



International organization progress report on the implementation of the Global Plan of Action for Animal Genetic Resources 2007-2013

1. Contact information and mandate

Name and position of respondent	Gerrit J. Viljoen, Section Head
Name of organization	Animal Production and Health Section, Joint FAO/IAEA Division, IAEA, Vienna
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Geographical coverage of your organization	Asia, Africa, Latin America, Europe

2. Animal species coverage of your organization

General livestock-related mandate	<input checked="" type="checkbox"/>
Large ruminants	<input checked="" type="checkbox"/>
Small ruminants	<input checked="" type="checkbox"/>
Pigs	<input checked="" type="checkbox"/>
Poultry	<input checked="" type="checkbox"/>
Rabbits & micro livestock	<input type="checkbox"/>
Camelidae	<input checked="" type="checkbox"/>
Equines	<input checked="" type="checkbox"/>

Strategic Priority Area 1: Characterization, Inventory and Monitoring

1. Does your organization implement or support the implementation of projects or programmes on phenotypic characterization of animal genetic resources?

- Yes
- No

If yes, please provide details and specify the countries and species involved and whether you include characterization of production environments:

Animal Production and Health Sub-program (APHS) of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture implemented/currently implementing the following projects related to phenotypic characterization of animal genetic resources:

1. Coordinated Research Project (CRP D3.10.25): Gene based technologies in livestock breeding: Characterization of small ruminant genetic resources in Asia.

Under this project, APHS supported phenotypic characterization of 38 sheep breeds and 37 goat breeds from seven Asian countries (Bangladesh, China, Indonesia, Iran, Pakistan, Sri Lanka and Vietnam). Phenotypic characterization involved collection of information on geographic distribution of breeds, management practices, utility of breeds and production performance.

2. Coordinated Research Project (CRP D3.10.26): Gene based technologies in livestock breeding: Genetic variation on the control of resistance to infectious diseases in small ruminants for improving productivity

Under this project, APHS supported characterization of 13 sheep breeds and 11 goat breeds for phenotypes related to host resistance against gastrointestinal parasites. Twelve countries from Asia, Africa and Latin America (Argentina, Bangladesh, Brazil, Burkina Faso, China, Indonesia, Ethiopia, Iran, Nigeria, Pakistan, Saudi Arabia, Sri Lanka) are currently supported.

2. Does your organization implement or support the implementation of projects or programmes on molecular characterization of animal genetic resources?

Yes

No

If yes, please provide details and specify the countries and species involved:

1. Coordinated Research Project (CRP D3.10.25): Gene based technologies in livestock breeding: Characterization of small ruminant genetic resources in Asia.

Under this project, APHS supported molecular genetic characterization of 38 sheep breeds and 37 goat breeds from seven Asian countries (Bangladesh, China, Indonesia, Iran, Pakistan, Sri Lanka and Vietnam). Genetic characterization involved genotyping of animals at FAO recommended microsatellite marker loci, sequencing mitochondrial DNA control region and assessment of genetic diversity, structure and phylogeography.

2. Characterization of Sheep breeds: Ten breeds of sheep from four other countries (Bulgaria, Peru, India and Burkina Faso) including wild Asian sheep (Urial and Asiatic Mouflon) from Pakistan were characterized genetically using microsatellite and mitochondrial DNA markers.

3. Coordinated Research Project (CRP D3.10.26): Gene based technologies in livestock breeding: Genetic variation on the control of resistance to infectious diseases in small ruminants for improving productivity

Under this project, APHS supported genotyping of more than 30 sheep breeds from 11 countries (Argentina, Burkina Faso, Indonesia, Ethiopia, Iran, Bulgaria, India, Peru, Austria, Pakistan, Bangladesh) at 180 Single Nucleotide Polymorphic (SNP) loci and association with phenotypes related to host resistance against gastrointestinal parasites.

4. Technical Cooperation Projects Under IAEA's Regional and National Technical Cooperation Projects, 23 countries (Myanmar, Madagascar, Zambia, Angola, Iraq, Jordan, Burkina Faso, Syria, Yemen, Oman, Albania, Armenia, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Hungary, Kazakhstan, Macedonia, Montenegro, Romania, Serbia and Turkey) were supported to characterize indigenous livestock and poultry breeds. Under these projects, genetic characterization of 9 native cattle breeds and 17 chicken populations were completed.

3. Does your organization implement or support the implementation of projects or programmes for surveying the size and/or structure of animal genetic resources populations and monitoring population trends?

Yes

No

If yes, please provide details and specify the countries and species involved:

4. Does your organization implement or support the implementation of projects or programmes for identifying and monitoring threats to animal genetic resources?

Yes

No

If yes, please provide details and specify the countries and species involved:

5. Does your organization support countries in the development of early warning and response systems for animal genetic resources?

Yes

No

If yes, please provide details and specify the countries and species involved:

6. Is your organization involved in research and development on methods, technical standards or protocols for phenotypic or molecular characterization, surveying and monitoring of population size or threats to animal genetic resources, or breed evaluation, valuation and comparison?

Phenotypic characterization

Yes

No

Molecular characterization

Yes

No

Surveying and monitoring

Yes

No

If yes, participatory monitoring

Yes

No

Breed evaluation or comparison

Yes

No

Economic valuation

Yes

No

Please provide details:

1. APHS developed protocols for phenotypic characterization of sheep and goat breeds for assessing their genetic resistance against gastrointestinal parasites through artificial challenge and natural field exposure trials. New phenotypes were identified

- to evaluate animals for their innate resistance potential against parasites
2. Around 180 novel SNP markers in sheep and 170 SNP markers in goats were identified and genotyping protocols were developed to assess diversity of immune related genes and their association with parasite resistance.
 3. Thirteen SNP markers were identified and protocols were developed for genotyping chicken populations from Asia and Europe
 4. Breed descriptors adapted to prevailing production system in target countries were developed for survey and recording of information of breeds belonging to different livestock species.

7. Has your organization identified major obstacles to inventory, characterization and monitoring of animal genetic resources in all or part of your mandate area or species coverage?

- Yes
- No

If yes, please list them being as specific as possible regarding geographical area / species:

1. Inadequate number of skilled personnel available to carry out phenotypic and genetic characterization tasks.
2. Lack of adequate resources in terms of infrastructure, equipment and funding for DNA analysis including genotyping, sequencing, etc.
3. Lack of awareness among National stakeholders on the importance of evaluation of local animal genetic resources
4. Unavailability of breed specific census data resulting in lack of information on population status, breed distribution, etc.
5. Lack of pedigree and performance records to assess breeds in small holder production systems
6. Lack of simple production system specific questionnaire to collect information on breeds

8. What are the priority measures that need to be taken to address these obstacles?

1. Training of personnel from member states and capacity building
2. Continued financial support to member states for the implementation of breed characterization studies
3. Raising awareness among National stakeholders through continued advocacy

9. Please describe any additional activities relevant to the implementation of Strategic Priority Area 1: Characterization, inventory and monitoring of trends and associated risks.

Strategic Priority Area 2: Sustainable Use and Development

1. Does your organization support countries in developing, reviewing or adjusting their national policies affecting the sustainable use of animal genetic resources?

- Yes
- No

If yes, please provide details and specify the countries and species involved:

- Assistance to Myanmar, Madagascar, Zambia, Angola and Sierra Leone on breeding of cattle for milk, meat and draught

2. Does your organization promote agro-ecosystem approaches?

- Yes
- No

If yes, please provide details:

IAEA activities related to Soil-Crop-Livestock system with focus on nutrient recycling across soil, plants and animals, Genotype X Environment interaction and optimal breed that is adapted for a particular production system

3. Does your organization contribute to the planning or implementation of strategic breeding programmes?

Mainstream breeds

Yes

No

Under-utilized breeds

Yes

No

If yes, please provide details (including the breeds involved) being as specific as possible:

- Madagascar - Malagasy Zebu cattle
- Myanmar - Pyar Zein, Shwe Ni and Shwe Ni Gyi cattle
- Zambia - Angoni, Barotse and Tonga cattle
- Burkina Faso - Sahelian goat
- Sierra Leone - N'Dama cattle
- Republic of Chad - Red Fulani and Kori cattle

4. Does your organization contribute to the development of recording systems or organizational structures for breeding programmes?

Yes

No

If yes, please provide details (including the breeds involved) being as specific as possible:

- Madagascar - Malagasy Zebu
- Myanmar - Pyar Zein, Shwe Ni and Shwe Ni Gyi
- Sierra Leone - Red Fulani and Kori cattle
- Jordan - Awassi sheep

5. If the projects and programmes that your organization implements or supports involve the use of exotic breeds, have any assessments been made of the long-term impacts of the use of exotic breeds on animal genetic resource diversity, livelihoods and/or food security in the affected countries and production systems?

Yes

No

No projects or programmes involving exotic breeds

If yes, please provide details:

6. Has your organization implemented or supported the implementation of animal genetic resources-related projects that aim at achieving sustainable intensification of production?

Yes

No

If yes, please provide details and specify the countries and animal genetic resources involved:

- Cattle - Myanmar, Madagascar, Sierra Leone, Zambia, Republic of Chad
- Goat - Burkina Faso

7. Does your organization contribute to the development of mechanisms for facilitating interactions among stakeholders, scientific disciplines and sectors as part of planning for sustainable use development of animal genetic resources?

Yes

No

If yes, please provide details and specify the countries or regions involved:

IAEA facilitates interaction of stakeholders within countries like Animal Husbandry Department, Livestock Breeding organizations and University/Institutional laboratories, especially targeting the value chain on delivery of breeding services (identification of right bull, semen collection, freezing of semen, semen evaluation, cold chain maintenance and delivery of AI service) (Myanmar, Madagascar, Sierra Leone, Chad, Mongolia).

8. Do your organization's activities contribute to improving farmers' and livestock keepers' knowledge of animal genetic resources from various sources?

Yes

No

If yes, please provide details and specify the countries and types of animal genetic resources involved:

9. Do your organization's activities contribute to improving farmers' and livestock keepers' access to animal genetic resources from various sources?

Yes

No

If yes, please provide details and specify the countries and types of animal genetic resources involved:

Through delivery of artificial insemination services to farmers with semen of required breeds (dissemination of superior germplasm), radio immuno assays to estimate progesterone levels and to help farmers with early detection of non-pregnant animals.

10. Does your organization contribute to the development of agreements for equitable sharing of benefits arising from access to and use and development of, animal genetic resources?

Yes

No

If yes, please provide details:

11. Does your organization contribute to efforts to preserve and respect indigenous or local production systems and associated traditional knowledge and practices related to animal genetic resources?

Yes

No

If yes, please provide details:

IAEA-APHS has supported National efforts to preserve indigenous or local production systems. Specifically, IAEA promoted utilization of indigenous breeds, locally available feed resources, Silvi pastoral system, etc for sustainable management of livestock among local communities

1. IAEA-Technical Cooperation Project supported Tanzania in its efforts to preserve and improve livestock among Masai tribes in Ngorongoro Conservation Area
2. Support to Nomadic and Semi-Nomadic pastoralism in Mongolia

12. Does your organization implement or support the implementation of projects that aim to promote the marketing of products from local breeds or local production systems?

- Yes
- No

If yes, please provide details and specify the breeds and production systems involved:

13. Has your organization identified obstacles to enhancing the sustainable use and development of animal genetic resources?

- Yes
- No

If yes, please provide details:

1. Lack of national breeding policy and inadequate breeding strategies for improved production of local animal breeds in some member states.
2. Lack of institutional framework to provide efficient animal breeding services
3. Lack of infrastructure to produce required doses of germplasm and poor A.I. coverage
4. Lack of systematic identification of superior merit bulls for sustainable genetic improvement of target breeds.
5. Lack of animal identification systems and field performance recording in low input systems

14. What are the priority measures that need to be taken to address these obstacles?

1. Advocacy to formulate National and Regional breeding policy within country
2. Formulation of effective strategies for breeding local breeds with focus on well defined trait(s)
3. Strengthening institutional framework and infrastructure to improve A.I. coverage and delivery of animal breeding services

15. Does your organization provide, or support the provision of, training or technical support programmes for animal breeding activities in pastoralist and farming communities?

- Yes
- No

If yes, please provide details:

1. IAEA supported local training of Masai tribes on artificial insemination technology in Tanzania
2. Technical support and training on artificial insemination of Yak maintained under nomadic and semi-nomadic pastoral system in Mongolia
3. Training and support for artificial insemination technology in cattle maintained by Fulani tribes in Sierra Leone

16. Has your organization identified priorities for future training or support programmes to enhance the use and development of available animal genetic resources?

- Yes
- No

If yes, please provide details of the priority activities, being as specific as possible:

1. Electronic animal identification systems and performance recording under low external input production systems
2. Modern biotechnological tools to improve animal reproduction and dissemination of superior germplasm
3. Improvement of artificial insemination services (Tools for early pregnancy diagnosis, infertility management, etc.)
4. Application of genomic tools for selective animal breeding

17. Please describe any additional activities relevant to the implementation of Strategic Priority Area 2: Sustainable use and development.

Strategic Priority Area 3: Conservation

1. Is erosion of animal genetic resources occurring in any of the countries or regions in which your organization is active?

- Yes
- No
- Do not know

If yes, please describe. Please be as specific as possible and indicate which factors or drivers affect which species in which countries or regions:

Local chicken populations in Eastern Europe, specifically in Bulgaria, where indigenous chicken population is limited to few hundreds in one or two Institutional farms.

2. Does your organization support the establishment of emergency response systems that provide for immediate action to maintain threatened breeds?

- Yes
- No

If yes, please provide details:

3. Does your organization take or support actions to protect breeds and populations that are at risk from natural or human-induced disasters?

- Yes
- No

If yes, please provide details:

4. From your organizational point of view, how would you judge the state of conservation policies for animal genetic resources in the countries and regions in which you operate?

1. Generally, there is a lack of clear-cut conservation policy in many member states, especially on various strategies/measures to be taken relational to the population status of a particular breed/ecotype
 2. Lack of production system specific or country specific population parameters for classification of breeds under different

conservation status/category (i.e Normal, Insecure, Vulnerable, Endangered, Critical, Extinct). Such a classification based on locally available infrastructure (for breeding, artificial insemination, capacity on modern biotechnologies like Embryo transfer, in vitro fertilization, cloning, etc.) for revival of breeds is completely lacking in most member states.

5. What types of conservation measures for animal genetic resources does your organization implement or support the implementation of?

In situ

Yes

No

Ex situ in vivo

Yes

No

Ex situ in vitro

Yes

No

Please provide details, and specify the countries and animal genetic resources involved:

Through strengthening and maintenance of genetic repository of various livestock breeds

6. If your organization maintains *ex situ* collections of animal genetic resources, could you please provide further information on these collections?

Yes. Animal Production and Health Laboratory (APHL) of IAEA is maintaining a repository of genetic material (DNA) from indigenous livestock breeds. At present, about 3000 DNA samples collected from more than 70 breeds of various livestock species including cattle, sheep, goat, chicken, Alpaca and pig are maintained under cold storage. Information on all these DNA samples have been documented. The repository helps to improve collaborative animal genetic research through sharing of samples under appropriate material transfer agreement among collaborators from different member states.

7. Is your organization conducting research to further develop methods and technologies for *in situ* or *ex situ* conservation of animal genetic resources?

Yes

No

If yes, please briefly describe the research:

Protocol for sample collection, DNA extraction, storage and documentation

8. Has your organization identified major obstacles to enhancing the conservation of animal genetic resources?

Yes

No

If yes, please provide details:

- Lack of funding for in situ as well as ex situ conservation of endangered animal breeds
- Lack of infrastructure for maintenance of National Gene Banks and storage of germplasm

9. What are the priority measures that need to be taken to address these obstacles?

Adequate funding to establish infrastructure for gene banks

10. From your organizational point of view, what are the priority requirements for enhancing conservation measures for animal genetic resources in the countries and regions in which you operate? Please list the requirements, being as specific as possible:

11. Please describe any additional activities relevant to the implementation of Strategic Priority Area 3: Conservation.

Strategic Priority Area 4: Policies, Institutions and Capacity-building

1. Does your organization support or facilitate the establishment of institutional frameworks for planning and implementing animal genetic resources programmes?

- Yes
- No

If yes, please provide details and specify the countries or regions involved:

2. Does your organization support countries in formulating or implementing national strategies and action plans for animal genetic resources?

- Yes
- No

If yes, please provide details and specify the countries involved:

3. Does your organization contribute to the development of regulatory frameworks or legislation for animal genetic resources?

- Yes
- No

If yes, please provide details and specify the countries or regions involved:

4. Does your organization have a database or information system for animal genetic resources-related data?

- Yes
- No

If yes, please describe the purpose and contents of the system and, if relevant, how frequently data are updated:

IAEA is currently establishing APHL - Animal Genetics Reference Material Database. The database consists of information on

- (i) Genetic repository of indigenous livestock breeds
- (ii) DNA marker tools available for genetic characterization of livestock
- (iii) Radiation hybrid panels for whole genome mapping of livestock
- (iv) Gene based technologies and resources (Oligos, Genotyping assays, etc.) related to animal genetic resource characterization
- (v) Protocols and SOPs for various techniques related to molecular genetic analysis of animal breeds

5. Does your organization have collaborative links to other stakeholders involved in the management of animal genetic resources (e.g. the breeding industry, livestock keepers, government agencies, research institutes and civil society organizations)?

Yes

No

If yes, please provide details:

6. Does your organization cooperate with breeders' organizations?

Yes

No

If yes, please provide details:

7. Has your organization supported the establishment or strengthening of community-based organizations, networks or initiatives for sustainable use, breeding or conservation?

Yes

No

If yes, please provide details:

IAEA initiated and supported "Community based dairy veterinary services to improve animal breeding services and milk marketing in Bangladesh"

8. Does your organization implement or support the implementation of training or capacity-building programmes for animal genetic resources management?

Yes

No

If yes, please provide details and specify countries involved:

IAEA-APHS conducted group training and individual fellowship training courses on genetic characterization of indigenous animal genetic resources and bioinformatic analysis of sequence and genotype data. A total of 57 participants were trained through 1-2 weeks of group training courses. Apart from this, 11 participants were provided individual fellowship training for a duration of 2-3 months on specific topics at Animal Production and Health Laboratory (APHL), IAEA, Seibersdorf. The details are given below:

Group Training

1. Regional Training Course (RTC) on "Genomic DNA Preparation, Microsatellite Analyses and Sequencing" (RER5015) from 7 -18 Dec, 2009 at APHL, Seibersdorf. The course was attended by 20 participants from 14 Member States (Albania, Armenia, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Hungary, Kazakhstan, Macedonia, Montenegro, Moldova, Romania, Russian Federation, Serbia, Turkey, India and Azerbaijan)

2. Regional Training Course on "Bioinformatics Tools and Microsatellite Analyses and Sequencing (RER5015) from 22nd Nov to 3rd Dec 2010 at APHL, Seibersdorf, Austria. The course was attended by 15 participants from Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Hungary, Montenegro, Poland, Romania, the Russian Federation and Turkey.
3. Workshop on "Analysis of sheep and goat mitochondrial sequence data" during October, 2009 in Beijing China. Nine research contract holders of the IAEA-CRP D3.10.25 participated in the training/workshop.
4. Regional Training Course on "Advanced molecular genetic tools for characterization and improvement of indigenous small ruminants" from 17-21 June, 2013 at APHL, Seibersdorf. 13 participants from four ARASIA countries Iraq, Jordan, Yemen and Oman participated.

Fellowship Training

11 fellows from 9 MS (Bulgaria-1, Costa Rica-1, Peru-2, Madagascar-2, Myanmar-1, Pakistan-1, Zambia-1, Angola-1, Burkina Faso-1) were trained on molecular genetic techniques for characterization of livestock breed

9. Has your organization identified priorities for future animal genetic resources-related capacity-building and education?

- Yes
- No

If yes, please provide details:

1. Genetic Characterization of Livestock Breeds
 - (a) Molecular genetic characterization of livestock breeds using genome-wide markers
 - (b) Analysis of Next Generation sequence data to identify genome wide markers
 - (c) Analysis of high throughput SNP data for evaluating genetic structure of livestock populations
2. Animal Identification using electronic devices and performance recording under field conditions
3. Genomic tools for selective animal breeding
4. Modern biotechnological tools to improve animal reproduction and dissemination of superior germplasm
5. Improvement of artificial insemination services (Tools for early pregnancy diagnosis, infertility management, etc.)

10. Does your organization implement or support the implementation of programmes to increase public awareness of the roles and values of animal genetic resources?

- Yes
- No

If yes, please provide details:

11. Please describe any additional activities relevant to the implementation of Strategic Priority Area 4: Policies, institutions and capacity-building.

Implementation and Financing of Global Plan of Action for Animal Genetic Resources

1. Has your organization's budget for activities supporting the implementation of the Global Plan of Action and animal genetic resources programmes increased since the plan's adoption in September 2007?

- Yes
- No

Please provide details:

Evidenced through number of IAEA TC projects and number of group training and individual fellowships

2. Has your organization contributed to the establishment or strengthening of international research and/or education programmes to assist developing countries or countries with economies in transition to better manage animal genetic resources?

Yes

No

If yes, please provide details:

The Coordinated Research Projects and Technical Cooperation Projects initiated and supported by IAEA were targeted mostly towards developing countries especially from Asia, Africa and Latin America.

3. Has your organization contributed to the establishment or strengthening of international programmes to assist developing countries or countries with economies in transition to obtain training and technologies or develop information systems related to animal genetic resources?

Yes

No

If yes, please provide details:

IAEA-APHS organized group training and individual fellowship training courses to enhance and build capacities of developing member states in the areas of Evaluation, Characterization, Improvement and Sustainable Utilization of Animal Genetic Resources (Name of the countries supported are listed in previous columns).

4. Has your organization provided funding to countries for the implementation of the Global Plan of Action for Animal Genetic Resources?

Yes

No

If yes, please provide details and specify the countries involved:

During the period 2007-2013, IAEA provided complete or partial financial support to at least 39 countries for the evaluation, characterization and sustainable utilization of animal genetic resources through (1) Research contracts under coordinated research projects (2) Regional Technical Cooperation Projects (3) National Technical Cooperation Projects.

The countries include Pakistan, Bangladesh, Sri Lanka, Vietnam, Indonesia, Iran, China, Burkina Faso, Nigeria, Ethiopia, Argentina, Brazil, Saudi Arabia, Iraq, Jordan, Syria, Yemen, Oman, Madagascar, Zambia, Angola, Myanmar, Albania, Armenia, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Hungary, Kazakhstan, Macedonia, Montenegro, Romania, Serbia, Turkey, Sierra Leone, Republic of Chad, Tanzania and Mongolia.

5. Has your organization contributed to establishing or strengthening international collaboration with regard to:

Characterization of animal genetic resources

Yes

No

Use and development of animal genetic resources

Yes

No

Conservation of transboundary breeds

- Yes
- No

Please provide details and specify the countries involved:

IAEA-APHS established a network of genetic laboratories from various member states through its Coordinated Research Projects, Regional and National Technical Cooperation Projects to facilitate and strengthen international collaborations especially in the areas of molecular genetic characterization of livestock breeds and information sharing on transboundary animal breeds.

6. Does your organization collaborate with national or international non-governmental organizations (NGOs) in the fields of:

Characterization

- Yes
- No

Sustainable intensification

- Yes
- No

Conservation of breeds at risk

- Yes
- No

Please provide details and specify the countries involved:

7. Please describe any additional activities relevant to the implementation and financing of the Global Plan of Action for Animal Genetic Resources: