

4. Has your country conducted a baseline survey of the population status of its animal genetic resources for all livestock species of economic importance (SP 1, Action 1)?

Glossary: A baseline provides a reference point for monitoring population trends. Population status refers to the total size of a national breed population (ideally, also the proportion that is actively used for breeding and the number of male and female breeding animals).

- ◉ a. Yes, a baseline survey was undertaken before the adoption of the GPA
- ○ b. Yes, a baseline survey has been undertaken or has commenced after the adoption of the GPA
- ○ c. Yes, a baseline survey has been undertaken for some species (coverage increased since the adoption of the GPA)
- ○ d. Yes, a baseline survey has been undertaken for some species (coverage not increased since the adoption of the GPA)
- ○ e. No, but action is planned and funding identified
- ○ f. No, but action is planned and funding is sought
- ○ g. No

Please provide further details:

The Brazilian Animal Genetic Resources Conservation Program was created in 1983. The first decade was devoted to the identification of the locally adapted breeds, as well as to quantify their population size and to determine their geographic location. To avoid the loss of some breeds with rather small population size, a cryopreservation program was simultaneously created in 1983, and the first semen samples were stored in the Brazilian Animal Gene Bank in that same year. It is necessary, however, to start a second phase, revising these numbers. As an example, we can mention the Caracu cattle breed, that was threatened when the conservation program started, but today, due to the efforts of different research institutions and to a very strong Breeders' Association, numbers have increased to a total that by the end of 2012 surpasses 70,000 heads of cattle. As for commercial breeds the number of animals registered in their specific Breeders' Association is known. Unfortunately, the number of non-registered animals by is not known, because the rural censuses are done by species and not by breed.

5. Have institutional responsibilities for monitoring the status of animal genetic resources in your country been established (SP 1, Action 3)?

Glossary: Monitoring is a systematic set of activities undertaken to document changes in the population size and structure of animal genetic resources over time.

- ◉ a. Yes, responsibilities established before the adoption of the GPA
- ○ b. Yes, responsibilities established after the adoption of the GPA
- ○ c. No, but action is planned and funding identified
- ○ d. No, but action is planned and funding is sought
- ○ e. No

Please provide further details:

As mentioned before, in general the population size of the locally adapted breeds is very small. So, their monitoring is being conducted by the National Platform of Genetic Resources, through the Conservation Nuclei, in the habitats where specific locally adapted breeds occur.

6. Have protocols (details of schedules, objectives and methods) been established for a programme to monitor the status of animal genetic resources in your country (SP 2)?

- ◉ a. Yes, protocols established before the adoption of the GPA
- ○ b. Yes, protocols established after the adoption of the GPA
- ○ c. No, but action is planned and funding identified

- ○ d. No, but action is planned and funding is sought
- ○ e. No

Please provide further details:

Again, this is being done in the Conservation Nuclei, and for the whole population whenever there is a Breeders' Association.

7. Are the population status and trends of your country's animal genetic resources being monitored regularly for all livestock species of economic importance (SP 1, Action 2)?

- ◉ a. Yes, regular monitoring commenced before the adoption of the GPA
- ○ b. Yes, regular monitoring commenced after the adoption of the GPA
- ○ c. Yes, regular monitoring is being undertaken for some species (coverage increased since the adoption of the GPA)
- ○ d. Yes, regular monitoring is being undertaken for some species (coverage not increased since the adoption of the GPA)
- ○ e. No, but action is planned and funding identified
- ○ f. No, but action is planned and funding is sought
- ○ g. No

Please provide further details:

See answer for question 6.

8. Which criteria does your country use for assessing the risk status of its animal genetic resources (SP 1, Action 7)?

Glossary: FAO has developed criteria that it uses to allocate breeds to risk-status categories based on the size and structure of their populations (http://www.fao.org/docrep/010/a1250e/a1250e00.htm).

- ◉ a. FAO criteria
- ○ b. National criteria that differ from the FAO criteria
- ○ c. Other criteria (e.g. defined by international body such as European Union)
- ○ d. None

Please provide further details. If applicable, please describe (or provide a link to a web site that describes) your national criteria or those of the respective international body:

9. Has your country established an operational emergency response system (http://www.fao.org/docrep/meeting/021/K3812e.pdf) that provides for immediate action to safeguard breeds at risk in all important livestock species (SP 1, Action 7)?

- ○ a. Yes, a comprehensive system was established before the adoption of the GPA
- ○ b. Yes, a comprehensive system has been established since the adoption of the GPA
- ○ c. For some species and breeds (coverage expanded since the adoption of the GPA)
- ○ d. For some species and breeds (coverage not expanded since the adoption of the GPA)
- ○ e. No, but action is planned and funding identified
- ○ f. No, but action is planned and funding is sought
- ◉ g. No

Please provide further details:

10. Is your country conducting research to develop methods, technical standards or protocols for phenotypic or molecular characterization, or breed evaluation, valuation or comparison? (SP 2, Action 2)

- (●) a. Yes, research commenced before the adoption of the GPA
- ( ) b. Yes, research commenced after the adoption of the GPA
- ( ) c. No, but action is planned and funding identified
- ( ) d. No, but action is planned and funding is sought
- ( ) e. No

Please provide further details:

See answer to question 3.

11. Has your country identified the major barriers and obstacles to enhancing its inventory, characterization and monitoring programmes?

- ( ) a. Yes
- ( ) b. No
- (●) c. No major barriers and obstacles exist. Comprehensive inventory, characterization and monitoring programmes are in place.

Please provide further details. If barriers and obstacles have been identified, please list them:

12. If applicable, please list and describe the measures that need to be taken to address these barriers and obstacles and to enhance your country's inventory, characterization and monitoring programmes:

13. Please provide further comments on your country's activities related to Strategic Priority Area 1: Characterization, inventory and monitoring of trends and associated risks (including regional and international cooperation)

Note: It is not necessary to duplicate information provided in previous sections. Where relevant, please provide cross-references.

Genetic characterization of locally adapted breeds had a great impulse in 1989, when the Animal Genetic Laboratory was established at the National Center for Genetic Resources (Cenargen)0. Since then, breeds of cattle, buffaloes, horses, donkeys, sheep, goats and pigs have been genetically characterized. At first, with RAPD, and later, with Microsatellites, Y-Chromosome and SNPs. Regional and International cooperation in this field occurred with Colombia (pigs and cattle); Cuba (goats); Mexico (pigs); Uruguay (pigs); Spain (cattle, buffaloes and horses); and USA (sheep).
In terms of commercial breeds, other Embrapa research centers as well as the huge number of graduate students at the different universities spread all over the country are using the phenotypic and genetic characterization as the topic for their theses.

In terms of inventory, it is necessary to convince the governmental institution responsible for the Rural Inventory to include Breed Names in their survey. Up to now, the survey being conducted only indicates the number of animals/ species, without identifying the breeds.

STRATEGIC PRIORITY AREA 2: SUSTAINABLE USE AND DEVELOPMENT

- The state of national sustainable use policies for animal genetic resources
- The state of national species and breed development strategies and programmes
- The state of efforts to promote agro-ecosystem approaches

14. Does your country have adequate national policies in place to promote the sustainable use of animal genetic resources (see also questions 46 and 54)?

- (●) a. Yes, since before the adoption of the GPA
- ( ) b. Yes, policies put in place or updated after the adoption of the GPA
- ( ) c. No, but action is planned and funding identified
- ( ) d. No, but action is planned and funding is sought
- ( ) e. No

Please provide further details. If available, please provide the text of the policies or a web link to the text:

Even though Brazil is promoting the sustainable use of AnGR, it is still necessary to elaborate national policies on this topic (see answer for Question 56). Legislation in place regulates research, development and access and benefit sharing for all native genetic resources, including locally adapted livestock breeds.

15. Do these policies address the integration of agro-ecosystem approaches into the management of animal genetic resources in your country (SP5) (see also questions 46 and 54)?

Glossary: The ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way (for further information see http://www.cbd.int/ecosystem/description.shtml).

- (●) a. Yes
- ( ) b. No, but a policy update is planned and funding identified
- ( ) c. No, but action is planned and funding is sought
- ( ) d. No

Please provide further details:

The locally adapted breeds are exactly the ones that do promote the conservation and sustainable use. In general, they are extensively raised and since the 1500's (when most of their ancestors arrived from the Iberian Peninsula) they developed important and unique adaptive traits in ecological niches in the country. In the last decade, there has been an increase on the integration of Crop-Livestock-Forest. It is estimated that Brazil has about 110 million hectares with cultivated pastures where about 70% have some degree of degradation, with low productive capacity of fodder and consequently low production of meat and/or milk and high rates of soil and water losses (erosion), with negative effects on the economy and on the environment. These areas can be recovered with the adoption of an integration of Crop-Livestock-Forest (iLPF, in Portuguese), which consists of the implementation of different production systems of grains, fiber, meat, milk, and other agro-energy, in the same areas, with sequential or rotational periods, leveraging synergies among them. The Ministry of Agriculture signs technical cooperation agreements with agencies, organizations and public and private institutions as a strategy for staff training and as a way to encourage the practice of iLPF among farmers. The program is developed by the Coordination for Sustainable Management of Production Systems of the Ministry of Agriculture. This integration has been very positive for livestock, since there has been an increase in the available area, without any deforestation, as well as a decrease in the emission of green house gases.

16. Do breeding programmes exist in your country for all major species and breeds, and are these programmes regularly reviewed, and if necessary revised, with the aim of meeting foreseeable economic and social needs and market demands (SP4, Action 2)?

- ( ) a. Yes, since before the adoption of the GPA
- (●) b. Yes, put in place after the adoption of the GPA
- ( ) c. For some species and breeds (coverage has increased since the adoption of the GPA)
- ( ) d. For some species and breeds (coverage has not increased since the adoption of the GPA)
- ( ) e. No, but action is planned and funding identified
- ( ) f. No, but action is planned and funding is sought

- ○ g. No

Please provide further details:

This is true for the locally adapted breeds. For commercial breeds, however, there are real strong development programs that started long before the adoption of the GPA. Brazil has several breeding programs responsible for the analyses of performance data, calculation of EPDs, Sires Summaries,etc. Two of the most important ones are the PROMEBO, that deals with European cattle breeds and the GENEPLUS that deals with Zebu type cattle breeds. The GENEPLUS analyses for only the Nellore breed (the most important *Bos indicus* breed in Brazil) involves data on more than 1.5 million animals/Summary.

17. Is long-term sustainable use planning – including, if appropriate, strategic breeding programmes – in place for all major livestock species and breeds (SP4, Action 1)?

- ◉ a. Yes, since before the adoption of the GPA
- ○ b. Yes, put in place after the adoption of the GPA
- ○ c. For some species and breeds (further progress made since the adoption of the GPA)
- ○ d. For some species and breeds (no further progress made since the adoption of the GPA)
- ○ e. No, but action is planned and funding identified
- ○ f. No, but action is planned and funding is sought
- ○ g. No

Please provide further details:

18. Have the major barriers and obstacles to enhancing the sustainable use and development of animal genetic resources in your country been identified?

- ○ a. Yes
- ○ b. No
- ◉ c. No major barriers and obstacles exist. Comprehensive sustainable use and development measures are in place.

Please provide further details. If barriers and obstacles have been identified, please list them:

19. Have the long-term impacts of the use of exotic breeds on locally adapted breeds (e.g. economic, environmental or genetic impacts) and on food security been assessed in your country (SP4, Action 1)?

Glossary:

Exotic breeds are breeds that are maintained in a different area from the one in which they were developed. Exotic breeds comprise both recently introduced breeds and continually imported breeds.

Locally adapted breeds are breeds that have been in the country for a sufficient time to be genetically adapted to one or more of traditional production systems or environments in the country. The phrase "sufficient time" refers to time present in one or more of the country's traditional production systems or environments. Taking cultural, social and genetic aspects into account, a period of 40 years and six generations of the respective species might be considered as a guiding value for "sufficient time", subject to specific national circumstances.

b. Yes, assessments were introduced before the adoption of the GPA

Please provide further details:

There is no doubt that the exotic breeds, imported at the end of the 19th century and beginning of the 20th century, were responsible for the huge decrease in the effective population size of the locally adapted breeds, taking the majority of them to the verge of extinction. It is also true, however, that in recent years farmers started to use locally adapted breeds on crossbreding programmes due to their adaptation and unique traits. In other words, in the past, the crossbreeding aimed at the substitution of the locally adapted breeds by the exotic ones, and today, farmers are trying to get the best of each one of them: productivity of the exotic ones and the adaptation and hardiness of the locally adapted ones.

20. Have recording systems and organizational structures for breeding programmes been established or strengthened (SP4, Action 3)?

- (●) a. Yes, sufficient recording systems and organizational structures for breeding programmes have existed since before the adoption of the GPA
- ( ) b. Yes, sufficient recording systems and organizational structures for breeding programmes exist because of progress made since the adoption of the GPA
- ( ) c. Yes, recording systems and organizational structures for breeding programmes are partially in place (and were established or strengthened after the adoption of the GPA)
- ( ) d. Yes, recording systems and organizational structures for breeding programmes are partially in place (but no progress has been made since the adoption of the GPA)
- ( ) e. No, but action is planned and funding identified
- ( ) f. No, but action is planned and funding is sought
- ( ) g. No

Please provide further details:

Breeders' Associations have been very active and have their own recording systems. There has been a huge integration among the Breeders' Associations with the Ministry of Agriculture, with Embrapa and with different Universities, who evaluate the breeding programs. Brazil, United States and Canada are engaged on the development of an Information System for recording the information on their Animal Genetic Resources, with emphasis on Gene Banks. Brazil specifically will include in this new Information System, data about the animals maintained on the Conservation Nuclei of locally adapted breeds of livestock.

21. Are mechanisms in place in your country to facilitate interactions among stakeholders, scientific disciplines and sectors as part of sustainable use development planning (SP5, Action 3)?

- (●) a. Yes, comprehensive mechanisms have existed since before the adoption of the GPA
- ( ) b. Yes, comprehensive mechanisms exist because of progress made since the adoption of the GPA
- ( ) c. Yes, mechanisms are partially in place (and were established or strengthened after the adoption of the GPA)
- ( ) d. Yes, mechanisms are partially in place (but no progress has been made since the adoption of the GPA)
- ( ) e. No, but action is planned and funding identified
- ( ) f. No, but action is planned and funding is sought
- ( ) g. No

Please provide further details:

See answer for question 20.

22. Have measures been implemented in your country to provide farmers and livestock keepers with information that facilitates their access to animal genetic resources (SP 4, Action 7)?

- (●) a. Yes, comprehensive measures have existed since before the adoption of the GPA
- ( ) b. Yes, comprehensive measures exist because of progress made since the adoption of the GPA
- ( ) c. Yes, measures partially implemented (and were established or strengthened after the adoption of the GPA)
- ( ) d. Yes, measures partially implemented (but no progress has been made since the adoption of the GPA)
- ( ) e. No, but action is planned and funding identified
- ( ) f. No, but action is planned and funding is sought
- ( ) g. No

Please provide further details:

The breeding programs for different species (like PROMEBO and GENEPLUS, mentioned on question 16) are very popular among farmers, who perform the selection on their herds based on the results of these programs. Since these programs have been created, there has been a complete change in the behavior of farmers, that now select their animals based on productivity instead of only phenotypic traits.

23. Has your country developed a national policy or entered specific contractual agreements for access to and the equitable sharing of benefits resulting from the use and development of animal genetic resources and associated traditional knowledge (SP3, Action 2)?

- ○ a. Yes, sufficient measures (policy and/or agreements) have been in place since before the adoption of the GPA
- ○ b. Yes, sufficient measures (policy and/or agreements) are in place because of progress made since the adoption of the GPA
- ○ c. Yes, some measures (policy and/or agreements) are in place (progress has been made since the adoption of the GPA)
- ◉ d. Yes, some measures (policy and/or agreements) are in place (but no progress has been made since the adoption of the GPA)
- ○ e. No, but a policy and/or agreements are in preparation
- ○ f. No, but a policy and/or agreements are planned
- ○ g. No

Please provide further details:

Legislation in place regulates research, development and benefit sharing for all native genetic resources including locally adapted breeds of livestock. But there is a long way to go before this legislation can be put in place.

24. Have training and technical support programmes for the breeding activities of livestock-keepers been established or strengthened in your country (SP 4, Action 1)?

- ◉ a. Yes, sufficient programmes have existed since before the adoption of the GPA
- ○ b. Yes, sufficient programmes exist because of progress made since the adoption of the GPA
- ○ c. Yes, some programmes exist (progress has been made since the adoption of the GPA)
- ○ d. Yes, some programmes exist (but no progress has been made since the adoption of the GPA)
- ○ e. No, but action is planned and funding identified
- ○ f. No, but action is planned and funding is sought
- ○ g. No

Please provide further details:

This is being done by the Extension Service, mostly with smallholders raising sheep and goats. In general breeders raising beef cattle own large properties and are very active on their specific Breeders' Association that in general organizes meetings with their associates. The Brazilian Zebu Breeders Association, a good example of a very active Association, offers in general two large meetings per year (during the Beef Cattle Cattle Show and during the Dairy Cattle show), when researchers are invited to shares their experiences and to report the results of the analyses of the breeding programs. Similar meetings are organized by other Breeders' Associations during the diverse Cattle Shows held each year.

25. Have priorities for future technical training and support programmes to enhance the use and development of animal genetic resources in your country been identified (SP 4, paragraph 42)?

- ◉ a. Yes, priorities have been identified or updated since the adoption of the GPA
- ○ b. Yes, priorities were identified before the adaption of the GPA but have not been updated
- ○ c. No, but action is planned and funding identified
- ○ d. No, but action is planned and funding is sought
- ○ e. No

Please provide further details:

At this moment, the main priority is to train people on the utilization of the new Information System mentioned on Question 20, and that should be released on the first semester of 2014.

26. Have efforts been made in your country to assess and support indigenous or local production systems and associated traditional knowledge and practices related to animal genetic resources (SP 6, Action 1, 2)?

- ○ a. Yes, sufficient measures have been in place since before the adoption of the GPA

- ○ b. Yes, sufficient measures are in place because of progress made since the adoption of the GPA
- ○ c. Yes, some measures are in place (and were established or strengthened after the adoption of the GPA)
- ◉ d. Yes, some measures are in place (but no progress has been made since the adoption of the GPA)
- ○ e. No, but action is planned and funding identified
- ○ f. No, but action is planned and funding is sought
- ○ g. No

Please provide further details:

27. Have efforts been made in your country to promote products derived from indigenous and local species and locally adapted breeds, and facilitate access to markets (SP 6, Action 2, 4)?

- ○ a. Yes, sufficient measures have been in place since before the adoption of the GPA
- ○ b. Yes, sufficient measures are in place because of progress made since the adoption of the GPA
- ○ c. Yes, some measures are in place (and were established or strengthened after the adoption of the GPA)
- ◉ d. Yes, some measures are in place (but no progress has been made since the adoption of the GPA)
- ○ e. No, but action is planned and funding identified
- ○ f. No, but action is planned and funding is sought
- ○ g. No

Please provide further details:

28. If applicable, please list and describe priority requirements for enhancing the sustainable use and development of animal genetic resources in your country:

Along the centuries, since they were brought to this country by the Portuguese conquerors, the Brazilian locally adapted breeds developed specific traits to the habitats where they developed. For each one of them, it is necessary to explore niche markets for their products in order to show to the breeders that they can get profits out of these breeds.

29. Please provide further comments on your country's activities related to Strategic Priority Area 2: Sustainable Use and Development (including regional and international cooperation)

Note: It is not necessary to duplicate information provided in previous sections. Where relevant, please provide cross-references.

The adaptive traits mentioned in the above question, are the most important "feature" of the Brazilian locally adapted breeds of livestock. After a long period showing no interest at all on locally adapted breeds, there has been a change in the behavior of many breeders that raise commercial breeds, towards the utilization of the locally adapted breeds on a sustainable way. Many breeders are now trying to re-insert locally adapted breeds in their production systems. A recent research showed the improvement in beef tenderness due to a crossbreeding of Curraleiro cattle (a Brazilian locally adapted breed) with the Nellore cattle (the breed that has by far the largest population in Brazil). Another example is the utilization of Caracu bulls (a breed that is no longer endangered) in crossbreeding programs, with either European and Zebu breeds.

STRATEGIC PRIORITY AREA 3: CONSERVATION

- The state of national conservation policies
- The state of *in situ* and *ex situ* conservation programmes
- The state of regional and global long-term conservation strategies and agreement on technical standards for conservation

30. Does your country regularly assess factors leading to the erosion of its animal genetic resources (SP 7, Action 2)?

- ○ a. Erosion not occurring
- ◉ b. Yes, regular assessments have been implemented since before the adoption of the GPA
- ○ c. Yes, regular assessments have commenced since the adoption of the GPA
- ○ d. No, but action is planned and funding identified
- ○ e. No, but action is planned and funding is sought
- ○ f. No

Please provide further details:

31. What factors or drivers are leading to the erosion of animal genetic resources? Please describe the factors specifying which breeds or species are affected:

The main factor leading the locally adapted breeds to erosion is their crossbreeding with imported exotic breeds. This is a very serious situation, due to the small effective population size of the majority of the locally adapted breeds. As an example we can mention the decrease in numbers of locally adapted cattle breeds, which occurred in two steps. On a first step, when British breeds were imported, in the 1800's. At that time, the breeds found in the southern region of the country (that present a temperate climate) almost disappeared. One century later, zebu breeds were imported from India. Those zebu breeds were brought to the Southeastern and Central-Western states (with tropical climate), and led to a huge and quick decrease in the population size of the tropical local breeds. Today, zebu breeds account for 80% of all registered cattle in Brazil, and among those, 85% are Nellore.
Locally adapted cattle breeds raised in areas with severe climate are in a better situation than the ones raised in areas with a regular climate. The Curraleiro cattle, raised on a semi-arid region do not have to compete with the Nellore, that did not adapt to the low availability of forages. The Pantaneiro cattle, a breed well adapted to the Pantanal region, have to compete with the Nellore cattle, that even though much more recent in that region, are also well adapted. It is very difficult to convince breeders to continue raising the locally adapted one, if the Nellore presents a higher productivity. For pigs, the problem is that all locally adapted breeds are of the fat type, and the pig industry only utilizes the lean type pigs. It is necessary that Brazilian researchers develop a production system similar to the one developed for the locally adapted pig breeds in Spain. With the right nutrition, the Spanish pigs, originally of the fat type, are not allowed to develop a large amount of fat, and produce a high quality ham.

32. Does your country have conservation policies and programmes in place to protect locally adapted breeds at risk in all important livestock species (SP 7, SP 8 and SP 9)?

Glossary: Locally adapted breeds are breeds that have been in the country for a sufficient time to be genetically adapted to one or more of traditional production systems or environments in the country. The phrase "sufficient time" refers to time present in one or more of the country's traditional production systems or environments. Taking cultural, social and genetic aspects into account, a period of 40 years and six generations of the respective species might be considered as a guiding value for "sufficient time", subject to specific national circumstances.

- ○ a. Country requires no policies and programmes because all locally adapted breeds are secure
- ◉ b. Yes, comprehensive policies and programmes have been in place since before the adoption of the GPA
- ○ c. Yes, comprehensive policies and programmes exist because of progress made since the adoption of the GPA
- ○ d. For some species and breeds (coverage expanded since the adoption of the GPA)
- ○ e. For some species and breeds (coverage not expanded since the adoption of the GPA)
- ○ f. No, but action is planned and funding identified
- ○ g. No, but action is planned and funding is sought
- ○ h. No

Please provide further details:

The Brazilian Agricultural Research Corporation - Embrapa which is the branch of the Ministry of Agriculture, Livestock and Food Supply has established a National Platform of Genetic Resources. This Platform is coordinated by Embrapa's National Center for Genetic Resources and Biotechnology - Cenargen, and it includes other 35 research centers of

Embrapa, and 70 partner institutions. Cenargen has the mandate to coordinate programs to conserve genetic resources, including animals, plants and microorganisms. The overall management of animal genetic resources is dealt with by the Brazilian Network of Animal Genetic Resources which is one of the four Networks of this Platform. This Network was responsible for the establishment of Conservation Nuclei for the majority of locally adapted breeds, in order to prevent their extinction. These Nuclei, created exactly on the habitats where the breeds developed, serve as an in situ conservation program, as well as for an ex situ in vitro program, since they are responsible for the collection of samples for cryopreservation and for genetic characterization. These Conservation Nuclei also serve to increase the awareness about the importance of conserving each one of these locally adapted breeds. Up to now, there are no conservation policies.

33. If conservation policies and programmes are in place, are they regularly evaluated or reviewed (SP 7, Action 1; SP 8, Action 1; and SP 9, Action 1)?

- (●) a. Yes
- ( ) b. No, but action is planned and funding identified
- ( ) c. No, but action is planned and funding is sought
- ( ) d. No

Please provide further details:

The conservation program is very flexible. Each one of the Conservation Nuclei mentioned on Question 33 consists of a research project that is evaluated every year. If another locally adapted breed is identified along one specific year, it may be included in the conservation program in the following year. In the opposite direction, if one of the breeds already included in the conservation program is considered no longer endangered, it may be excluded of the program.

34. Does your country have in situ conservation measures in place for locally adapted breeds at risk of extinction and to prevent breeds from becoming at risk (SP 8 and SP 9)?

Glossary: Locally adapted breeds are breeds that have been in the country for a sufficient time to be genetically adapted to one or more of traditional production systems or environments in the country. The phrase "sufficient time" refers to time present in one or more of the country's traditional production systems or environments. Taking cultural, social and genetic aspects into account, a period of 40 years and six generations of the respective species might be considered as a guiding value for "sufficient time", subject to specific national circumstances.

- ( ) a. Country requires no in situ conservation measures because all locally adapted breeds are secure
- ( ) b. Yes for all breeds
- ( ) c. For some breeds (coverage expanded since the adoption of the GPA)
- (●) d. For some breeds (coverage not expanded since the adoption of the GPA)
- ( ) e. No, but action is planned and funding identified
- ( ) f. No, but action is planned and funding is sought
- ( ) g. No

Please provide further details:

As mentioned on Question 33, in situ conservation measures are done through the Conservation Nuclei spread all over Brazil. There are Conservation Nuclei for locally adapted breeds at risk of the following species: Cattle, Buffaloes, Pigs, Sheep, Goats, Horses and Asses.

35. Does your country have ex situ in vivo conservation measures in place for locally adapted breeds at risk of extinction and to prevent breeds from becoming at risk (SP 8 and SP 9)?

Glossary: Ex situ in vivo conservation - maintenance of live animal populations not kept under their normal management conditions - e.g. in zoological parks or governmental farms - and/or outside the area in which they evolved or are now normally found.

- ( ) a. Country requires no ex situ in vivo conservation measures because all locally adapted breeds are secure
- ( ) b. Yes for all breeds
- ( ) c. For some breeds (coverage expanded since the adoption of the GPA)
- (●) d. For some breeds (coverage not expanded since the adoption of the GPA)
- ( ) e. No, but action is planned and funding identified
- ( ) f. No, but action is planned and funding is sought

- ○ g. No

Please provide further details:

The National Center for Genetic Resources and Biotechnology (Cenargen) has an Experimental Farm where *ex situ in vivo* measures for locally adapted livestock breeds are in place. Animals brought from the majority of the Conservation Nuclei are kept together not only to increase awareness of the civil society, as a Farm Park, as to serve as donors for semen and embryo collection for storage at the Animal Gene Bank.

36. Does your country have ex situ in vitro conservation measures in place for locally adapted breeds at risk of extinction and to prevent breeds from becoming at risk (SP 8 and SP 9)?

Glossary: Ex situ in vitro - conservation, under cryogenic conditions including, inter alia, the cryoconservation of embryos, semen, oocytes, somatic cells or tissues having the potential to reconstitute live animals at a later date.

- ○ a. Country requires no ex situ in vitro conservation measures because all locally adapted breeds are secure
- ○ b. Yes for all breeds
- ○ c. For some breeds (coverage expanded since the adoption of the GPA)
- ◉ d. For some breeds (coverage not expanded since the adoption of the GPA)
- ○ e. No, but action is planned and funding identified
- ○ f. No, but action is planned and funding is sought
- ○ g. No

Please provide further details:

The Brazilian Animal Gene Bank for locally adapted breeds was created in 1983. At the beginning only semen of cattle was collected and stored. Later, semen of sheep, goats, horses, asses and pigs were included. Presently, the Brazilian Animal Gene Bank has semen and embryos of the majority of these species. Even though the Nellore is the largest beef cattle population in Brazil, the almost disappearance of some line breeds lead their breeders to start storing semen from the original line breeds that gave origin to today's Nellore.

37. Please describe the measures (indicating for each whether they were introduced before or after the adoption of the GPA) or provide a web link to a published document that provides further information:

38. If your country has not established any conservation programmes, is this a future priority?

- ○ a. Yes
- ○ b. No

Please provide further details:

39. Has your country identified the major barriers and obstacles to enhancing the conservation of its animal genetic resources?

- ○ a. Country requires no conservation programmes because all animal genetic resources are secure
- ○ b. Yes
- ○ c. No
- ◉ d. No major barriers and obstacles exist. Comprehensive conservation programmes are in place

Please provide further details. If barriers and obstacles have been identified, please list them:

40. If your country has existing ex situ collections of animal genetic resources, are there major gaps in these collections (SP 9, Action 5)?

- [x] a. Yes
- [ ] b. No

If yes, have priorities for filling the gaps been established?

- [x] a. Yes
- [ ] b. No, but action is planned and funding identified
- [ ] c. No, but action is planned and funding is sought
- [ ] d. No

Please provide further details:

As mentioned on Question 36, when the Animal Gene Bank (AGB) was created (in 1983), it started collecting only semen from locally adapted breeds of cattle. More recently, the AGB started the collection of the other species: sheep, goats, horses and asses. Among the present priorities are to collect genetic material from pigs and buffaloes as well as to increase the numbers of samples from locally adapted breeds of goats, horses and asses.

41. Are arrangements in place in your country to protect breeds and populations that are at risk from natural or human-induced disasters (SPA 3)?

- [ ] a. Yes, arrangements have been in place since before the adoption of the GPA
- [ ] b. Yes, arrangements put in place after the adoption of the GPA
- [ ] c. No, but action is planned and funding identified
- [ ] d. No, but action is planned and funding is sought
- [x] e. No

Please provide further details:

42. Are arrangements in place in your country for extraction and use of conserved genetic material following loss of animal genetic resources (e.g. through disasters), including arrangements to enable restocking (SP 9, Action 3)?

- [ ] a. Yes, arrangements have been in place since before the adoption of the GPA
- [ ] b. Yes, arrangements put in place after the adoption of the GPA
- [ ] c. No, but action is planned and funding identified
- [ ] d. No, but action is planned and funding is sought
- [x] e. No

Please provide further details:

43. Is your country conducting research to adapt existing, or develop new, methods and technologies for in situ and ex situ conservation of animal genetic resources (SP 11, Action 1)?

- [x] a. Yes, research commenced before the adoption of the GPA
- [ ] b. Yes, research commenced since the adoption of the GPA
- [ ] c. No, but action is planned and funding identified
- [ ] d. No, but action is planned and funding is sought
- [ ] e. No

Please provide further details. If yes, please briefly describe the research:

The research on in situ and ex situ conservation of AnGR is being done trough the Brazilian Network of Animal Genetic Resources. This Network was created as part of the Brazilian Platform of Genetic Resources, and it consists of six

research projects:
1. Management of the Brazilian Network for Animal Genetic Resources
2. In situ conservation of large frame livestock species (cattle, buffaloes, horses, asses)
3. In situ conservation of small frame livestock species (sheep, goats, pigs)
4. In situ conservation of wildlife species with economic potential
5. Ex situ in vitro conservation
6. Genetic Characterization

The Brazilian Network of AnGR involves: 10 Research Centers of Embrapa. 12 Universities, 5 Breeders' Associations and a total of 86 researchers, from those different institutions.

All Conservation Nuclei belong to projects 2 and 3 listed above, while the measures for *ex situ in vitro* conservation are included in project 5. Whenever genetic material is collected (project 5) for storage at the Animal Gene Bank (AGB), blood is also collected and sent to the AGB for DNA extraction and its utilization on the genetic characterization (project 6) of the locally adapted breeds.

Project 5 does a lot of research to adapt existing methods and technologies for the cryopreservation of semen, embryos and oocytes, because many protocols utilized for commercial breeds do not work properly for these locally adapted breeds.

44. Does your country implement programmes to promote documentation and dissemination of knowledge, technologies and best practices for conservation (SP 11, Action 2)?

- (●) a. Yes, programmes commenced before the adoption of the GPA
- ( ) b. Yes, programmes commenced since the adoption of the GPA
- ( ) c. No, but action is planned and funding identified
- ( ) d. No, but action is planned and funding is sought
- ( ) e. No

Please provide further details:

This is true for the implementation of programmes to promote documentation and dissemination of knowledge. In terms of best practices, up to now they have been implemented only at the Animal Genetics Laboratory. Documentation will have a large impact with the release of the new Information System mentioned on Question 20. In terms of dissemination of knowledge, evey year Embrapa organizes Field Days and training Courses in its different research centers involved with the conservation of locally adapted livestock breeds.

45. What are your country's priority requirements for enhancing conservation measures for animal genetic resources? Please list and describe them:

1. Increase awareness of the society (mainly breeders) about the importance of the locally adapted breeds with their unique traits and their adaptation to the different ecosystems of the country. It is necessary that we can prove to breeders that they can get a profit from the herds of their locally adapted breeds.
2. Work together with the Ministry of Agriculture and breeders to develop animal products with designation of origin (up to now, in Brazil only plant products have been released with designation of origin).
3. Together with breeders, develop niche markets for animal products produced by locally adapted breeds.
4. Convince the Government about the importance of identifying breeds within each one of the species during the Rural Census, performed from time to time by the Brazilian Institute of Geography and Statistics (IBGE in Portuguese).

46. Please provide further comments describing your country's activities related to Strategic Priority Area 3: Conservation (including regional and international cooperation)

Note: It is not necessary to duplicate information provided in previous sections. Where relevant, please provide cross-references.

Following the establishment of the in situ program on a nationwide scale, in 1983, it was decided that EMBRAPA should start an ex situ program. This program would avoid the genetic dilution and the loss of irreplaceable genes of the locally adapted breeds. In order to store semen and embryos from these animals, the Animal Gene Bank was established. Currently, the Animal Network of the Brazilian Platform of Genetic Resources coordinated by CENARGEN has Conservation Nuclei of locally adapted breeds established all over the country. Each Conservation Nucleus has been located at a site with the necessary infrastructure for the collection of semen and embryos. The selected animals are assembled at these sites and their germplasm is immediately transferred to the Animal Gene Bank, located in Brasilia.

When the infrastructure for the collection of semen and embryos do not exist, donors are temporarily transferred to the Experimental Farm under CENARGEN for subsequent collection. On December 2013, the Animal Gene Bank had about 80,000 doses of semen and 453 embryos.

STRATEGIC PRIORITY AREA 4: POLICIES, INSTITUTIONS AND CAPACITY-BUILDING IMPLEMENTATION AND FINANCING OF THE GLOBAL PLAN OF ACTION FOR ANIMAL GENETIC RESOURCES

- The state of national institutions for planning and implementing animal genetic resources measures
- The state of information sharing
- The state of educational and research facilities capacity for characterization, inventory, and monitoring, sustainable use, development, and conservation
- The state of awareness of the roles and values of animal genetic resources
- The state of policies and legal frameworks for animal genetic resources

47. Does your country have sufficient institutional capacity to support holistic planning of the livestock sector (SP 12, Action1)?

- (●) a. Yes, sufficient capacity has been in place since before the adoption of the GPA
- ( ) b. Yes, sufficient capacity is in place because of progress made after the adoption of the GPA
- ( ) c. No, but action is planned and funding identified
- ( ) d. No, but action is planned and funding is sought
- ( ) e. No

Please provide further details:

The Ministry of Agriculture has many Thematic Chambers formed by the different stakeholders. Among those Thematic Chambers, six deal with animals:
1. Beef;
2. Milk and Dairy Products;
3. Sheep and Goats;
4. Pigs and Poultry;
5. Horses and Asses; and
6. Honey and other Honeybee Products.

Embrapa, which is the branch of the Ministry of Agriculture responsible for the agricultural research at federal level, has the mandate to coordinate through CENARGEN (a thematic research center) the conservation of locally adapted breeds of livestock. Embrapa has two other types of research centers working on AnGR. The first type, known as Product Research Centers, work with specific species where the main focus is on commercial breeds of livestock:
1. Embrapa Beef Cattle Research Center;
2. Embrapa Dairy Cattle Research Center;
3. Embrapa Sheep and Goats Research Center; and
4. Embrapa Swine and Poultry Research Center.

The other type of research centres known as Eco-Regional Research Centers, work on breeds adapted to specific biomes:
5. Embrapa Pantanal (Pantaneiro horse, Pantaneiro cattle, Monteiro pig);
6. Embrapa Eastern Amazon (Marajoara and Puruca horse; Carabao and Baio buffaloes);
7. Embrapa Mid-North (Curraleiro Pé-Duro cattle), Marota goat, Santa Ines sheep);
8. Embrapa Coastal Tablelands (Santa Ines sheep);
9. Embrapa South Animal Husbandry and Sheep (Criollo Lanado sheep).

Besides all that, Brazil has a great number of agricultural universities with strong graduate courses at M.Sc. and Ph. D. levels, dealing with all field areas of the livestock sector. In the year 2010, when the World Congress on Genetics Applied to Livestock Production was held in Germany, the fourth largest delegation was the Brazilian one (formed by

Embrapa's Researchers, University Professors and Graduate students) showing the importance of this field for the country.

48. What is the current status of your country's national strategy and action plan for animal genetic resources (SP 20)?

Glossary: National strategy and action plan for animal genetic resources: a strategy and plan, agreed by stakeholders and preferably government-endorsed, that translates the internationally agreed Global Plan of Action for Animal Genetic Resources into national actions, with the aim of ensuring a strategic and comprehensive approach to the sustainable use, development and conservation of animal genetic resources for food and agriculture.

- (●) a. Previously endorsed national strategy and action plan is being updated (or new version has been endorsed)
- ( ) b. Completed and government-endorsed
- ( ) c. Completed and agreed by stakeholders
- ( ) d. In preparation
- ( ) e. Preparation is planned and funding identified
- ( ) f. Future priority activity
- ( ) g. Not planned

Please provide further details. If available, please provide a copy of your country's national strategy and action plan as a separate document or as a web link:

http://plataformarg.cenargen.embrapa.br/rede-animal

49. Are animal genetic resources addressed in your country's National Biodiversity Strategy and Action Plan (http://www.cbd.int/nbsap/)?

- ( ) a. Yes
- (●) b. No, but they will be addressed in forthcoming plan
- ( ) c. No

Please provide further details:

50. Are animal genetic resources addressed in your country's national livestock sector strategy, plan or policy (or equivalent instrument)?

- ( ) a. Yes
- (●) b. No, but they will be addressed in a forthcoming strategy, plan or policy
- ( ) c. No, animal genetic resources are not addressed
- ( ) d. No, the country does not have a national livestock sector strategy, plan or policy

Please provide further details. If available, please provide the text of the strategy, plan or policy or a web link to the text:

51. Has your country established or strengthened a national database for animal genetic resources (independent from DAD-IS) (SP 15, Action 4)?

- ( ) a. Yes, a national database has been in place since before the adoption of the GPA
- ( ) b. Yes, a national database is in place because of progress made since the adoption of the GPA
- (●) c. Yes, a national database is in place but still requires strengthening (progress since adoption of the GPA)
- ( ) d. Yes, a national database is in place but still requires strengthening (no progress since adoption of the GPA)
- ( ) e. No, but action is planned and funding identified
- ( ) f. No, but action is planned and funding is sought

- ○ g. No

Please provide further details:

The new Information System being developed by Brazil in conjunction with the United States and Canada, that will be released in the first semester of 2014, will consolidate all data already available on Animal Genetic Resources in the country.

52. Have your country's national data on animal genetic resources been regularly updated in DAD-IS?

Note that the Commission on Genetic Resources for Food and Agriculture has requested FAO to produce global status and trends reports every two years.

- ○ a. Yes, regular updates have been occurring since before the adoption of the GPA
- ○ b. Yes, regular updates started after the adoption of the GPA
- ◉ c. No, but it is a future priority
- ○ d. No

Please provide further details:

Brazil in involved with FAO in a pilot project to describe the "Production Environment Descriptors" (PEDs) in the country, and it wuill be an excellent opportunity to update DAD-IS.

53. Has your country established a National Advisory Committee for Animal Genetic Resources (SP 12, Action 3)?

- ◉ a. Yes, established before the adoption of the GPA
- ○ b. Yes, established after the adoption of the GPA
- ○ c. No, but action is planned and funding identified
- ○ d. No, but action is planned and funding is sought
- ○ e. No

Please provide further details. If a National Advisory Committee has been established, please list its main functions:

A National Advisory Committee for Animal Genetic Resources was created prior to the elaboration of the First Country Report, in 2002. Since then, it has been replaced by the Coordinators of projects that belong to the Network for Animal Genetic Resources of the Brazilian Platform of Genetic Resources, described on Questions 32 and 43.
The functions of this Committee are: Identify breeds in danger of extinction, Phenotypic Characterization, Genetic Characterization, Cryopreservation of semen and embryos to enrich the Brazilian Bank of AnGR, Enrichment of the DNA Bank for AnGR, Development of reproductive techniques applied to cryopreservation, Participate in the development of an Information System for AnGR, Interact with Breeders Associations of locally adapted breeds, Increase awareness of the civil society about the importance of AnGR, Help breeders in the formation of new Breeders Associations devoted to locally adapted breeds.

54. Is there strong coordination and interaction between the National Focal Point and stakeholders involved with animal genetic resources, such as the breeding industry, livestock keepers, government agencies, research institutes and civil society organizations (SP 12, Action 3)?

- ◉ a. Yes, strong coordination has been in place since before the adoption of the GPA
- ○ b. Yes, strong coordination was established after the adoption of the GPA
- ○ c. No, but action is planned and funding identified
- ○ d. No, but action is planned and funding is sought
- ○ e. No

Please provide further details:

The National Focal Point was established in 1997, right after the 7th Ordinary Session of the Commission on Genetic Resources for Food and Agriculture, when it was decided to it decided to convene the First Session of the Intergovernmental Technical Working Group on Animal Genetic Resources for Food and Agriculture, with the task of furthering the development of the Global Strategy for the Management of Farm Animal Genetic Resources. Since the first meeting, Brazil kept the same person as the National Coordinator, facilitating the integration with all stakeholders.

55. Does the National Focal Point (or other institutions) undertake activities to increase public awareness of the roles and values of animal genetic resources (SP 18)?

- (●) a. Yes, activities commenced before the adoption of the GPA
- ( ) b. Yes, activities commenced after the adoption of the GPA
- ( ) c. No, but activities are planned and funding identified
- ( ) d. No, but activities are planned and funding is sought
- ( ) e. No

Please provide further details:

There are many activities being done to increase public awareness of the roles and values of AnGR:
1. Field days at the Experimental Station, located in Brasilia, showing the animals of locally adapted breeds of the majority of the Conservation Nuclei, stressing the importance of their conservation;
2. Field days held in other research centers of Embrapa, showing animals of the specific locally adapted breeds maintained in their Conservation Nuclei, again stressing the importance of their conservation;
3. News and interviews on newspapers of wide circulation
4. News and interviews on rural magazines
5. News and interviews on Embrapa's web site
6. Presentation on rural TV programs. In 2010 a series of eight programs showing eight of the Conservation Nuclei were presented at national level, with a huge impact in the civil society. We received numerous calls and e-mails afterwards.
7. Embrapa has a weekly program, called " Field Day on TV". Some of these programs are devoted to AnGR.
8. Production of a comprehensive book (*Animals of the Discovery: Domestic Breeds in the History of Brazil*) about the locally adapted breeds (2nd edition published in 2006).

In 2013, a very interesting television programme was filmed in Brazil by RAI (Radio and Television Company of Italy). The subject of the TV programme was Brazil's development, and the topics presented were: (1) airplane industry in Brazil; (2) Brazilian advances in agro-energy (ethanol and bio-diesel), and (3) the importance of locally adapted cattle breeds to improve the meat quality in Brazilian commercial breeds! The mix of topics made us very proud with the importance that was given to the Brazilian livestock breeds.

56. Does your country have national policies and legal frameworks for animal genetic resources management (SP 20)?

- ( ) a. Yes, comprehensive national policies and legal frameworks were in place before the adoption of the GPA and are kept up to date
- ( ) b. Yes, comprehensive and up-to-date national policies and legal frameworks in place because of progress made since the adoption of the GPA
- ( ) c. Yes, some national policies and legislation in place (strengthened since the adoption of the GPA)
- ( ) d. Yes, some national policies and legislation in place (not strengthened since the adoption of the GPA)
- (●) e. No, but action is planned and funding identified
- ( ) f. No, but action is planned and funding is sought
- ( ) g. No

Please provide further details:

It is expected that another Thematic Chamber will be created at the Ministry of Agriculture (similar to the ones mentioned on Question 47) to discuss Genetic Resources as a whole, including, of course, AnGR.

57. Which of the following options best describes the state of training and technology transfer programmes in your country related to inventory, characterization, monitoring, sustainable use, development and conservation of animal genetic resources (SP14, Action 1)?

- (●) a. Comprehensive programmes have been in place since before the adoption of the GPA
- ( ) b. Comprehensive programmes exist because of progress made since the adoption of the GPA
- ( ) c. Some programmes exist (further progress since the adoption of the GPA)
- ( ) d. Some programmes (no further progress since the adoption of the GPA)

- ○ e. None, but action is planned and funding identified
- ○ f. None, but action is planned and funding is sought
- ○ g. None

Please provide further details:

In Brazil, the first actions on Animal Genetic Resources were taken in the state of São Paulo and started in the 70's with the conservation of Caracu cattle. A few years later, Embrapa included AnGR in its research programme on Genetic Resources, that until then included only plants. Today all these measures are coordinated by the Brazilian Network of Animal Genetic Resources.

58. Have organizations (including where relevant community-based organizations), networks and initiatives for sustainable use, breeding and conservation been established or strengthened (SP 14, Action 3)?

- ◉ a. Yes, comprehensive organizations, networks and initiatives have existed since before the adoption of the GPA
- ○ b. Yes, comprehensive organizations, networks and initiatives exist because of progress made since the adoption of the GPA
- ○ c. Yes, some organizations, networks and initiatives exist (established or strengthened since adoption of the GPA)
- ○ d. Yes, some organizations, networks and initiatives exist (but no progress made since adoption of the GPA)
- ○ e. No, but action is planned and funding identified
- ○ f. No, but action is planned and funding is sought
- ○ g. No

Please provide further details:

59. Are there any national NGOs active in your country in the fields of:

Characterization?

- ◉ a. Yes
- ○ b. No

Sustainable use and development?

- ◉ c. Yes
- ○ d. No

Conservation of breeds at risk?

- ◉ e. Yes
- ○ f. No

If yes, please list the national NGOs and provide links to their web sites:

There are numerous active Breeders' Associations working with AnGR in Brazil, that can be considered as NGOs. Some of them are listed below:
1. Brazilian Association of Caracu Breeders: www.abccaracu.com.br
2. Brazilian Association of Criollo Lageano cattle: www.abccl.org.br
3. Brazilian Association of Pantaneiro Horses: www.abccp.com.br
4. Brazilian Association of Sheep Breeders: www.arcoovinos.com.br
5. Herd Book Collares: www.herdbook.org.br, (working with British cattle breeds)
6. Brazilian Association of Goat Breeders: www.abccaprinos.com.br
7. Brazilian Association of Zebu Breeders: www.abcz.org.br

60. Has your country established or strengthened research or educational institutions in the field of animal genetic resources management (SP 13, Action 3)?

- ○ a. Yes, adequate research and education institutions have existed since before the adoption of the GPA
- ○ b. Yes, adequate research and education institutions exist because of progress made since the adoption of the GPA

- ○ c. Yes, research and education institutions exist but still require strengthening (progress made since the adoption of the GPA)
- ◉ d. Yes, research and education institutions exist but still require strengthening (no progress made since the adoption of the GPA)
- ○ e. No, but action is planned and funding identified
- ○ f. No, but action is planned and funding is sought
- ○ g. No

Please provide further details:

There are some Universities that have specific courses on Conservation and Utilization of AnGR at M.Sc. and Ph.D. level, but it is necessary to include similar courses in a larger number of agricultural universities.

61. Please provide further comments describing your country's activities related to Strategic Priority Area 4: Policies, Institutions and Capacity-building (including regional and international cooperation)

Note: It is not necessary to duplicate information provided in previous sections. Where relevant, please provide cross-references.

The team working with AnGR at the National Research Center for Genetic Resources and Biotechnology (Cenargen) has been very active in terms of capacity building. Many regional courses were offered, and some with the participation of FAO:

1. Regional Animal Gene Banks - Brasilia, Brazil (Embrapa + INTA Argentina + University of Hanover + FAO) for Latin America and Caribbean countries;
2. Regional Animal Gene Banks - Nanjing, China (Brazil + France + India + China) for Asian countries;
3. Cryopreservation (Embrapa + IICA + University of Hokkaido - Japan + IICA) for Latin America and Caribbean countries
4. In vitro fertilization (Embrapa + Prague University - Czeck Republic + FAO) for Latin America and Caribbean countries
5. Introduction to DAD-IS (Embrapa + FAO) for Latin America and Caribbean countries
6. Twice a year, Embrapa Cenargen offers courses on Andrology; Embryo Transfer and In Vitro Fertilization in its Experimental Farm
7. Training Course on Cryopreservation, Tunis - Tunisia (United States + the Nethertlands + Brazil + FAO) for African countries
8. Training Course on Cryopreservation, Guayaquil, Ecuador (Brazil + Argentina + FAO) for Latin America and Caribbean countries
9. Every year, courses on Conservation of AnGR and on Genetic Characterization of AnGR are offered jointly with the University of Brasilia, at graduate level (M.Sc. and Ph.D.)
10. Organization of the World Conference on Conservation of AnGR (Embrapa + RBI + FAO)
11. Members of the Organization Committee of the 8th WCGALP, held in Brazil.

IMPLEMENTATION AND FINANCING OF THE *GLOBAL PLAN OF ACTION FOR ANIMAL GENETIC RESOURCES*

- The state of international collaboration for planning and implementing animal genetic resources measures
- The state of financial resources for the conservation, sustainable use and development of animal genetic resources

62. Has your country established or strengthened international collaboration in (SP 16): Characterization?

- ◉ a. Yes
- ○ b. No, but action is planned and funding identified
- ○ c. No, but action is planned and funding is sought
- ○ d. No

Sustainable use and development?

- (●) e. Yes
- ( ) f. No, but action is planned and funding identified
- ( ) g. No, but action is planned and funding is sought
- ( ) h. No

Conservation of breeds at risk?

- (●) i. Yes
- ( ) j. No, but action is planned and funding identified
- ( ) k. No, but action is planned and funding is sought
- ( ) l. No

Please provide further details:

In terms of Genetic Characterization:
1. Analyses of criollo cattle breeds (Brazil and Colombia);
2. sheep breeds (Brazil and USA - meta-analysis);
3. Pig breeds (Brazil, Colombia, Uruguay and Mexico);
4. Goat breeds (Brazil and Cuba; Argentina, Brazil and Costa Rica);
5. Chicken breeds (Brazil and Nigeria).

63. Are there any international NGOs active in your country in the fields of:

Characterization?

- ( ) a. Yes
- (●) b. No

Sustainable use and development?

- ( ) c. Yes
- (●) d. No

Conservation of breeds at risk?

- ( ) e. Yes
- (●) f. No

If yes, please list the international NGOs:

International NGOs present in the country dealing with animal genetic resources are the ones working only with wildlife (WWF and IUCN).

64. Has national funding for animal genetic resources programmes increased since the adoption of the GPA?

- (●) a. Yes
- ( ) b. No

Please provide further details:

There has been an increase in the national funding for the AnGR programme in 2009, with the creation of the Brazilian Platform of Genetic Resources, but this increase has no relation with the adoption of the GPA. The Brazilian Network of AnGR, part of the Brazilian Platform, received a 4-year budget of US$ 2,750,000.00 (two million seven hundred and fifty thousand US dollars), not including salaries of its research team, for the period 2009-2012, and there has been an addition of 50% of this budget for the period 2013-2014.

65. Has your country received external funding for implementation of the GPA?

- (●) a. Yes
- ( ) b. No
- ( ) c. No, because country generally does not receive external funding

Please provide further details:

Brazil approved a Regional Project together with Argentina and Costa Rica with financial resources from the FAO Funding Strategy, for the genetic characterization of locally adapted goat breeds of the three participant countries. Another project was approved at the Agricultural Innovation Africa Brazil Marketplace (funds from Bill and Melinda Gates Foundation and the World Bank), for the genetic characterization of locally adapted chicken breeds, as well as training of Nigerian graduate students in Brazil.

66. Has your country supported or participated in international research and education programmes assisting developing countries and countries with economies in transition to better manage animal genetic resources (SP 15 and 16)?

- (●) a. Yes, support or participation in place before the adoption of the GPA and strengthened since
- ( ) b. Yes, support or participation in place before the adoption of the GPA but not strengthened since
- ( ) c. Yes, support or participation in place since the adoption of the GPA
- ( ) d. No, but action is planned and funding identified
- ( ) e. No, but action is planned and funding is sought
- ( ) f. No

Please provide further details:

There have been many opportunities for the Brazilian National Coordinator (also acting as Regional Coordinator for AnGR in Latin America and the Caribbean) present talks or lectures at training courses in developing countries. In recent years, such activities were held in: Argentina, Bolivia, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Mexico, Nigeria, Tunisia, Uruguay and Venezuela.

67. Has your country supported or participated in programmes aimed at assisting developing countries and countries with economies in transition to obtain training and technologies and to build their information systems (SP 15 and 16)?

- ( ) a. Yes, support or participation commenced before the adoption of the GPA and strengthened since
- ( ) b. Yes, support or participation commenced before the adoption of the GPA but not strengthened since
- (●) c. Yes, support or participation commenced since the adoption of the GPA
- ( ) d. No, but action is planned and funding identified
- ( ) e. No, but action is planned and funding is sought
- ( ) f. No

Please provide further details:

Brazil is involved in strengthening the genetic resources programme in Bolivia that almost disappeared when the official Agricultural Research organization of that country was closed. The new official organization, recently created is trying to recover the old programme with the help of Embrapa (Brazilian Agricultural Research Corporation).

68. Has your country provided funding to other countries for implementation of the Global Plan of Action?

- (●) a. Yes
- ( ) b. No, but action is planned and funding identified
- ( ) c. No, but action is planned and funding is sought
- ( ) d. No
- ( ) e. No, because country is generally not a donor country

Please provide further details. If relevant, specify whether funding was bilateral or multilateral; research cooperation or aid; and to whom and for what it was given:

The Agricultural Innovation MKTPlace is an international initiative supported by different partners aiming to link Brazilian, African and Latin American and Caribbean (LAC) experts and institutions to develop cooperative research projects for development. The Innovation MKTPlace is composed of three basic pillars:
1. A policy dialogue between the main authorities from Africa, LAC and Brazil supporting institutions focused on the

development of a mutually agreed framework for collaboration;
2. A Forum for capacitystrengthening, presentation and discussion of research for development ideas consolidated into research for development projects supported by the MKTPlace; and
3. Joint agricultural research for development projects.
The Marketplace is a bilateral funding established by the World Bank, Bill and Melinda Gates Foundation and Embrapa. At the beginning, only African countries could apply, but its mandate is now covering Latin America and the Caribbean as well.

69. Has your country contributed to international cooperative inventory, characterization and monitoring activities involving countries sharing transboundary breeds and similar production systems (SP 1, Action 5)?

- ○ a. Yes
- ○ b. No, but action is planned and funding identified
- ○ c. No, but action is planned and funding is sought
- ◉ d. No

Please provide further details:

70. Has your country contributed to establishing or strengthening global or regional information systems or networks related to inventory, monitoring and characterization of animal genetic resources (SP 1, Action 6)?

- ◉ a. Yes
- ○ b. No, but action is planned and funding identified
- ○ c. No, but action is planned and funding is sought
- ○ d. No

Please provide further details:

REGENSUR: Network of Genetic Resources of the Southern Cone of Latin America - PROCISUR/IICA, involving the six countries of PROCISUR: Argentina, Bolivia, Brazil, Chile, Paraguay and Uruguay.
CONBIAND Network: Association for the Conservation of the Biodiversity of Animal Genetic Resources for the Rural Sustainable Development - Brazil is one of the 23 member countries
CYTED Network, Sub-programme XII
Information System for AnGR - In conjunction with the United States and Canada, Brazil is developing a new Information System to be released in the first semester of 2014, that in the future may be used by other countries of the region.

71. Has your country contributed to the development of international technical standards and protocols for characterization, inventory and monitoring of animal genetic resources (SP2)?

- ◉ a. Yes
- ○ b. No, but action is planned and funding identified
- ○ c. No, but action is planned and funding is sought
- ○ d. No

Please provide further details:

72. Has your country contributed to the development and implementation of regional in situ conservation programmes for breeds that are at risk (SP 8, Action 2; SP 10, Action 1)?

- ○ a. Yes
- ○ b. No, but action is planned and funding identified
- ○ c. No, but action is planned and funding is sought

- (●) d. No

Please provide further details:

73. Has your country contributed to the development and implementation of regional ex situ conservation programmes for breeds that are at risk (SP 9, Action 2; SP 10, Action 3; SP 10, Action 4)?

- ( ) a. Yes
- ( ) b. No, but action is planned and funding identified
- ( ) c. No, but action is planned and funding is sought
- (●) d. No

Please provide further details:

74. Has your country contributed to the establishment of fair and equitable arrangements for the storage, access and use of genetic material stored in supra-national ex situ gene banks (SP9, Action 3)?

- ( ) a. Yes
- ( ) b. No, but action is planned and funding identified
- ( ) c. No, but action is planned and funding is sought
- (●) d. No

Please provide further details:

75. Has your country participated in regional or international campaigns to raise awareness of the status of animal genetic resources (SP19)?

- ( ) a. Yes
- ( ) b. No, but action is planned and funding identified
- ( ) c. No, but action is planned and funding is sought
- (●) d. No

Please provide further details:

76. Has your country participated in reviewing or developing international policies and regulatory frameworks relevant to animal genetic resources (SP 21)?

- (●) a. Yes
- ( ) b. No, but action is planned and funding identified
- ( ) c. No, but action is planned and funding is sought
- ( ) d. No

Please provide further details:

Many discussions have been held at the Ministry of Foreign Affairs, involving member of different Ministries (mainly Agriculture and Environment). Brazil has participated actively in many international meetings (COPs, Nagoya, etc) as well as in two specific Symposia held to discuss specifically access and benefit sharing (the first one was held in

Wageningen, and the second one, organized by Louvain la Neuve University of Belgium, with meetings in two different places: Brussels and Montpellier).

EMERGING ISSUES

77. In view of the possibility that at some point countries may wish to update the GPA, please list any aspects of animal genetic resources management that are not addressed in the current GPA but will be important to address in the future (approximately the next ten years). Please also describe why these issues are important and indicate what needs to be done to address them.
Issues to be addressed in future

Issues to be addressed in future (next ten years)	Reasons	Actions required
Creation of an international project on genetic characterization of livestock	Lots of efforts have been made by different countries in the genetic characterization of their livestock breeds. For many countries, however, this type of study is extremely difficult due to the lack of the necessary infrastructure. Analyses linking results from countries from the different regions using some common breeds/species (meta-analyses) may give us a complete idea about one specific species, facilitating the identification of breeds that could be exchanged among countries.	Identification of the most comprehensive genetic characterization studies already done by species, and establishment of committees that would decide how to analyze them altogether.

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