



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: Botswana

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).

Livestock production in Botswana is of great strategic importance as it contributes to agricultural sector's competitiveness and rural poverty alleviation. Currently, livestock contributes about 80% of agriculture's contribution towards GDP and the country is self sufficient in beef and poultry, while self sufficiency has not been attained in other livestock products (MoA, and FAO, 2012: Beef value chain Study). However, it must be noted that the overall contribution of the agriculture sector towards GDP has dropped from 40% in 1966 when the country attained its independence, to the current 1.7% in 2008. The decline has mainly been due to discovery of minerals and emergence of non-agriculture based industries like tourism and textiles. Animal genetic resources in the country are comprised of the following livestock species: cattle, sheep, goats, pigs, horses, donkeys, chickens, ostriches and Botswana camels. According to Statistics Botswana (2013), in 2011, the livestock population sizes of these animal genetic resources stood at 2,553 million cattle, 1,770 million goats, 296,000 sheep, 5,000 pigs, 1,499 million chickens, 351,000 donkeys, 40,000 horses, and while the Ostrich population size in 2010 was 2,000. On the other hand, the estimated population for Botswana Camel during 2012/3 was around 350. Camels in Botswana are mainly used for transport and tourism purposes. The number of breeds found in the country is as follows: 4 Dairy cattle breeds (Jersey, Holstein Freisian, dairy Swiss and Ayrshire), 13 beef cattle breeds (Tswana, Musi, Brahman, Tuli, Charolais, Sussex, Bonsmara, Limousine, Santa Gertrudis, Brown Swiss, Simmental, Pinzguer and Afrikaner), 1 multi-purpose breed (Simmental), 4 sheep breeds (Tswana, Dorper, Karakul and Blackheaded Persian), 6 goat breeds (Tswana, Boar goat, Kalahari red, Saanen, Toggenburgh and Savanna), 6 pig breeds (Tswana, Large white, Landrace, Duroc, Hampshire and Combrough), 11 chicken strains (Naked neck, Dwarf, Frizzle, Rumpless, Crested, Feathered legs, Ross, Cobb, Abor Acre, Lohman and High-line), 2 Ostrich strains (African Black and Kalahari blue neck), 1 dromedary (Botswana camel), 1 Ass breed (Tswana) and 4 Horses breeds (Tswana, Thoroughbreds, Warmbloods and Arabs) although majority of them are crossbreeds.

Livestock in Botswana is kept under two types of farming systems which are:

1. traditional (subsistence) and
2. commercial system.

The presence of these systems is mainly dictated by the type of land tenure system found in the country. The traditional

system is practiced in communal tribal land whereas commercial farming is found in leasehold or freehold fenced farms. However, majority of livestock populations (i.e. 88% cattle, 96% sheep, 98% goats, 99% donkeys, 90% horses, 90% chickens, 85% pigs) in the country are found in communal areas.

Realizing the importance of animal genetic resources in the lives of Botswana, government has therefore put in place policies and programs (e.g. Livestock Management and Infrastructure Development (LIMID), National Master Plan for Arable Agriculture and Dairy Development (NAMPAADD), Economic Diversification Drive (EDD), Young farmers' fund and Poverty Eradication Program) which are aimed at promoting and commercialization of the livestock sector. These policies and programs are in the form of subsidized loans, feed, husbandry inputs and in the support of construction of boreholes and free veterinary services. In addition, livestock keepers are given training in different management aspects of animal production so as to help improve livestock productivity.

Driving forces that affect animal genetic resources in the country include the following:

1. Disease outbreaks: The regular outbreaks of certain diseases such as Foot and Mouth Disease (FMD) and Newcastle in the country results in periodic mass slaughtering of livestock in affected areas in an effort to control these diseases. Such incidents not only affect population sizes and livestock productivity but also threaten access to lucrative markets like the EU.
2. Droughts: Recurring droughts which are common in Botswana resulting in high losses of animal genetic resources through increased mortality rates and poor productivity (NDP, 10).
3. Markets for livestock products: Livestock products in the country include meat, milk, hides and skins. Finding markets for these livestock products is not always an easy task as there are usually stringent requirements which the country has to meet.
4. Infrastructure: productivity of the different livestock sub-sectors is in most cases affected by the lack of supporting infrastructure (e.g. roads, electricity, etc). For example, in the case of poultry production, the inadequacy of slaughter and packaging facilities for poultry are also major constraints for small scale producers (NDP, 10). In addition, the dairy industry in Botswana is one sector whose performance is highly affected by lack of infrastructure.

Because majority of livestock in Botswana is found in communal areas, they are mainly bred through natural mating. Artificial insemination (AI), which is the only reproduction biotechnology practiced in the country is only done on a small percentage of cattle in the country. This is because AI services are mainly provided by the Department of Animal Production, Ministry of Agriculture at their network of AI ranches across the country and farmers are limited on the number of cows they can bring for insemination in a year. In communal areas, controlled breeding is difficult to practice, therefore there is a lot of crossbreeding (especially for cattle) of indigenous breeds with exotic ones.

Among the strengths that Botswana has in management of animal genetic resources is support for research by government. Research in animal genetic resources is mostly undertaken by government institutions which are Department of Agricultural Research (DAR) and Botswana College of Agriculture (BCA). Adding to the strengths is the availability of the Livestock Identification and Traceback System (LITS) for cattle which is implemented by the Department of Veterinary Services. This system was introduced as a way of securing the EU market for Botswana beef since it was one the requirements which had to be met. The LITS system had previously from inception used cattle boluses but these have since been replaced by ear tags in 2013.

One of the major constraints in the management of animal genetic resources in the country is the lack of livestock recording systems for almost all livestock species. Although efforts have been put in place to establish the Beef Cattle Livestock Recording Scheme, this has not been fruitful so far due to many problems among which included lack of interest by farmers and shortage of extension officers to facilitate the scheme. However, there is still hope that recoding schemes for all livestock species in the country will be created following the enactment of the Livestock Improvement Act of 2009 which allows for establishment of Breed Associations. Implementation of the Livestock Improvement Act started in mid 2013 and currently structures (Registrar's office and the Animal Production Advisory Board) have been established. In addition, provisions of this Act and its implementation implications are being cascaded to livestock producers through their respective Livestock Farmers Associations in order to sensitize the farming community about the Act.

Future priorities would therefore include establishment of various livestock recording schemes for the different livestock species as these are fundamental to the improvement and management of animal genetic resources in the country. In addition, Breed Societies/Associations would be established which would augment the recording schemes. Currently, there is more focus or effort on establishing Livestock Producers Associations so as to bring producers of common commodity together.

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.

In Botswana most gene flow is from neighboring South Africa. Breeding males and females of cattle, poultry, pigs, sheep and goats are imported from South Africa. These would mainly be high yielding breeding stock imported into the country from South Africa to be used for genetic improvement of local breeds.

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.

Most of the gene flow occurs in cattle where breeding animals (males and females) are imported into the country from mostly South Africa. In additions to these, semen of exotic bulls is imported into the country by the National Artificial Insemination Laboratory at Ramatlabama mainly from South Africa.

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 has been an increasing gene flow from neighboring countries to Botswana on the overall through importation of live animals, semen and even embryos. This has been mainly influenced by the desire to improve the genetic production potential of livestock locally with the view to commercialize the livestock industry in the country. However, due to the nature of farming in the country where most farming is done in the communal areas, there has been increased rate of uncontrolled breeding which has resulted in reducing the number of indigenous breed populations. Because these exotic

breeds require high maintenance, farmers have to buy supplementary feed as range alone cannot sustain them.

For dairy cattle, usually high yielding dairy heifers are purchased from neighbouring countries. These are then managed intensively, or semi intensively. The main problem with dairy production in the country is feed availability as this also is mainly imported from neighbouring countries. Very few farmers produce forage for their dairy cattle. The same applies with pigs as improved breeding animals (gilts and boars) are purchased from RSA. In addition, livestock feed for dairy cattle, pigs and poultry is also imported.

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)	medium	high	The increase in population size and the increased rate of urban migration would mean that more protein will be needed to feed the growing population. This will necessitate the need to keep high yielding breeds and crossbred animals. As a result, low yielding breeds, mostly indigenous may suffer negligence. However, there is also a likelihood of increase in numbers and improved management of animal genetic resources kept in the country.
Changing demand for livestock products (quality)	medium	high	This is more likely to result in increased product quality such as good beef animal. It can also improve breeding particularly of indigenous which must be kept to combat climatic changes. In addition, this will also provide an opportunity for better prices for livestock products.
Changes in marketing infrastructure and access	medium	medium	With the introduction of government programs aimed at poverty alleviation e.g. Young Farmers Fund, more livestock purchased due to organized markets for these programs. There are organized markets for different species in different districts which are spearheaded by Farmers Unions and Extension officers. In addition, this will also provide an opportunity to farm with fast growing breeds.

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
Changes in retailing	medium	medium	Livestock products that are affected by retailing are mainly processed ones. With the developments of variety of products from these, some species e.g. pig which did not enjoy high consumption previously have seen a high rise in their consumption. In addition, consumers nowadays demand healthy products as such marketing for these has increased. Changes in retailing would also afford farmers to have more feedlotting opportunities as more animal products are needed. Opportunities also exist for new products processing businesses.
Changes in international trade in animal products (imports)	low	low	Globalization requires countries to be competitive in animal products. As such, this would create an opportunity in the country to have local artificial insemination for other livestock species other than cattle.
Changes in international trade in animal products (exports)	low	medium	This would create an opportunity for more farmers to venture into feedlotting business in order to meet the needs of the outside markets. In addition, new markets would be identified for animal products.
Climatic changes	medium	high	With the Botswana climate becoming even more drier due to climatic change, there is likelihood of animals perishing due to extended drought spells. Reliance on crossbred animals may also increase as livestock producers would be harnessing the benefits of hybrid to combat effects of changing climate.
Degradation or improvement of grazing land	high	high	There is more likelihood of having increased interest in wildlife ranching.
Loss of, or loss of access to, grazing land and other natural resources	medium	medium	With loss of access to grazing land, it would mean livestock farmers in the country have to give more consideration to intensive farming. There is likelihood of development of competition between construction, mining and wildlife. Fodder production would become an opportune business.
Economic, livelihood or lifestyle factors affecting the popularity of livestock keeping	medium	medium	The current trend is that more people are moving towards modern lifestyle. As such, with the current livestock keepers growing older, more effort will have to be put in place to attract younger generations into keeping livestock. Also, it would force livestock keepers to have low numbers of high quality (producing) animals.

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
Replacement of livestock functions	low	low	Majority of Batswana particularly in rural areas still rely on livestock. The chances are these will continue to serve the same purposes in the next ten years as they did in the past. However, in future, it will mean alternative sources of livelihoods will have to be identified if livestock functions get changed.
Changing cultural roles of livestock	low	low	Majority of Botswana particularly in rural areas still rely on livestock. The chances are these will continue to serve the same purposes in the next ten years as they did in the past.
Changes in technology	medium	medium	The world over, there is a general drift towards use of high technology. In Botswana, changes in technology would create opportunities for improved management of farm animal genetic resources in the country, especially with issue of livestock performance recording systems. In these instances, data relay may become even more smoother between farmers and extension officers e.g. use of mobile phones messaging.
Policy factors	medium	medium	Livestock development is seen as an important instrument for the government to achieve poverty reduction and increase food security in Botswana. As such, government therefore promotes livestock production through subsidized loans, feed, animal husbandry inputs and in the support of construction of boreholes and free veterinary services. In addition, National Development Plans 10 (NDP 10) commits to improving the quality and quantity of beef, dairy, smallstock, poultry and pigs. In this NDP 10, government also promises to assist farmers to develop basic infrastructure and purchase of some inputs. However, despite all these policies, the level of policy implementation is a bit low or not satisfactory.
Disease epidemics	high	high	Disease outbreaks in certain zones have led to mass slaughter of animals in the effort of controlling the disease. This reduces population size and also affects genetic distribution and diversity since restocking has to be done with animals from other zones. Furthermore, following these mass slaughters, the restocking exercise brings in more improved animals not indigenous ones which are adaptable to the local production environment. This case was more evident in North East District where 25,000 sheep and goats (mostly indigenous) were replaced with crossbreds and exotic breeds. There is need to have strategies which would promote timely response to disease outbreaks.

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)	0	4
Cattle (specialized beef)	2	11
Cattle (multipurpose)	0	1
Sheep	1	3
Goats	1	5
Pigs	1	5
Chickens	6	5
Ostriches	2	0
Dromedaries	1	0
Asses	1	0
Horses	1	3

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)	0	0	low	none	none	none	none	none
Cattle (specialized beef)	1	1	low	none	none	none	none	none
Cattle (multipurpose)	0	0	none	none	none	none	none	none
Sheep	1	1	low	none	none	none	none	none
Goats	1	1	low	none	none	low	none	none
Pigs	0	0	none	none	none	none	none	none
Chickens	0	0	none	none	none	none	none	none
Ostriches	2	2	none	none	none	none	none	none
Dromedaries	1	1	none	none	none	none	none	none
Asses	1	1	none	none	none	none	none	none

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	medium
Research	medium
Knowledge	low
Awareness	low
Infrastructure	low
Stakeholder participation	low
Policies	medium
Policy implementation	low

	Score
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	Although there is a reasonable number of Animal Scientists within the Ministry of Agriculture, not many of them have specialist training in the field of Animal breeding and genetics. However, livestock keepers at various districts are given training on livestock management skills in different Rural Training Centres. This problem can be addressed by increasing the number of trained animal breeders in the country so that they can effectively spearhead activities of animal genetic resources in the country. To increase knowledge on this, it may help if the issue of Animal genetic resources and their management are incorporated into school syllabuses.
Research	Little research has been done to fully characterize breeds in the country. Lack of trained personnel (e.g. Animal breeders and Molecular Geneticists) also hampers continuity of research in this area. Research is mostly done by government (Department of Agricultural Research and Botswana College of Agriculture) with some support from International Organizations. There is no research work in animal genetic resources undertaken by private sector in the country.
Knowledge	Conservation animal genetic resources and their management concept is not yet well understood by the general public in the country. As such, not many consider it as a top priority in the livestock industry. Awareness workshops are needed to educate the public on animal genetic resources and their management.
Awareness	Some workshops have been held for stakeholders in an effort to create awareness on animal genetic resources management. In addition, awareness creation is made during agricultural shows and field days. However, more still needs to be done to achieve satisfactory awareness level.
Infrastructure	There is no or minimal Infrastructure in place for animal genetic resources management. This end up negatively affecting productivity of the livestock sector in the country.
Stakeholder participation	Stakeholders occasionally meet to discuss issues of animal genetic resources in the country. However, there is low implementation on agreed issues due to inadequate resources.
Policies	Livestock development is seen as an important instrument for the government to achieve poverty reduction and increase food security. Government has therefore developed policies (e.g. Livestock Management and Infrastructure Development (LIMID), National Master Plan for Arable Agriculture and Dairy Development (NAMPAADD, Economic Diversification Drive (EDD), Young farmers' fund, Poverty Eradication Program) which promote livestock production through subsidized loans, feed, animal husbandry inputs and in the support of construction of boreholes and free veterinary services. In addition, national development plans commit to improving the quality and quantity of beef, dairy smallstock, poultry and pigs. In these plans, government also promises to assist farmers to develop basic infrastructure and purchase of some inputs. Although these policies are present, there sometimes are problems of inadequate dissemination and implementation is low in some instances.
Policy implementation	Policies are implemented but not to the satisfaction of livestock producers because in most cases there is shortage of extension officers who could be facilitating implementation of these policies. There is low implementation of policies due to inadequate staff (extension officers) and poor transport for extension officers when there is need to consult with farmers. Extension officers also have many pressing assignments which they have to undertake thereby resulting in very little done per activity.

	Description
Laws	<p>Laws which are related to livestock in Botswana include the following:</p> <ol style="list-style-type: none"> 1. Branding of Cattle 2. Control of Livestock Industry 3. Livestock and Meat Industries Registration of Livestock 4. Pounds 5. Matimela (stray animals) 6. Diseases of Animals 7. Cruelty to Animals 8. Livestock Improvement Act, 2009 9. Botswana Meat Commission Act <p>However, farmers feel that they are more of recipients of these laws as they are seldom consulted to have their input in the law making process.</p>
Implementation of laws	<p>Although laws are made, its implementation is not fully carried out because sometimes these are used by different departments. In addition, the public is also not aware of these laws as such awareness creation on them is very necessary.</p>

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>).

There is the Livestock Improvement Act 2009 which has provision for establishment of Breed Societies for various livestock species. In 2013, the office of the Registrar was established which would be responsible for overseeing the implementation of the Act. Establishment of other institutions which would facilitate implementation of this Act is still a challenge due to lack of resources. However, sensitization of stakeholders, especially farmer organizations on the Livestock Improvement Act of 2009 is continuing. Currently there are different livestock producers associations (e.g. Botswana Beef Cattle Producers Union, Botswana Pig Producers Association, Smallstock Industry Federation of Botswana, Botswana Dairy association, Botswana Ostrich Farmers Association and Botswana Poultry Association). Although these have been established, they are all at different stages of development and such their effectiveness is not yet at the desired level with regard to improvement and management of farm animal genetic resources in the country. In addition, the Department of Agricultural Research has drafted a Strategic and Management Plan for Farm Animal Genetic Resources which will be presented to stakeholders in the near future.

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	no	no	no	no	no	yes
Cattle (specialized beef)	yes	yes	no	no	no	no	yes
Cattle (multipurpose)	no	no	no	no	no	no	yes
Sheep	yes	yes	no	no	no	no	yes
Goats	yes	yes	no	no	no	no	yes
Pigs	yes	yes	no	no	no	no	yes
Chickens	yes	no	no	yes	no	no	yes
Ostriches	yes	yes	no	yes	no	no	yes
Dromedaries	yes	yes	no	no	no	no	yes
Asses	no	no	no	no	no	no	yes
Horses	yes	no	no	no	no	no	yes

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

Breeding programs for most livestock species are mainly operated by individual livestock owners who determine their own breeding goals. Associations that have been established are commodity-based (e.g Beef Cattle Producers Association) and more often members will be farmers using different breeds. Some farmers formulate breeding programs through their associations while most farmers (especially in communal grazing areas) do not have formalized breeding programs.

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 dairy)	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Cattle (specialized beef)	2	11	0	0	0	0	0	0	2	0	0	0	0	0	1	11

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)	0	0	0	4
Cattle (specialized beef)	1	0	1	11
Sheep	0	0	1	3
Goats	0	0	1	5
Pigs	0	0	1	5
Chickens	0	5	6	0
Ostriches	0	0	2	0
Dromedaries	1	0	0	0
Asses	1	0	0	0
Horses	0	0	1	3

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

Species	Training	Research
Cattle (specialized dairy)	low	low
Cattle (specialized beef)	low	medium
Cattle (multipurpose)	low	low
Sheep	low	low
Goats	low	low

Species	Training	Research
Pigs	low	low
Chickens	low	low
Ostriches	none	none
Dromedaries	low	none
Asses	none	none
Horses	none	none

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)	low
Cattle (specialized beef)	low
Cattle (multipurpose)	low
Sheep	low
Goats	low
Pigs	low
Chickens	low
Ostriches	none
Dromedaries	low
Asses	none
Horses	none

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 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	medium	low	low	high	none	none	none	
Animal identification	high	low	low	medium	none	none	none	
Recording	medium	low	low	low	low	none	none	
Provision of artificial insemination services	high	low	low	low	low	low	none	
Genetic evaluation	low	medium	low	low	none	none	none	

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	medium	low	low	high	none	none	none	
Animal identification	high	low	low	medium	none	none	none	
Recording	medium	low	low	low	low	none	none	
Provision of artificial insemination services	high	low	low	low	low	low	none	
Genetic evaluation	low	medium	low	low	none	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	low	low	none	high	none	none	none	
Animal identification	none	none	none	low	none	none	none	
Recording	none	low	none	low	none	none	none	
Provision of artificial insemination services	none	none	none	none	none	none	none	
Genetic evaluation	none	none	none	none	none	none	none	

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	low	low	low	high	none	none	none	
Animal identification	none	none	none	low	none	none	none	
Recording	none	none	none	none	none	none	none	
Provision of artificial insemination services	none	none	none	none	none	none	none	
Genetic evaluation	none	none	none	none	none	none	none	

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	low	none	low	medium	low	none	none	
Animal identification	none	none	none	low	low	none	none	
Recording	low	none	low	low	none	none	none	
Provision of artificial insemination services	none	none	none	none	none	none	none	
Genetic evaluation	none	none	none	none	none	none	none	

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	low	none	low	medium	medium	low	none	
Animal identification	none	none	none	none	low	none	none	
Recording	none	none	none	low	low	none	none	
Provision of artificial insemination services	none	none	none	none	none	none	none	
Genetic evaluation	none	none	none	none	none	none	none	

Ostriches	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	none	low	medium	medium	none	none	
Animal identification	low	none	none	none	none	none	none	
Recording	low	none	none	none	none	none	none	
Provision of artificial insemination services	none	none	none	none	none	none	none	
Genetic evaluation	low	none	none	none	none	none	none	

Dromedaries	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	none	medium	low	none	none	medium	
Animal identification	low	none	low	low	none	none	low	
Recording	low	none	low	low	none	none	low	
Provision of artificial insemination services	none	none	none	none	none	none	none	
Genetic evaluation	none	low	none	none	none	none	none	

Asses	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	low	none	low	none	none	none	
Animal identification	none	none	none	low	none	none	none	
Recording	none	none	none	none	none	none	none	
Provision of artificial insemination services	none	none	none	none	none	none	none	
Genetic evaluation	none	none	none	none	none	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	low	none	low	medium	none	none	none	
Animal identification	none	low	low	low	none	none	none	
Recording	none	none	low	low	none	none	none	
Provision of artificial insemination services	none	none	none	none	none	none	none	
Genetic evaluation	none	none	none	none	none	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.

Please regard the annex responding to this question at the end of this document.

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
Ostriches	yes
Dromedaries	yes
Asses	no
Horses	no

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)	The National Master Plan for Arable Agriculture and Dairy Development (NAMPAADD) program was developed as one of the strategies to improve dairy production in the country. In addition, farmers can purchase semen of high performing bulls from Ramatlabama National AI laboratory at subsidized prices. Of recent (2012), the Dairy Strategy was developed with the intention to increase viability and competitiveness of the dairy sector in Botswana.
Cattle (specialized beef)	The Department of Agricultural Research has the Tswana cattle selection program which is aimed at improving performance of the breed as a way of attracting cattle producers towards farming with the indigenous Tswana breed. There is also annual artificial insemination of cattle undertaken by government at the Department of Animal Production's 14 AI centers across the country. Furthermore, there are Artificial Insemination Courses for local farmers as well as operation of semen collection centre at the national AI laboratory. In addition, farmers can purchase semen of high performing bulls from Ramatlabama National AI laboratory at subsidized prices.
Cattle (multipurpose)	There is also annual artificial insemination of cattle undertaken by government at the Department of Animal Production's 14 AI centers across the country. Furthermore, there are Artificial Insemination Courses for local farmers as well as operation of semen collection centre at the national AI laboratory. In addition, farmers can purchase semen of high performing bulls from Ramatlabama National AI laboratory at subsidized prices.

Species	Description of policies or programmes
Sheep	Programs such as the National Policy on Agriculture Development, Livestock Management and Infrastructure Development (LIMID) scheme and Poverty Eradication Program were introduced to promote livestock farming (especially smallstock and poultry farming) among resource poor farmers. Government also operate smallstock breeding farms at Lobu and Mantshwabisi government farms and progeny is sold to farmers to help improve their stock quality to assist farmers with replacement breeding stock. Associations are being formed and registered across the country to promote smallstock (sheep) breeding and farming.
Goats	Programs such as the National Policy on Agriculture Development, Livestock Management and Infrastructure Development (LIMID) scheme and Poverty Eradication Program were introduced to promote livestock farming (especially smallstock and poultry farming) among resource poor farmers. Government also operate smallstock breeding farms at Lobu and Mantshwabisi government farms and progeny is sold to farmers to help improve their stock quality to assist farmers with replacement breeding stock. Associations are being formed and registered across the country to promote smallstock (goats) breeding and farming. Interested farmers are in the process of forming Dairy Goats Association.
Pigs	There is Government Pig Multiplication Farm at Sebele which assist farmers with replacement breeding stock of high genetic merit. The farm buys genetically improved stock (gilts and boars) from South Africa and the progeny from these is sold to farmers at subsidized price. The National Policy on Agriculture Development also promote the keeping of pigs in the country.
Chickens	Programs such as Livestock Management and Infrastructure Development (LIMID) scheme and Poverty Eradication Program were introduced to promote livestock farming (especially smallstock and poultry farming) among resource poor farmers.
Ostriches	The Ostrich Multiplication Unit is located at Dibete government farm. This unit is aimed at availing ostrich production services to the farmers so that production is not affected by unavailability of replacement chicks. Furthermore, Ostrich chicks are sold at a subsidized price to farmers.

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)	The lack of breeding policy for specialized dairy cattle breeds mean that there won't be any Botswana dairy breed(s) which is (are) adapted to the country's climatic conditions. Moreover, it is also difficult to access quality dairy animals as there are no breed societies for dairy breeds in the country. Furthermore, this lack of breeding policy for specialized dairy cattle breeds means that farmers are at liberty to import and breed with any sort of breed that they desire. The influx of these exotic breeds does not take into consideration the ability or suitability of these breeds to survive under Botswana's climatic conditions. Another problem encountered due to lack of breeding policies was the difficulty in registering stud breeders and breed societies. This resulted in poor marketing of breeding stock because of lack of performance records.
Cattle (specialized beef)	The lack of breeding policy for specialized beef cattle breeds means that farmers are at liberty to import and breed with any sort of breed that they desire. The influx of these exotic breeds does not take into consideration the ability or suitability of these breeds to survive under Botswana's climatic conditions. In most instances, livestock keepers rearing these new breeds decry of lack of support from government officials on the best management practices for these new exotic breeds which they have. In addition, there is also need for feedback on progeny of registered animals used in artificial insemination. Another problem encountered due to lack of breeding policies was the difficulty in registering stud breeders and breed societies. This resulted in poor marketing of breeding stock because of lack of performance records.

Species	Description of consequences
Cattle (multipurpose)	The lack of breeding policy for specialized multipurpose cattle breeds means that farmers are at liberty to import and breed with any sort of breed that they desire. The influx of these exotic breeds does not take into consideration the ability or suitability of these breeds to survive under Botswana's climatic conditions. In most instances, livestock keepers rearing these new breeds decry of lack of support from government officials on the best management practices for these new exotic breeds which they have. Sometimes even finding replacement breeding bulls becomes a problem as there would be few farmers keeping that breed. In addition, there is also need for feedback on progeny of registered animals used in artificial insemination. Another problem encountered due to lack of breeding policies was the difficulty in registering stud breeders and breed societies. This resulted in poor marketing of breeding stock because of lack of performance records.
Sheep	Lack of recording for small stock genetic improvement in the country. In addition, there is a high chance of indiscriminate crossbreeding especially in communal grazing areas. Another problem encountered due to lack of breeding policies was the difficulty in registering stud breeders and breed societies. This resulted in poor marketing of breeding stock because of lack of performance records.
Goats	Lack of recording for small stock genetic improvement in the country. In addition, there is a high chance of indiscriminate crossbreeding especially in communal grazing areas. Another problem encountered due to lack of breeding policies was the difficulty in registering stud breeders and breed societies. This resulted in poor marketing of breeding stock because of lack of performance records.
Pigs	Due to the small numbers of pigs in the country, there is possible threat of inbreeding of pig breeds in the country. In addition, negligence of indigenous Tswana pigs by farmers pose a serious threat to extinction of this genetic resource. Another problem encountered due to lack of breeding policies was the difficulty in registering stud breeders and breed societies. This resulted in poor marketing of breeding stock because of lack of performance records.
Chickens	Lack of recording for poultry genetic improvement in the country. Although the population sizes are high within the country, there is a likelihood of inbreeding within in local community populations as these are not exchanged much.
Ostriches	Having an Ostrich Multiplication Unit meant that Ostrich farmers could continue with the business after slaughtering other batches because farmers are able to purchase replacement chicks from this unit at a subsidy price.
Dromedaries	The low numbers of Botswana camels pose a serious threat of inbreeding amongst these animals. They are in danger of extinction due to their low numbers.
Asses	There is no breeding policy in Botswana for Donkeys but these are not under any serious threat as there no (or very very little) influx of donkeys from outside the country, so no indiscriminate crossbreeding occurs amongst this species in the country.

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.

Achievements:
There are different livestock producers associations (e.g. Botswana Beef Cattle Producers Union, Botswana Pig Producers Association, Smallstock Industry Federation of Botswana, Botswana Dairy association, Botswana Ostrich Farmers Association and Botswana Poultry Association) that have been formed/established in the country. Because these are still relatively new in existence, many of them are still finding their way in their bid to improve productivity of their commodities e.g The Smallstock National Federation was recently inaugurated and is still working on ways of establishing smallstock recording scheme. A group of interested farmers are in the process of forming a Dairy Goat Association.

The main constraints to implements of breeding programs are:
1. Type of farming systems in Botswana where majority of livestock keepers are found in communal areas where

controlled breeding is difficult to practice. However, government has introduced programs which are aimed at commercializing Agriculture.

2. Poor infrastructure for improved livestock rearing systems.
3. Disease prevalence which sometimes lead to eradication of all animals (of a particular species) within a region.
4. Lack of breed societies to promote the different breeds of different species within the country.
5. Lack of livestock performance recording programs to facilitate livestock improvement programs.
6. Shortage of Extension officers.
7. Failure by livestock producers to adopt new technologies such as artificial insemination.
8. Poor linkages between research scientists, extension officers and livestock keepers to facilitate smooth adoption of livestock improvement technologies.
9. Lack of defined breeding policies and legislation.

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)	<ol style="list-style-type: none"> 1. Establishment of milk recording scheme 2. Establishment of dairy cattle breeding societies 3. Dairy cattle strategy implementation 4. Facilitation and promotion of stud breeding
Cattle (specialized beef)	<ol style="list-style-type: none"> 1. Establishment of beef cattle recording scheme 2. Establishment of breed societies 3. Facilitation and promotion of stud breeding
Cattle (multipurpose)	<ol style="list-style-type: none"> 1. Establishment of milk beef cattle recording scheme 2. Establishment of breed societies 3. Facilitation and promotion of stud breeding
Sheep	<ol style="list-style-type: none"> 1. Establishment of performance recording schemes 2. Establishment of breed societies 3. Breeding for adaptability
Goats	<ol style="list-style-type: none"> 1. Establishment of performance recording schemes 2. Establishment of breed societies 3. Breeding for adaptability
Pigs	<ol style="list-style-type: none"> 1. Establishment of performance recording schemes 2. Establishment of breed societies 3. Development of serious conservation strategy
Chickens	<ol style="list-style-type: none"> 1. Commercialization of indigenous chickens 2. Development of serious conservation strategy
Ostriches	Establishment of satellite farms for ostriches to raise chicks to market weight

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)	none	none	none
Cattle (specialized beef)	low	none	low
Cattle (multipurpose)	none	none	none
Sheep	low	low	none
Goats	low	low	none
Pigs	low	none	none
Chickens	low	none	none
Ostriches	low	none	none
Dromedaries	low	none	none
Asses	none	none	none
Horses	none	none	none

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	
Genetic uniqueness	
Genetic variation within the breed	
Production traits	
Non-production traits	
Cultural or historical importance	
Probability of success	

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	yes	yes	yes	no	no	no	no	yes
Private sector	no	no	no	no	yes	no	no	yes	no	no	no	no
Cattle (specialized dairy)	no	no	no	no	yes	no	no	no	no	no	no	no
Cattle (specialized beef)	no	no	no	no	yes	yes	yes	no	no	no	no	yes
Cattle (multipurpose)	no	no	no	no	yes	no	no	no	no	no	no	no
Sheep	no	no	no	no	yes	yes	no	no	no	no	no	yes
Goats	no	no	no	no	yes	yes	no	no	no	no	no	yes
Pigs	no	yes	no	no	yes	yes	no	no	no	no	no	yes
Chickens	no	yes	no	no	yes	yes	no	no	no	no	no	yes
Ostriches	no	no	no	no	no	no	no	no	no	no	no	no
Dromedaries	no	yes	no	no	no	yes	no	yes	no	no	no	yes
Asses	no	yes	no	no	no	no	no	no	no	no	no	no

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.

In-situ conservation programs are operated by the Department of Agricultural Research under the Ministry of Agriculture. The department has herds of indigenous species (i.e. Tswana cattle, Tswana sheep, Tswana goats, Tswana pigs and indigenous Tswana chickens) which are kept in various ranches for conservation purposes. Conservation in the country has focused mainly on indigenous livestock species because it was realized that these were at risk of disappearing due to threat of indiscriminate crossbreeding with exotic breed species. The Botswana camels on the other hand are conserved by Botswana Tourism Organization a community based Tourism Trust. These are mainly found in the Kgalagadi District, and previously were kept by Botswana Police and used for transport purposes.

Awareness-raising on the importance of conservation of breeds at-risk is done periodically during agricultural shows to sensitize the public. In addition, there are television programs and brochures with information on the need and importance of conserving animal genetic resources in the country.

Livestock breeders are usually recognized for their work during District Agricultural Shows and the National Agricultural Show. This recognition comes in the form of prizes for best Show animals under different species (dairy cattle, Beef cattle, sheep, goats, pigs and chickens) and breed classes.

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.

Yes, the country currently has a gene bank for animal genetic resources. However, this is not operational because due to shortage of necessary equipment which is lacking to make the gene bank fully operational. Currently the gene bank can only undertake molecular analysis and characterization activities as the cryopreservation part is not there. To make the gene bank operational, the Department of Agricultural Research has been trying to source for funds to buy the missing equipment in the gene bank. Another effort made was to establish collaboration with the Department of Animal Production's National AI laboratory at Ramatlabama as they have a fully functional laboratory and cryotanks there. Currently there is semen from Indigenous Tswana bulls which are preserved at this laboratory. Plans had been underway to take indigenous Tswana rams and bucks to Ramatlabama so that semen can be tapped and conserved from these animals.

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	no
Embryos	no
Oocytes	no
Somatic cells (tissue or cultured cells)	no
Isolated DNA	no

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)	0	0	no	no	no	no	no

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 (multipurpose)	0	0	no	no	no	no	no
Sheep	0	0	no	no	no	no	no
Goats	0	0	no	no	no	no	no
Pigs	0	0	no	no	no	no	no
Chickens	0	0	no	no	no	no	no
Ostriches	0	0	no	no	no	no	no
Dromedaries	0	0	no	no	no	no	no
Horses	0	0	no	no	no	no	no

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.

The gene bank is currently being utilized for molecular characterization and GMO detection studies. However, there is semen from Tswana bulls which is stored at Ramatlabama AI lab. This has not been used to reconstitute breed but future plans would be to utilise the semen and keep increasing collections of semen from indigenous Tswana bulls (after their genetic purity) has been ascertained through molecular and DNA analysis. In addition, use of Tswana sheep and goat semen will be explored in the future. Currently, expertise in AI for sheep and goats is lacking among Extension officers but plans are underway to get some officers trained in smallstock AI.

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.

Botswana Camel has formerly been classified as endangered due to its small number of breeding females. However, the numbers of these camels are still low as they are estimated at around 350. There is a possibility of having increased inbreeding rate due to the small population of these camels 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.

Species	Biotechnologies								
	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)	medium	low	none	none	none	none	none	none	none
Cattle (specialized beef)	low	none	none	none	none	none	none	none	none
Cattle (multipurpose)	low	none	none	none	none	none	none	none	none

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

Artificial Insemination (AI) as an assisted reproductive technology remains to be the mostly used technology in Botswana. This is so because the Department of Animal Production's (DAP) Animal breeding section coordinates or oversees this operation. The DAP has a network of 14 Artificial Insemination camps in the country where farmers can bring their cattle to be inseminated from October to March. In addition, this department also undertakes artificial insemination courses annually to train farmers in AI so that they can perform this at their respective farms. Most of the trained Inseminators are farm owners or farm managers (of both dairy and beef cattle farms).

The other biotechnology of Embryo Transfer (ET) has been tried by very few farmers including the Department of Agricultural Research where it was tried at an experimental level. Results from ET have been very low as compared to those from AI where high conception (>70%) and calving rates have been obtained in the 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	no	no	no	no	no
Embryo transfer	no	no	no	no	no	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.

Government plays a vital role in the provision of artificial insemination services in the country. The DAP under Ministry of Agriculture operates a National Artificial Insemination laboratory at Ramatlabama. This laboratory provides semen (both imported and locally produced) and from bulls of different breeds. The laboratory also sources AI equipment for livestock keepers who undertake artificial insemination at their respective farms. In addition to this, the DAP operates 14 Artificial Insemination farms where small-scale beef producers can bring their cattle for insemination. This service is heavily subsidized by government and it is aimed at improving genetic merit of beef cattle for resource poor farmers. On the other hand, the number of farmers in the country who are interested in embryo transfer is increasing, however, but these are slowed down by the lack of skilled veterinarians and technicians in this field. Training and capacity building on the use of this biotechnology needs to be done.

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	no	no
Embryo transfer or MOET	yes	no
Semen sexing	no	no
<i>In vitro</i> fertilization	no	no
Cloning	no	no
Genetic modification	no	no
Use of molecular genetic or genomic information for estimation of genetic diversity	no	no
Use of molecular genetic or genomic information for prediction of breeding values	no	no
Research on adaptedness based on molecular genetic or genomic information	no	yes

30.1. Please briefly describe the research.

The research project on Embryo Transfer at national level was undertaken as a collaboration project between the

Department of Agricultural Research (DAR) and a private farmer. The research was aimed at evaluating the viability of ET biotechnology under Botswana conditions. The farmer provided the embryos (Dairy Simmental embryos) while DAR provided surrogate cows, infrastructure and consumables. The project had very low success rate because out of the 129 embryos transplanted, only 9 calves were born from 2007 to 2011.

Another research project undertaken to promote use of AI in the country was a collaboration project between Botswana government and International atomic Energy Agency. The Project was entitled Improvement of Livestock Productivity Through the Use of Integrated Technologies (Artificial Insemination and Progesterone-Radioactive immune Assay). The benefit of this project was in the utilization of Progesterone-Radioactive immune Assay to determine pregnancy results in month following artificial insemination in dairy cows. However, the project never yielded any intended results due to many problems (e.g. equipment failure, poor heat detection, sample loss from recurring power cuts) which were encountered during its implementation. Project is still continuing.

Another research on the 'Use of molecular genetic or genomic information for estimation of genetic diversity' was done on camels where the objective was to establish the genetic diversity with Botswana camels. This study is still continuing. For 'Research on adaptedness based on molecular genetic or genomic information', a research on Tswana goats was undertaken. These were genotyped for milk protein genes.

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 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	low	low	low	none	low
Artificial insemination using imported semen from exotic breeds	medium	none	low	none	low
Natural mating	high	high	high	high	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.

The most commonly used biotechnology in Botswana is artificial insemination. However, even this one is not widely used as majority of livestock bred through natural mating. Artificial insemination is only used in cattle. A few ranch owners use AI but most of commercial cattle producers use natural mating. The wide adoption of AI in the country is limited by lack of resources. This includes equipment, consumables such as liquid nitrogen and the expertise needed in carrying AI. The Department of Animal Production assist the farmers by training their farm managers as Trained Inseminators for

free. However, these trained Inseminators usually look for greener pastures once they have acquired the AI skill.

The other factor attributing to the low use of biotechnology in the country is the high costs associated with these. In the past, some farmers had shown interest in using embryo transfer but the costs for these were prohibitive. This explains why many farmers in the country use natural mating because it is relatively cheaper and easy to manage than when using these technologies.

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	limited	Conservation of plant and animal genetic resources are addressed by different sections belonging to different divisions of DAR.
Collaboration in the characterization, surveying or monitoring of genetic resources, production environments or ecosystems	limited	Characterization, surveying or monitoring of genetic resources are addressed by different sections/ departments within the Ministry of Agriculture.
Collaboration related to genetic improvement	limited	Collaboration very limited as this is undertaken separately by different departments or even other ministries.
Collaboration related to product development and/or marketing	limited	Collaboration very limited as this is undertaken separately by different departments or even other ministries.
Collaboration in conservation strategies, programmes or projects	limited	Collaboration very limited as this is undertaken separately by different departments or even other ministries.
Collaboration in awareness-raising on the roles and values of genetic resources	limited	Collaboration very limited as this is undertaken separately by different departments or even other ministries. Issues are not integrated
Training activities and/or educational curricula that address genetic resources in an integrated manner	limited	Collaboration very limited as this is undertaken separately by different departments or even other ministries. Issues not integrated.
Collaboration in the mobilization of resources for the management of genetic resources	limited	Collaboration needed on establishing policies on Genetically modified organisms (GMOs) and management of GMOs.

2. Please describe any other types of collaboration.

Monitoring of rangeland ecosystem normally recommend sustainable stocking rates and appropriate use of natural resources.

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

Collaboration would promote sustainable use of rangelands for grazing and thereby leading to low mortality of animals.

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

Collaborative approaches in management of genetic resources of animal, plant, forestry and aquatic genetic resources could be constrained by the fact that these lie in different Ministries and Departments. As such, resources and efforts for management of these respective genetic resources are spread across these departments, thereby resulting in fragmented efforts nationally which are not coordinated in any manner. Poor coordination of management of these various genetic resources in the country is therefore a constraint on itself. There is need for Holistic policy and legislation on management of genetic resources.

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

The above-mentioned constraints could be addressed by having an umbrella body in the country which would coordinate all activities related to genetic resources. All stakeholders (i.e. department, private companies, NGOs, etc.) should be represented in that umbrella body.

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).

1. Proper stocking rates for livestock facilitated by Fencing Policy and Tribal Grazing Land Policy
2. An integrated approach to address issues holistically

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).

Limited success because farmers do not adhere to proper stocking rates.

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).

1. Fencing allows proper breeding and maintenance of pure breeds.

Environmental Impact Assessment e.g. to assess impact of feedlots to the environment.

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.

1. Rangeland degradation
2. Over grazing
3. Soil erosion

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.

Poor coordination of activities addressing environmental problems and the results not widely shared with community.

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.

The local breeds are small in frame and therefore require less nutrients for maintenance. They are also used for utilising various local herbage species.

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.

1. Further research on land-carrying capacity and stocking accordingly.
2. Development of appropriate land reclamation protocols
3. Improvement of early warning systems

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:

There has been some phenotypic characterization studies on the Musi cattle breed. This is a synthetic beef cattle breed which was developed in Botswana since 1980 and was officially released in 2011. The Musi cattle has breed composition of 28.24% Tswana, 4.44% Tuli, 26.32% Simmental, 22.60% Brahman and 18.40% Bonsmara.

In addition, there has been efforts to perform molecular characterization of Botswana camels. Already blood and hair samples have been collected from about 210 camels in 2013 and these will hopefully be analyzed in the next financial year.

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:

There are plans to undertake molecular characterisation of the Botswana camel. Blood and hair samples were recently (2013) collected from the various camel herds in Kgalagadi District where most of the camels are found. Hopefully these will be analyzed in the next financial year when some funding becomes available.

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:

Statistics Botswana undertakes extensive annual agricultural surveys which cover both arable crops and animal genetic resources. In these Agricultural Statistics Annual Reports, production parameters such as calving rates, mortalities, population size of all livestock species in the different agricultural regions of the country are reported. Furthermore, for every species, indigenous breed populations are monitored as these are under threat of disappearing due to indiscriminate crossbreeding with exotic breeds. However, for commercial livestock sector (in ranches) the Agricultural Statistics Annual Reports are able to indicate population sizes of different breeds with each species.

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:

Within the Ministry there is an Agricultural Statistics Unit whose responsibility is to conduct agricultural surveys on annual basis. Data from these is sent to Statistics Botswana who publish reports on annual basis.

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:

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:

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:

Website for Statistics Botswana is: www.cso.gov.bw

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:

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.

Some characterization work is underway for Musi and Tswana cattle.

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:

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:

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:

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:

Some of the barriers identified are trans-boundary diseases like Foot and Mouth Disease and persistent droughts.

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.

f. No

Please provide further details:

The effect of indiscriminate crossbreeding in the country are well known and are sometimes visible as indicated by population sizes of pure indigenous breeds, However, no formal studies have been undertaken to assess the impacts.

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:

There are plans to implement the Beef cattle performance recording nationally as previously it was piloted in one region (Gantsi District). In addition, there are some plans to establish a pilot milk recording scheme, as a collaboration between Botswana, South Africa and Zimbabwe.

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:

There is a planned Animal genetic Resources stakeholder workshop around June 2014. At this workshop, the Animal Genetic Resources Strategic Plan will be presented to stakeholders so that their input can be incorporated in the Plan.

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:

Communication to the farming community on access to animal genetic resources is done through media, farmers associations and extension outreach programmes.

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:

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:

Farmer training and technical support programmes for breeding activities are in place for some livestock species. There are AI support programmes for cattle and government has multiplication farms (different animal species) which support farmers with progeny from high performance animals. However, these are not effective due to shortage of resources.

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 adaptation 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:

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:

Efforts are in place to support the indigenous or local production systems, these include Livestock Management and Infrastructure Development (LIMID) and Poverty Eradication program which are undertaken to improve livestock production.

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:

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.

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:

Animal diseases outbreaks erode animal genetic genetic resources, especially cattle in Botswana because of the stamping out (eradication through mass slaughtering) which end up affecting animal genetic resources diversity in the affected region.

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 indiscriminate crossbreeding with exotic breeds. This is because most livestock in the country is found in communal areas where controlled breeding is hard to practice. As such, indigenous Tswana breeds of different species (cattle, sheep, goats, pigs) are the ones which are at risk because most farmers want to farm with 'improved' stock due to their high growth performance and economic returns. Furthermore, animal diseases outbreaks erode animal genetic genetic resources, especially cattle in Botswana because of the stamping out (eradication through mass slaughtering) which end up affecting animal genetic resources diversity in the affected region.

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:

Government has conserved indigenous Tswana species in some of its farms. These include Tswana cattle, Tswana sheep, Tswana goats, Tswana pigs and indigenous chickens. However, government does not have conserved donkeys in its farms because these are considered not to be endangered in any way.

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:

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:

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:

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:

For cattle, there is semen of Tswana bulls conserved at Ramatlabama National AI laboratory. Efforts have been made to train Tswana rams and bucks for semen tapping but these have not been fruitful so far.

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)?

- a. Yes
- b. No

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

- 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 gaps exist due to the fact that semen collected was from few bulls. Future plans are to source more Tswana bulls from different backgrounds and increase Tswana bulls semen collection stores. In addition, there are plans to conserve semen from other species like sheep and goats. It is the intention of the Department of Agricultural Research to also cryopreserve not only semen but also embryos and oocytes, but in order for us to achieve these, funding is needed for training of technicians and equipment for the gene bank.

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
- 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
- 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)?

- 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:

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:

A Farm Animal genetic Resources conservation Unit was established within the Department of Agricultural Research. The mandate of this unit is to drive and coordinate all activities of animal genetic resources in the department (as well as nationally).

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

1. Capacity building with relevant skills (e.g Animal breeders, curators, Animal physiologists)
2. Purchase of equipment for the gene bank
3. Awareness creation on conservation of animal genetic resources
4. Establishment of Breed Societies for different breeds of different species

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.

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:

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:

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:

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:

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:

Following the enactment of the Livestock Improvement Act of 2009, the Animal Production Advisory Board was established in 2013 although the modalities of operation for this board have not been developed yet.

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:

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:

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:

The implementation of the Livestock Improvement Act of 2009 will influence the development of policies and strategies for the management and conservation of animal genetic resources in the country.

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:

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:

Botswana Tourism, a parastatal company in the country is involved in the conservation of Botswana camels. These are mainly used for transport as well as for tourism purposes.

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:

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.

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:

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:

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

- a. Yes
- b. No

Please provide further details:

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:

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:

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:

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:

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:

Livestock Information Management System (LIMS) for the Southern African Development Community (SADC) countries. This LIMS database consists of several modules categorized into four components mainl

1. Animal Health (involved disease report modules)
2. Animal Production (animal breeds, census modules etc.)
3. Livestock Market & Trade
4. Livestock Development with relates to policies, Legislation, infrastructure, Procedures and service providers.

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:

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:

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
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Submit by Email

Annex

Additional comments to question 15.2: Please provide further information on the roles of stakeholders in implementation of various activities listed in above table as well as in driving breeding activities in the country?

Government:

Government provides a network of Extension Officers who are there to assist farmers (livestock keepers) in different regions with the setting up of breeding goals, management of livestock in their respective farms as well as disease management. However because of the fact that majority of livestock are found in communal areas, breeding goals are sometimes difficult to implement because of the difficulty to control breeding in communal areas.

The cattle industry in Botswana has an animal identification program known as Livestock Identification and Traceback System (LITS) which is run by the Department of Veterinary Services, under the Ministry of Agriculture. This system was introduced in order to allow traceability of beef and beef products to their farm of origin. Government however is not actively involved with identification of other livestock species. Rather it is upon individual livestock keepers to have identification system for their livestock. This can be in the form of eartags, brand number or other forms of markings.

Livestock recording is still very low for the different livestock species in the country. However, efforts have been made by the Ministry Agriculture's two Departments (Department of Animal Production (DAP) and Department of Agricultural Research (DAR) to implement Beef cattle recording scheme nationally. However, participation by farmers on this scheme has not been encouraging due to non satisfactory support from the Ministry staff. Plans are also underway to establish a Pilot National Milk Recording program and this will be a collaboration project between South Africa, Botswana and Zimbabwe.

Government plays a vital role in the provision of artificial insemination services in the country. The DAP under Ministry of Agriculture operates a National Artificial Insemination laboratory at Ramatlabama. This laboratory provides semen (both imported and locally produced) and from bulls of different breeds. The lab also sources AI equipment for livestock keepers who undertake artificial insemination at their respective farms. In addition to this, the DAP operates 14 Artificial Insemination farms where small-scale beef producers can bring their cattle for AI. This service is heavily subsidised by government and it is aimed at improving genetic merit of beef cattle for resource poor farmers.

Research Organisations:

Research organisations which deal with animal genetic resources would mainly be the Department of Agricultural Research under the Ministry of Agriculture and the Botswana College of Agriculture. These generate technologies which will help improve productivity of animal genetic resources in the country. The contribution of research organisations in setting of breeding goals is only through assisting farmers who come to consult with research scientist on breeding issues.

The DAR is the lead institution in establishment and implementation of livestock performance recording schemes. The animal breeders assist participating farmers in selecting the best animals and culling of non-performing animals.

Genetic evaluation: The DAR performs genetic evaluation on data from beef cattle farmers who participates in the beef cattle performance scheme. Through these, farmers are assisted to select future breeding stock using genetic evaluation procedures.

Individual breeders /livestock keepers:

Individual breeders in Botswana are highly involved with the setting up of breeding goals for their animal genetic resources. Each farmer determines how he/she will breed his/her animals because there aren't any

formalised associations or breed societies to guide/direct how to breed. Government officials only provide farmers with information but the final decisions on which species or breed to farm lies with the farmer. Individual breeders/livestock keepers in Botswana are also highly involved with the animal identification of their animal genetic resources. Different ways of identification are used. For cattle, electronic boluses have been used (until 2013). Currently, government advocates the use of ear tags (electronic and analogue) to identify cattle. Ear tags are also used for other species like sheep and goats. Another form of identification used in Botswana is the use of brand number and ear markings. Farmers have to register for brand number with Department of Veterinary Services while ear markings are determined by individual farmers.

Participation of farmers in Livestock recoding schemes has been very low in Botswana. This is not helped by the fact that there is a shortage of trained personnel in government departments (DAP and DAR) which are responsible for running the schemes, thereby resulting in longer time for feedback to reach the farmers.

Cattle producers in Botswana are very highly interested in using artificial insemination. However, they are mainly limited by lack of resources as well as the capacity of AI camps in the country because there is a limit on the number of cows a farmer can send to AI camp, hence the low participation despite high interest from farmers. In addition, majority of farmers in Botswana do not have ranches (or private land) therefore most of the natural matings occur in communal land, where breeding is very difficult to control. Artificial insemination is only done in cattle (mostly beef cattle) while AI in other species like sheep and goats is still not being practised in Botswana.

National Commercial Companies:

Commercial companies in the country take part in breeding activities by selling equipments such as ear tags, Liquid nitrogen and Liquid nitrogen portable tanks.

External Commercial Companies:

Commercial companies outside the country take part in breeding activities by selling equipments such as ear tags and artificial insemination equipment such as liquid nitrogen portable tanks.

In addition, external companies in the EU are heavily involved in the establishment of a national Livestock Identification and Traceback System (LITS) because they are the ones who demanded as a top priority requirement that proper LITS should be in place in order for them to buy Botswana Beef.