



联合国  
粮食及  
农业组织

Food and Agriculture  
Organization of the  
United Nations

Organisation des Nations  
Unies pour l'alimentation  
et l'agriculture

Продовольственная и  
сельскохозяйственная организация  
Объединенных Наций

Organización de las  
Naciones Unidas para la  
Alimentación y la Agricultura

منظمة  
الغذية والزراعة  
للأمم المتحدة

E

# COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE

## Item 3.1 of the Provisional Agenda

### INTERGOVERNMENTAL TECHNICAL WORKING GROUP ON ANIMAL GENETIC RESOURCES FOR FOOD AND AGRICULTURE

#### Ninth Session

Rome, 6 - 8 July 2016

### DETAILED FAO PROGRESS REPORT ON THE IMPLEMENTATION OF THE GLOBAL PLAN OF ACTION FOR ANIMAL GENETIC RESOURCES

#### TABLE OF CONTENTS

	Page
I. INTRODUCTION.....	2
II. <i>THE SECOND REPORT ON THE STATE OF THE WORLD'S ANIMAL GENETIC RESOURCES FOR FOOD AND AGRICULTURE</i> .....	2
III. REPORTING AND AWARENESS RAISING ON THE GLOBAL PLAN OF ACTION .....	3
IV. CAPACITY-BUILDING AND TECHNICAL SUPPORT TO THE IMPLEMENTATION OF THE GLOBAL PLAN OF ACTION AT NATIONAL LEVEL .....	3
V. UPDATE ON PROJECTS FUNDED BY THE FAO TRUST ACCOUNT UNDER THE FUNDING STRATEGY FOR THE IMPLEMENTATION OF THE GLOBAL PLAN OF ACTION FOR ANIMAL GENETIC RESOURCES .....	12
Annexes.....	16 - 24

*This document is printed in limited numbers to minimize the environmental impact of FAO's processes and contribute to climate neutrality. Delegates and observers are kindly requested to bring their copies to meetings and to avoid asking for additional copies. Most FAO meeting documents are available on the Internet at <http://www.fao.org>*

## I. INTRODUCTION

The Commission on Genetic Resources for Food and Agriculture (Commission), at its Fifteenth Regular Session, requested FAO to continue supporting country implementation of the Global Plan of Action for Animal Genetic Resources<sup>1</sup> (Global Plan of Action). The document *FAO progress report on the implementation of the Global Plan of Action for Animal Genetic Resources and the Interlaken Declaration*<sup>2</sup> provides an overview of activities undertaken between the Fourteenth and Fifteenth Sessions of the Commission. This document provides a more detailed report on FAO activities since the Eighth Session of the Intergovernmental Technical Working Group on Animal Genetic Resources for Food and Agriculture (Working Group). The activities are grouped according to their relevance to the four strategic priority areas of the Global Plan of Action.

## II. THE SECOND REPORT ON THE STATE OF THE WORLD'S ANIMAL GENETIC RESOURCES FOR FOOD AND AGRICULTURE

A draft version of *The Second Report on the State of the World's Animal Genetic Resources for Food and Agriculture*<sup>3</sup> (Second Report) was presented to the Commission at its Fifteenth Session.<sup>4</sup> As requested by the Commission at its Fifteenth Session,<sup>5</sup> FAO made a revised draft Second Report available by 31 March 2015 and invited comments from Members and observers by 31 May 2015. FAO then finalized the Second Report, taking into account comments received, and published it in English.<sup>6</sup> The Second Report was launched 27 January 2016 at a ceremony held at FAO Headquarters. The ceremony was attended by more than 100 persons, including representatives of at least 19 countries. The ceremony was webcast live and was viewed live by more than 115 persons. According to the request of the Commission,<sup>7</sup> in-brief<sup>8</sup> and brochure<sup>9</sup> versions of the Second Report have been prepared and published in all languages of FAO. With the support of the Chinese government, a Chinese version of the Second Report has been prepared. Versions of the Second Report in the other FAO languages will be prepared pending the availability of extra-budgetary financial resources from governments and other donors. Translations of various Second Report documents into other languages have been undertaken by stakeholders on a volunteer basis.

FAO has also prepared several secondary publications based on data from the Second Report. A chapter on plant and animal resources diversity in the Mediterranean region was prepared and will be published in the 2016 Edition of *Mediterra* – a flagship publication of the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM) – that is co-produced with the FAO. In addition, FAO has prepared two scientific articles on specific topics regarding the management of animal genetic resources, based on in-depth analyses of country reports for the Second Report, in relation to general implementation of animal genetic resources activities and stakeholders' involvement. One key result of this analysis is shown in Figure 1. The figure compares the degree to which livestock keepers in OECD and non-OECD countries are organized for collaboration on activities related to animal breeding. Although there are notable differences among species, a clear result is that the level of organization among livestock keepers is on average much greater in OECD countries. These results suggest that promoting livestock keeper coordination, through creation and

---

<sup>1</sup> CGRFA-15/15/Report, paragraph 39.

<sup>2</sup> CGRFA-14/13/13.

<sup>3</sup> CGRFA-15/15/Inf.17.1,2 and 3.

<sup>4</sup> CGRFA-15/15/10.

<sup>5</sup> CGRFA-15/15/Report, paragraph 37.

<sup>6</sup> <http://www.fao.org/3/a-i4787e.pdf>.

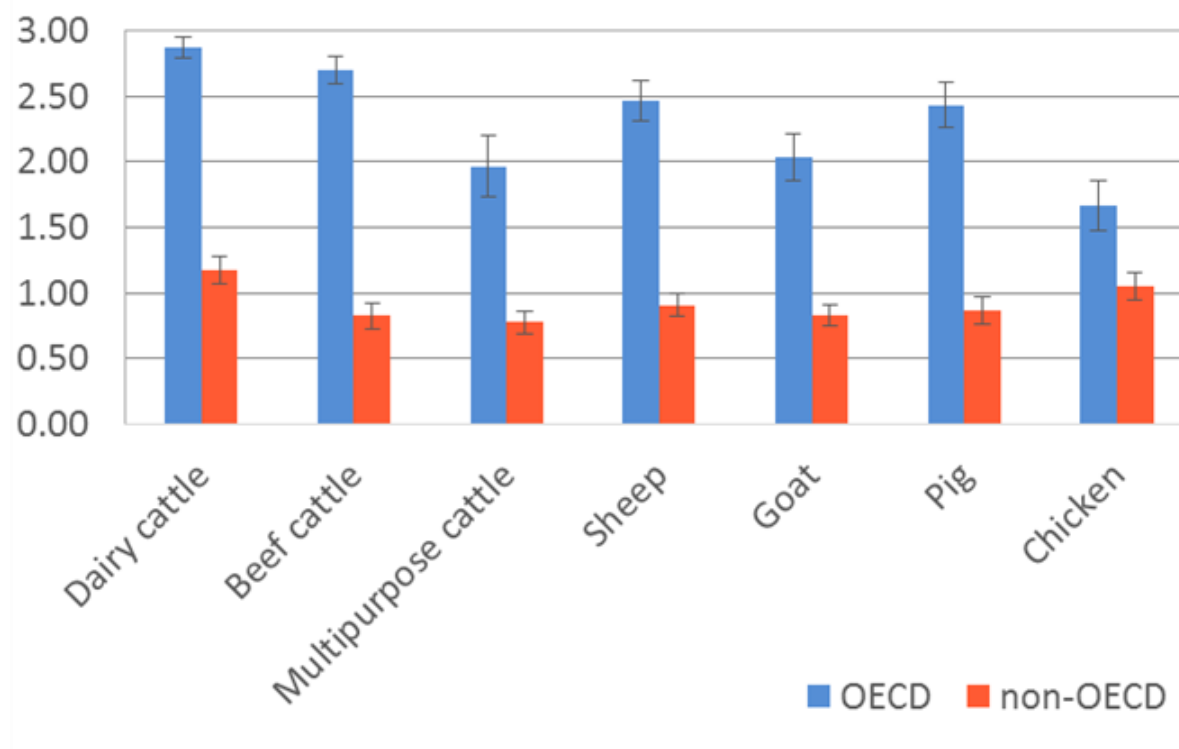
<sup>7</sup> CGRFA-15/15/Report, paragraph 37.

<sup>8</sup> <http://www.fao.org/3/a-i5077a.pdf>, <http://www.fao.org/3/a-i5077c.pdf>, <http://www.fao.org/3/a-i5077e.pdf>, <http://www.fao.org/3/a-i5077f.pdf>, <http://www.fao.org/3/a-i5077r.pdf>, <http://www.fao.org/3/a-i5077s.pdf>,

<sup>9</sup> <http://www.fao.org/3/a-i5086a.pdf>, <http://www.fao.org/3/a-i5086c.pdf>, <http://www.fao.org/3/a-i5086e.pdf>, <http://www.fao.org/3/a-i5086f.pdf>, <http://www.fao.org/3/a-i5086r.pdf>, <http://www.fao.org/3/a-i5086s.pdf>.

empowerment of cooperatives, associations or community approaches, should be a priority for politics and donors.

**Figure 1. Extent of organization of livestock keepers for the purpose of animal breeding. Scores reported being converted into numerical values (none = 0; low = 1; medium = 2; high = 3).**



### III. REPORTING AND AWARENESS RAISING ON THE GLOBAL PLAN OF ACTION

The Global Focal Point for Animal Genetic Resources (Global Focal Point) continued to distribute printed versions of the Global Plan of Action, The first report on *The State of the World's Animal Genetic Resources for Food and Agriculture (State of the World)* and related products and guidelines. Annex 4 provides a list of documents published since the Eighth Session of the Working Group. The website on “Implementing the Global Plan of Action for Animal Genetic Resources”<sup>10</sup> continues to provide information under the following headings: information resources, intergovernmental process, national implementation, regional collaboration, activities of international organizations, support to countries, funding strategy, call for support, reporting system and global assessments; and is available in English, French and Spanish.

The publication catalogue<sup>11</sup> including all publications and information products and services related to the implementation of the Global Plan of Action has been updated and it continues to be distributed at events to encourage requests for these products. The updated catalogue is among the documents made available for this meeting of the Working Group under “other documents”.

### IV. CAPACITY-BUILDING AND TECHNICAL SUPPORT TO THE IMPLEMENTATION OF THE GLOBAL PLAN OF ACTION AT NATIONAL LEVEL

<sup>10</sup> <http://www.fao.org/ag/angr.html>.

<sup>11</sup>

[http://www.fao.org/Ag/AGInfo/programmes/documents/genetics/AnimalGeneticResources\\_Publications\\_catalogue.pdf](http://www.fao.org/Ag/AGInfo/programmes/documents/genetics/AnimalGeneticResources_Publications_catalogue.pdf).

The Global Plan of Action<sup>12</sup> describes the essential role of the FAO in supporting country-driven efforts for its implementation, in particular, in facilitating global and regional collaboration and networks; supporting the convening of intergovernmental meetings; maintaining and further developing the Domestic Animal Diversity Information System (DAD-IS);<sup>13</sup> developing communication products; providing technical guidelines and assistance, and coordinated training programmes; promoting the transfer of technologies relating to sustainable use, development and conservation of animal genetic resources; and coordinating future preparation of global status and trends reports on animal genetic resources.<sup>14</sup> The following paragraphs provide a detailed description of FAO activities in each strategic priority area of the Global Plan of Action.

#### **A. Strategic Priority Area 1. Characterization, inventory and monitoring of trends and risks**

##### *Institutional and technical support*

FAO continued to contribute to the 2010 Biodiversity Indicators Partnership (BIP),<sup>15</sup> and worked on proposals for indicators related to the Sustainable Development Goals,<sup>16</sup> specifically under Target 2.5: “By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed”. Goal 2: “End hunger, achieve food security and improved nutrition and promote sustainable agriculture”.<sup>17</sup> Final decisions on the targets and indicators, which under the current proposal would include the monitoring of breeds both *in situ* and *ex situ*, will be made in early 2017. If approved, the proposed indicators imply the need for countries to update information on their programmes for locally adapted breeds on an annual basis.

FAO continued during the reporting period to maintain against all odds DAD-IS and, with extra-budgetary funding from the Government of Germany, develop a new prototype of DAD-IS. However, as part of the full implementation of its Revised Strategic Framework, FAO initiated in 2015 the centralization of major information management activities, including DAD-IS, in its Information Technology Division which, in the future, will be fully responsible for the further development and maintenance of the DAD-IS infrastructure. Although this development aims to increase the long-term sustainability of DAD-IS and other information systems, it has caused in the short term delays in the implementation of the DAD-IS project. The revision of DAD-IS will be completed during the current biennium.

In 2010, the European Regional Focal Point for the Management of Animal Genetic Resources (ERFP) set up a working group on documentation and information.<sup>18</sup> The Global Focal Point participated in the annual meeting of this working group held in Slovenia in May 2015.

In view of the need to prepare a new status and trends report (see document *Status report of animal genetic resources – 2016*),<sup>19</sup> the Global Focal Point invited National Coordinators to update their national breed-related data in DAD-IS. As of February 2016, 98 (out of 177) National Coordinators had updated national data since DAD-IS:3 i.e. (the current version) was launched in 2007. In addition, 17 countries have set up national nodes and five Scandinavian countries<sup>20</sup> have set up a subregional

---

<sup>12</sup> Global Plan of Action for Animal Genetic Resources, paragraph 58–61.

<sup>13</sup> <http://www.fao.org/dad-is>.

<sup>14</sup> Global Plan of Action for Animal Genetic Resources, paragraph 22–23, Strategic Priority 14.

<sup>15</sup> <http://www.bipindicators.net/about>.

<sup>16</sup> <http://www.un.org/sustainabledevelopment/sustainable-development-goals>.

<sup>17</sup> <http://www.un.org/sustainabledevelopment/hunger/>.

<sup>18</sup> <http://www.rfp-europe.org/index.php?id=527>.

<sup>19</sup> CGRFA/WG-AnGR-7/12/Inf.4.

<sup>20</sup> Denmark, Finland, Iceland, Norway and Sweden.

node as partners in the European Farm Animal Biodiversity Information System (EFABIS) network and can update their data via these nodes.

Since its Fourteenth session, the Commission has invited countries to provide information on how their breeds recorded in DAD-IS should be assigned to the categories “exotic” and “locally adapted” for the purpose of calculating the resource indicators.<sup>21</sup> To date, National Coordinators have made this information available for 4 352 out of 14 915 national breed populations.

Twenty-nine countries updated their national data in 2014, 13 in 2015 and 21 as of 18 February 2016. Since 2014, the percentage of avian breeds for which population data are available has improved slightly, from 56 to 57 percent, whereas for mammalian species the proportion has increased from 60 to 61 percent. Statistics regarding risk status remain essentially unchanged from 2014; 17 percent of 8 822 breeds are currently classified as being at risk; 18 percent are classified as not at risk; 58 percent have unknown risk status and 7 percent are reported to be extinct.<sup>22</sup>

The FAO/International Atomic Energy Agency (IAEA) Joint Division on Nuclear Techniques in Food and Agriculture (AGE) continued to maintain and enrich the Global Genetic Repository of Livestock at its Seibersdorf laboratories that helps preserve genomic DNA samples from animal genetic resources and promote collaborative research in developing countries. At present, the repository maintains about 7 000 DNA samples belonging to more than 100 breeds of various livestock species including alpaca, buffalo, cattle, chicken, goat and sheep.

#### *Research and capacity-building*

FAO has continued to collaborate with the Animal Genomics and Improvement Laboratory of the United States Department of Agriculture (USDA) as part of the African Goat Improvement Network project,<sup>23</sup> sponsored by the United States Agency for International Development (USAID) which undertakes characterization of African goat breeds and establishes community-based breeding programmes. With the financial contribution of Sweden (FMM/GLO/006/MUL), FAO has supported the characterization of 22 goat populations and their production environments in four countries<sup>24</sup>, as well as the collection of the complete production environment descriptor data of the main livestock species in Brazil and Kenya. The entire network project involves more than 60 populations from 16 countries. FAO hosted the fourth meeting and training workshop for the project, which was held in February 2016 and was attended by more than 40 persons from 17 countries.<sup>25</sup>

FAO has supported characterization of local populations through two Technical Cooperation Projects (TCP), “Élaboration d’un plan d’action national pour la gestion et l’amélioration des ressources génétiques animales au Burundi” (TCP/BDI/3402) and “Survey and characterization of livestock breeds and their production systems in Liberia for the development of a national strategy and action plan for animal genetic resources” (TCP/LIB/3502).

To facilitate global analysis of breed diversity through molecular genetic characterization, FAO has continued to promote the international use of standard microsatellite marker sets for the various species of livestock. This work is done in partnership with the International Society for Animal Genetics (ISAG)/FAO Advisory Group on Animal Genetic Diversity. Discussion is ongoing regarding the possible development of single nucleotide polymorphism chips for characterization, which would increase the amount of information available while decreasing the cost and improving standardization across laboratories.

---

<sup>21</sup> CGRFA-14/13/Report, paragraph 32.

<sup>22</sup> CGRFA/WG-AnGR-8/14/Inf.4.

<sup>23</sup> <http://www.ars.usda.gov/Research/docs.htm?docid=23010>.

<sup>24</sup> Egypt, Madagascar, Mali, United Republic of Tanzania.

<sup>25</sup> Austria, China, Egypt, Ethiopia, France, Italy, Kenya, Madagascar, Malawi, Mozambique, South Africa, Sudan, Uganda, United Kingdom, United States of America, United Republic of Tanzania and Zimbabwe.

FAO staff members contributed as co-authors to four articles included in the final scientific report<sup>26</sup> of the Genomic Resources<sup>27</sup> project of the European Science Foundation. This project evaluated the state of the art and provided training in the application of genomic tools in characterization of animal genetic resources. FAO also prepared a scientific article<sup>28</sup> on rare phenotypes associated with particular animal genetic resources and the need to adequately characterize the breeds possessing these traits.

FAO continues to participate in the Rabbit Genome Biology Network (RGB-Net),<sup>29</sup> a European Union-sponsored COST Action designed to improve collaboration among stakeholders in rabbit research and production. The Global Focal Point is a member of the working group on “Genetics in meat, fur and pet rabbits and biodiversity resources” and has contributed to a chapter on rabbit breeding and genetic resources in a book that the RGB-Net is preparing. Project participants used a crowd-sourcing approach to gather data on rabbit breeds from around the world. Data from 61 breed populations in four countries<sup>30</sup> were collected on DAD-IS data sheets and provided to National Coordinators for approval and entry into DAD-IS.

AGE continued to provide technical support to member states on molecular genetic characterization of indigenous livestock breeds. Since the Eighth Session of the Working Group, AGE has supported the characterization of 38 breed populations of cattle, buffalo, sheep and goat across eight countries<sup>31</sup> through various national and regional technical cooperation projects. During this period, AGE trained ten fellows in DNA marker based genetic characterization of domestic animal breeds at its Animal Production and Health Laboratory in Seibersdorf, Austria. The trainees came from seven countries<sup>32</sup> and the fellowships ranged from 1 to 3 months. AGE also implemented a regional training course on “Genetic Characterization of Indigenous Livestock Breeds Using DNA Markers”, as part of a regional Technical Cooperation Project on “Improving the reproductive and productive performance of local small ruminants”. The course was attended by 14 participants from five countries.<sup>33</sup> The AGE Coordinated Research Project entitled “Genetic variation on the control of resistance to infectious diseases in small ruminants for improving animal productivity” will be concluded with the final research coordination meeting in Vienna in September 2016. Ten countries<sup>34</sup> participated in the project to evaluate their sheep and goat breeds for genetic resistance against gastro-intestinal parasites. More than 4 500 animals from 14 breed populations were genotyped at selected candidate gene loci for association with phenotypes and the participants are in the process of preparing scientific articles and other publications to disseminate their results.

## **B. Strategic Priority Area 2. Sustainable use and development**

### *Institutional and technical support*

In response to the need for technical assistance to ensure the better use and development of animal genetic resources, FAO further invested in providing assistance in these fields, both directly and through cooperation with other organizations.

---

<sup>26</sup> <http://journal.frontiersin.org/researchtopic/2123/advances-in-farm-animal-genomic-resources#>.

<sup>27</sup> <http://genomic-resources.epfl.ch/>.

<sup>28</sup> <http://onlinelibrary.wiley.com/doi/10.1111/age.12393/abstract>.

<sup>29</sup> <http://www.biocomp.unibo.it/rabbit/>.

<sup>30</sup> Argentina, France, Germany, Nigeria.

<sup>31</sup> Bulgaria, Burkina Faso, Iraq, Madagascar, Myanmar, Pakistan, Sri Lanka and Zambia.

<sup>32</sup> Angola, Austria, Burkina Faso, Madagascar, Myanmar, Sri Lanka and Zambia.

<sup>33</sup> Iraq, Oman, Jordan, Syrian Arab Republic, and Yemen

<sup>34</sup> Argentina, Bangladesh, Brazil, Burkina Faso, Ethiopia, Indonesia, Islamic Republic of Iran, Nigeria, Pakistan, and Sri Lanka.

At its Fifteenth Session, the Commission endorsed the *Guidelines for the Development of Integrated Multipurpose Animal Recording Systems*<sup>35</sup> and requested FAO to publish and distribute them.<sup>36</sup> The guidelines have been finalized, published<sup>37</sup> and distributed.

FAO, as a member of the board of the International Committee for Animal Recording (ICAR), continued to lead the ICAR Developing Countries Working Group. The working group combines e-mail discussions and physical meetings.

FAO and ICAR collaborated with national and regional partners<sup>38</sup> to organize an International Symposium on Animal Identification and Recording (AIR) Systems for Traceability and Livestock Development in Sub-Saharan Africa, held in April 2015 in Pretoria. The symposium was attended by 130 high-level delegates from 30 countries and regional and international organizations. The event culminated with the adoption of a Declaration<sup>39</sup> that recognises the vital role of AIR for food security and safety, genetic improvement and better flock management, as well as stock theft mitigation. A press release was prepared<sup>40</sup> and videos about the symposium, including all presentations, have been produced and made available on YouTube.<sup>41</sup>

Various countries have requested FAO's technical and financial assistance to develop their animal identification and traceability systems. In Africa, the United Republic of Tanzania (TCP/URT/3303) has received FAO support through the Technical Cooperation Programme. In Central Asia and in the Near East region, respectively, FAO is supporting the Kyrgyz Republic (TCP/KYR/3404) and the West Bank and Gaza Strip (ORSO/GAZ/201/EC) in the development of an animal identification and traceability system, including an animal health information component. In Latin America and the Caribbean region, FAO is supporting Suriname (TCP/SUR/3501) in the development of its animal establishment registration system and an animal identification and traceability system. FAO has also developed a TCP for Georgia, with the objective to establish a national animal identification and traceability system. This project, which is supported by the governments of Austria and Switzerland, as well as the Georgian government and FAO, will run for six years. These projects benefit from the development of the technical guidelines, which integrate animal identification and registration, traceability and health and performance recording (see Section IV), but also contributed to their development. The synergy between use and development of the guidelines illustrates the complementarity between FAO's normative and field work.

Perhaps as a result of climate change and expected increasing value of animal genetic resources adapted to hot, dry climates, two countries have established national research centres for camel production. The Kingdom of Saudi Arabia (UTF/SAU/044/SAU) and Mauritania (TCP/MAU/3501 and UTF/MAU/026/MAU) have set up unilateral trust funds (UTF) to finance projects involving technical support from FAO in the establishment and operation of the research centres. The government of Turkey supported a Government Cooperation Project (GCP) (GCP/SEC/001/TUR) that provides technical assistance in cattle production to Azerbaijan, Kyrgyzstan, Tajikistan and Uzbekistan. An UTF in Mongolia (UTF/MON/009/MON) has assisted in the adoption of improved breeding practices for small ruminants. The FAO project is complementary to the larger World Bank sponsored Livestock and Agricultural Project and FAO has provided technical support to both projects. A TCP in Cuba (TCP/CUB/3402) is being implemented to establish semen processing centres for swine, thus supporting genetic improvement. Finally, Nepal established an UTF

---

<sup>35</sup> CGRFA-15/15/Inf.20.

<sup>36</sup> CGRFA-15/15/Report paragraph 40.

<sup>37</sup> <http://www.fao.org/3/a-i5702e.pdf>.

<sup>38</sup> The South African Department of Agriculture, Forestry and Fisheries, the Stud Book and Animal Improvement Association and the Agricultural Research Council of South Africa, the African Union Inter-African Bureau for Animal Resources (AU-IBAR).

<sup>39</sup> <http://www.icar.org/wp-content/uploads/2015/12/AIR-Pretoria-Declaration.pdf>.

<sup>40</sup> <http://www.fao.org/africa/news/detail-news/en/c/284638/>.

<sup>41</sup> [https://www.youtube.com/playlist?list=PLzp5NgJ2-dK6QBZ7fGDB\\_CRxGSjyV6id7](https://www.youtube.com/playlist?list=PLzp5NgJ2-dK6QBZ7fGDB_CRxGSjyV6id7).

(UTF/NEP/073/NEP) to obtain technical assisting from FAO in the management of local and exotic goat and chicken genetic resources, with the goal of increasing food security.

FAO has continued its work in support of small-scale livestock keepers and pastoralists. Specifically, with the extra-budgetary support of Germany (GCP/GLO/536/GER; GCP/GLO/311/GER), FAO has established the pastoralist knowledge hub to improve the capacity of pastoralist livestock keepers and facilitate communication among them. The hub brings together pastoralist networks and organizations working with them in order to promote collaboration and to enhance pastoral development and pastoralist-friendly policy interventions. Coordinated by FAO, the Hub aims to give pastoralists a voice by strengthening their capacities and by linking their representatives to policy dialogue. The project supported seven regional consultation workshops in India, Bolivia, Germany, Mongolia, Mali, Tunisia and Kenya.

To assist countries in planning for improved management and sustainable use of animal genetic resources in the face of climate change, FAO has developed an online tool to predict the inhabitable zones for animal genetic resources in the future, following climate change.<sup>42</sup> The current geographic distributions (available at least at country level and in some cases at subnational level) of about 8 800 livestock breeds, as recorded in DAD-IS, are being used to model suitable areas for breeds under current and expected future conditions. The climate models take several temperature and humidity parameters into account, including maximum temperature of warmest month, minimum temperature of coldest month, annual precipitation, precipitation seasonality measured as coefficient of variation, and mean temperatures of wettest and of driest months. FAO also contributed to Climate change and food security: risks and responses.<sup>43</sup>

AGE has developed a new Coordinated Research Project on “Application of nuclear and genomic tools to enable for the selection of animals with enhanced productivity traits”. The project was developed through collaboration with other FAO units and the inputs of experts from seven countries<sup>44</sup> and will emphasize the collection of phenotypic performance and pedigree data, thus ensuring that an informative basis for genomic analyses has been established.

AGE is also providing technical support to 11 countries<sup>45</sup> through IAEA national TCPs involving sustainable management of animal genetic resources, as well as through regional TCPs in Africa and Asia. The projects emphasize technology transfer and in particular support establishment and maintenance of artificial insemination centres and the use of molecular technologies as components of a holistic approach to increase livestock productivity. These projects have included capacity building workshops on artificial insemination and dairy herd management. An expert consultants meeting was organized in June 2014 to develop research guidance on early pregnancy diagnosis in bovine using nuclear and molecular techniques.

### *Research and capacity-building*

In March 2016, FAO, in collaboration with the Mediterranean Agronomic Institute of Zaragoza (IAMZ), one of CIHEAM’s centres, organized an expert meeting on development and strengthening of small-scale producers’ livestock value chains and value addition to livestock products. The objective of the meeting was to establish a foundation for the development of specific guidelines on these topics. The workshop was hosted at IAMZ/CIHEAM campus in Zaragoza, Spain. Seventeen persons from 11 countries<sup>46</sup> participated.

---

<sup>42</sup> <http://www.fao.org/climate-change/resources/data-tools/breed-distribution-model/en/>.

<sup>43</sup> [www.fao.org/3/a-i5188e.pdf](http://www.fao.org/3/a-i5188e.pdf).

<sup>44</sup> Austria, Australia, India, Italy, South Africa, United States of America.

<sup>45</sup> Algeria, Burkina Faso, Central African Republic, Chad, Cameroon, Madagascar, Mauritania, Myanmar, Sierra Leone, Sudan, Zambia.

<sup>46</sup> Belgium, France, Germany, India, Italy, Kenya, Mexico, Morocco, Spain, The Netherlands, Tunisia.



In February 2016, FAO organized and hosted the International Symposium on “The Role of Agricultural Biotechnologies in Sustainable Food Systems and Nutrition”.<sup>47</sup> The symposium had three main themes, 1) climate change, 2) food security, nutrition and resource use efficiency and 3) social, economic and policy aspects of biotechnologies. FAO gave a presentation on animal genetic resources in the session on “Facing the challenges of climate change: Adaptation in the livestock and fishery sectors”.<sup>48</sup>

In 2015, in collaboration with the European Regional Focal Point for Animal Genetic Resources, the FAO prepared a scientific review<sup>49</sup> on crossbreeding of animal genetic resources, discussing successes and failures of past efforts to introduce external germplasm into breeds and production systems and providing recommendations on situations where crossbreeding is likely to prosper or collapse. FAO continues as contributor to the European Union sponsored COST Action METHAGENE,<sup>50</sup> on “Large-scale methane measurements on individual ruminants for genetic evaluations”. The objectives of METHAGENE are to discuss and identify the best approaches to measure methane emission from dairy cattle and incorporate methane emissions into national breeding strategies. The project was launched in May 2014 and FAO provided lectures at a training workshop held in Germany in September 2014.

Following a consultants’ meeting in June 2015, AGE has prepared a new Coordinated Research Project on “Application of nuclear and genomic tools to enable for the selection of animals with enhanced productivity traits”. The project was developed through collaboration with other FAO units and the inputs of experts from seven countries<sup>51</sup> and will emphasize the collection of phenotypic performance and pedigree data, thus ensuring that an informative basis for genomic analyses has been established. During the period 2014-2016, AGE implemented three national training courses on artificial insemination and techniques for reproductive hormone estimation in small ruminants. Fifteen, 25 and 10 participants from Burkina Faso, Jordan and Thailand, respectively, participated in these training courses. AGE also implemented two regional courses in which 24 participants from Jordan, Oman, Iraq, Syria and Yemen were trained on electronic animal identification systems, livestock data collection and analysis, and artificial insemination in sheep and goat.

#### *Awareness raising and information*

Members of the Global Focal Point served as invited speakers at a number of conferences regarding the interaction among animal genetic resources and climate change, including the 61th Annual Meeting of the Brazilian Society of Genetics (September 2015 in Aguas de Lindoia, Brazil). They also presented the state of animal genetic resources in Iberoamerica at the 11th Congress of the Iberoamerican Federation for Creole and native breeds (FIRC), held in March 2015, in Zaragoza, Spain and informed on the key results of The Second Report at the 16<sup>th</sup> Iberoamerican Symposium on Conservation and Use of Animal Genetic Resources, held in October 2015, in Villavicencio, Colombia

FAO is a member of the Global Food Security Consortium (GFSC) of the Iowa State University. The GFSC is an initiative to improve networking among scientists and donor organizations and facilitate multidisciplinary research on increasing food security in developing countries. The GFSC provides a platform for members to prioritize research topics and apply for joint funding. FAO participated in the planning of international symposia on “Interlocking the pieces for global food security” in April 2015 and "REAL Sustainability" (Real Engagement in Agricultural Livelihoods)” in April 2016.

---

<sup>47</sup> <http://www.fao.org/about/meetings/agribiotechs-symposium/en>.

<sup>48</sup> <http://www.fao.org/webcast/home/en/item/4036/icode>.

<sup>49</sup> [http://journals.cambridge.org/download.php?file=%2FANM%2FANM10\\_02%2FS175173111500213Xa.pdf&code=853816c1c4f9ecdf00062d1042e9273c](http://journals.cambridge.org/download.php?file=%2FANM%2FANM10_02%2FS175173111500213Xa.pdf&code=853816c1c4f9ecdf00062d1042e9273c).

<sup>50</sup> <http://www.methagene.eu>.

<sup>51</sup> Austria, Australia, Ethiopia, Italy, India, South Africa and United States of America.

### C. Strategic Priority Area 3. Conservation

#### *Institutional and technical support*

FAO is providing technical support to the Kingdom of Saudi Arabia by means of a UTF on “The genetic conservation and improvement of the Arabian horse in its homeland” (UTF/SAU/045/SAU). This particularly targets conservation of the pure desert-bred population of Arabian horse, of which fewer than 300 are believed to exist.

FAO attended and provided technical support at the expert meeting on the development of gene bank standards for animal genetic resources in Africa, organized by African Union’s Interafrican Bureau for Animal Resources (AU-IBAR) in Rwanda in April 2016. FAO serves on the international advisory board of the Centres de Ressources Biologiques pour les Animaux Domestiques (CRB-Anim) project in France, which aims to improve the infrastructure and management of France’s *ex situ* conservation programmes, and participated in its biannual international seminar in February 2015.

#### *Research and capacity-building*

FAO, specifically its Regional office for Europe and Central Asia, organized jointly with ERFPA a workshop on *ex situ* conservation in April 2016 in Hungary. The workshop was hosted by the Research Centre for Farm Animal Gene Conservation in Gödöllo and was attended by 46 persons from 29 countries.<sup>52</sup>

FAO is a member of the research consortium implementing the project “IMAGE – Innovative Management of Animal Genetic Resources, which is funded through the Horizon 2020 programme of the European Union<sup>53</sup>. The project includes 28 partners from 17 countries<sup>54</sup> and will emphasize the improvement of *ex situ* conservation programmes, including their integration with breeding programmes and other *in situ* activities. FAO will in particular be responsible for developing standards for gene banking and for dissemination of results to non-European countries. The project, coordinated by the French National Institute for Agricultural Research (INRA), was launched in May 2016 and will last four years.

#### *Awareness raising and information*

The FAO Subregional Office for the Gulf Cooperation Council States and Yemen contributed to the Regional Conference for Animal Genetic Resources Conservation, which was held in Oman in February 2016. The conference was organized by the Oman Animal and Plant Genetic Resources Centre in collaboration with Sultan Qaboos University.

FAO participated in the workshop on “Better integration of *ex situ* and *in situ* approaches towards conservation and use of genetic resources at national and European Union level: from complementarity to synergy” in June 2015 and the “Final conference to present findings, conclusions, and preliminary recommendations” in June 2016, which were part of a project organized by the European Commission designed to gather data to inform the planning of future programmes to support the improved management of agricultural biodiversity in the European Union. FAO attended and contributed to the XV Simposio Iberoamericano de Conservación y Utilización de Recursos Zootécnicos in Colombia in October 2015.

---

<sup>52</sup> Albania, Austria, Croatia, Denmark, France, Gambia, Georgia, Germany, Hungary, Islamic Republic Of Iran, Kosovo, Latvia, Lithuania, Macedonia, Montenegro, Netherlands, Norway, Poland, Portugal, Republic Of Moldova, Russian Federation, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine.

<sup>53</sup> <http://ec.europa.eu/programmes/horizon2020/>.

<sup>54</sup> Argentina, Austria, Belgium, Colombia, Egypt, France, Hungary, Germany, Italy, Morocco, Netherlands, Poland, Portugal, Spain, Sweden, Switzerland, United Kingdom

## D. Strategic Priority Area 4. Policies, institutions and capacity-building

### *Institutional and technical support*

Strategic Priority 17 of the Global Plan of Action is to “Establish Regional Focal Points and strengthen international networks”. FAO has supported Sub-Regional Focal Points in Africa through a Regional TCP on “Assistance for a regional initiative on animal genetic resources in Africa” (TCP/RAF/3403). Much of the direct activity in the field has been undertaken by the African Union’s Interafrican Bureau for Animal Resources (AU-IBAR), the beneficiary of the project. The AU-IBAR has been the recipient of approximately Euro 15 million from the European Union for the five-year (2013-2018) project “Strengthening the capacity of African countries to conservation and sustainable utilisation of African animal genetic resources”. FAO is a member of the project’s steering committee. The funds have supported various animal genetic resources related activities in Africa, including the establishment and operation of Sub-Regional Focal Points, capacity building and participation of representatives from African countries to international policy meetings. FAO participated in the AU-IBAR organized consultations on “Movement and exchange of animal genetic materials and implementation of the Nagoya protocol on ABS in Africa”, held in April 2015 in Benin, and on “Gene bank standards for Africa”, held in April 2016 in Rwanda.

In other regions, a project funded by Turkey (GCP/SEC/003/TUR) was closed in April 2015. It aimed to prepare for the establishment of a subregional focal point for Central Asia, Turkey and Azerbaijan and to strengthen National Focal Points. All participating countries drafted National Strategies and Action Plans and these plans have been officially endorsed in Kyrgyzstan and Turkey. FAO has been a regular participant in meetings and other activities organized by the ERF and reported on activities related to management of animal genetic resources. In March 2016, FAO organized together with the Regional Focal Point in Latin America and the Caribbean a regional workshop in Cuba on the future of the Regional Focal Point. The National Coordinator of Thailand has led efforts to re-establish a Regional Focal Point in Asia. In particular, greater communication among countries has been facilitated.

With regard to support at national level, the previously-mentioned TCP in Burundi (TCP/BCI/3402) and Liberia (TCP/LIR/3502) have supported the preparation of National Strategies and Action Plans for the management of animal genetic resources. FAO has provided technical support for four workshops organized by the AU-IBAR in 2015 to provide capacity building for countries in the preparation of National Strategies and Action Plans.

In collaboration with the Regional Office for Europe, the Global Focal Point prepared a Russian version of the guidelines *Developing the institutional framework for the management of animal genetic resources*.<sup>55</sup> Elements of the Global Plan of Action have been incorporated into various regional strategies.

Further, AGE continued its efforts to improve the laboratory capacity of member states for management of animal genetic resources. Institutional and technical support were provided to six countries<sup>56</sup> for establishing or strengthening molecular genetic laboratories through provision of necessary equipment and laboratory supplies under the framework of national technical cooperation projects.

### *Awareness raising and information*

FAO, ERF and the EAAP Working Group on Animal Genetic Resources and the Genetics Commission of EAAP organized a joint session on “The role of imported genetics for sustainable

---

<sup>55</sup> <http://www.fao.org/3/a-ba0054r.pdf>.

<sup>56</sup> Angola, Burkina Faso, Madagascar, Myanmar, Sudan and Zambia.

breeding programmes” at the 64th Annual Conference of EAAP in 2015. The session consisted of eight scientific papers and one poster. About 80 participants attended the session, including 15 National Coordinators.

For the past seven years, FAO has collaborated with groups of students from Iowa State University in the United States of America, to conduct research on issues related to animal genetic resources and to publish the results in a variety of formats. In 2016, four students prepared and edited various Wikipedia pages on animal genetic resources, including by inserting links to various communication products prepared by FAO.

The Global Focal Point continues to maintain the Domestic Animal Diversity Network (DAD-Net) and regional sub-groups as an informal forum for the discussion of issues relevant to the management of animal genetic resources at national, regional and international levels. In February 2016, more than 2 800 persons from more than 185 countries were subscribed to the network. Over the year 2015, more than 1 000 messages were exchanged. DAD-Net continued to prove to be an effective means for sharing experiences, enabling participants to request information and facilitating informal discussions among individuals involved in various aspects of the management of animal genetic resources, in particular for individuals from countries where such means do not otherwise exist.

The Global Focal Point has continued to produce the journal *Animal Genetic Resources*. Issues 55,<sup>57</sup> 56,<sup>58</sup> and 57<sup>59</sup> were published during the reporting period, as online versions. The journal is published in collaboration with Cambridge University Press.<sup>60</sup>

Global Focal Point officers have participated as invited speakers at a number of international conferences and meetings of organizations with programmes related to the management of animal genetic resources. These meetings were held in locations spread throughout the world, including China, Colombia, Cuba, Brazil, Canada, Italy, France, Germany, Poland, Spain and Denmark.

## **V. UPDATE ON PROJECTS FUNDED BY THE FAO TRUST ACCOUNT UNDER THE FUNDING STRATEGY FOR THE IMPLEMENTATION OF THE GLOBAL PLAN OF ACTION FOR ANIMAL GENETIC RESOURCES**

Under the first call for proposals under the Funding Strategy, 13 project proposals, involving 30 countries, were approved by the Bureau of the Commission in October 2012. Subsequently, 17 Letters of Agreement (LoA) were prepared by the Secretariat, negotiated and signed for the implementation of the 13 projects. The number of LoAs prepared exceeded the number of projects because, for budgetary and operational reasons, some multi-country projects required the development of a separate LoA for each participating country.

The project cycle consisted of the following steps: opening calls for proposals (prepared by the Secretariat under the guidance of the Working Group, based on decisions of the Commission), submission of concept notes (by Commission Members or legal or natural persons, in consultation with Commission Members), screening and response to concept notes (by the six Members of the Bureau of the Commission, on the basis of preparatory work done by the Secretariat and the recommendations of the Bureau of the Working Group), submission of project proposals from approved concept notes (Commission Members or legal or natural persons, in consultation with Commission Members, through National Focal Points), appraisal of project proposals (the Bureau of the Commission, on the basis of recommendations submitted by the Bureau of the Working Group and an appraisal report submitted by a panel of experts designated by the Bureau of the Working Group),

<sup>57</sup> <http://www.fao.org/3/a-i4063t.pdf>

<sup>58</sup> <http://www.fao.org/3/a-i4736t.pdf>

<sup>59</sup> <http://www.fao.org/3/a-i5198t.pdf>

<sup>60</sup> <http://journals.cambridge.org/action/displayJournal?jid=AGR>.

approval of projects for funding within the project cycle (the Bureau of the Commission and, in addition, one representative per each region), disbursement of funds and implementation, and reporting and monitoring (by the Secretariat). An independent evaluation is foreseen, under the responsibility of the Commission and funds have already been budgeted for this activity.

As of May 2016, eight projects have been closed and the remaining five projects are in the final stages of implementation. The active projects and the overall FAO Trust Account project are scheduled to be closed by the end of 2016, after which time the independent evaluation will be undertaken.

Standard monitoring and reporting procedures for LoA were used for the projects. The LoA included a schedule of outputs and activities that was agreed upon by the Secretariat and the service providers. The LoA also included a schedule of mid-term and final reports. In these reports, the service providers indicated the activities that had been completed according to schedule and provided justifications for any activities that had not been completed. A list of activities to be completed within the subsequent reporting period was also included, as well as a summary of expenditures. Documents such as reports on training activities, participant lists, photos and summary statistics of data collected were attached as annexes. These reports were assessed and approved by the Secretariat prior to release of the subsequent tranche of funds. An overview of project objectives, achievement of outputs and state of completion is provided in Table 1.

The seven regional and six national projects covered all geographic regions, as defined by the Commission, with the exception of North America. Seven projects were implemented by government-assisted institutions or ministries, five by national research organisations or universities and five by NGOs. Various actions to improve animal genetic resources' management were applied to more than 50 different national breed populations belonging to seven species.

Awareness raising was a key component of all projects and most of the projects included capacity-building activities. Livestock keepers were the main beneficiaries of the projects. More than 2 150 people attended awareness-raising, capacity-building and dissemination events with participants ranging from government personnel and livestock keepers to researchers and technical experts. These stakeholders have benefited through increased networking with other livestock keepers and technical experts. The livestock keepers represented both genders and a range of age groups. Other beneficiaries include stakeholders such as members of producer and marketing associations, university students and staff of the implementing agencies. At least 20 policies of various types were prepared, including breeding strategies, conservation plans and biocultural community protocols. DAD-IS data sheets have been compiled for those projects that involved breed characterization.

**Table 1: Overview on project objectives, achievement of outputs and state of completion of projects funded by FAO's Trust Account**

Project name	Countries involved	Species breeds (n) <sup>a</sup>	Main objectives	Specific comments	Project status
Regional projects					
BushaLive	Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Montenegro, Serbia and The Former Yugoslav Republic of Macedonia	Cattle 1 breed 7 national breed populations	Strengthen across country collaboration Breed characterization Basic recording scheme	Planned outputs only partly achieved	closed
Preservation of the Béni Guil sheep breed by the exchange of experiences between countries	Algeria and Morocco	Sheep 1 2	Improving selection scheme Training and awareness raising	Planned outputs only partly achieved	ongoing
Enhancement of farmers communities through goats utilization and genetic improvement	Argentina, Brazil and Costa Rica	Goat 11 11	Breed characterization Establish participatory breeding schemes Cryoconservation Common goat DNA bank	Planned outputs only partly achieved, Brazil withdrew due to difficulties related to funds transfers	ongoing
Capacity development supporting the implementation of breeding strategies for llamas	Bolivia and Peru	Llama 2 2	Training and capacity development	Planned outputs achieved	closed
Conservation of indigenous pig and chicken breeds	Cook Islands, Fiji and Niue	Chicken, pig 3 3	Establishment of collection, breeding and conservation centers	Planned outputs achieved	closed
Promotion of indigenous chicken for improved livelihood and income generation	Ethiopia, Kenya and Uganda	Chicken 3 3	Breed characterization Establish breeding schemes	Planned outputs achieved	closed
Project name	Countries	Species	Main objectives	Specific	Project

	involved	breeds (n) <sup>a</sup>		comments	status
Assessment of the impact of transhumance on the sustainable management of animal genetic resources	Gambia, Guinea, Mali and Senegal	Cattle, goat, sheep 3 12	Assessment of transhumant system	Planned outputs achieved	closed
<b>National Projects</b>					
In situ conservation strategy for goats and cattle	Chile	Cattle, goat 2	Development of conservation strategy Breed characterization	Planned outputs achieved	closed
Documenting and supporting community-based conservation of four local breeds	India	Cattle, camel, goat 4	Development of Biocultural Protocols Capacity development	Planned outputs achieved	closed
Conservation of native cattle breeds, for their present and future use	Mozambique	Cattle 3	Breed characterization	Planned outputs only partly achieved due to social unrest in one region	ongoing
Conserving Muturu cattle in the South Rain Forest Zone	Nigeria	Cattle 1	Establishment of conservation strategy	Planned outputs not yet achieved	ongoing
Phenotypic and molecular characterization of local chicken	Togo	Chicken 1	Breed characterization	Planned outputs achieved	ongoing
Conservation and characterization of Criollo sheep	Uruguay	Sheep 1	Breed characterization Development of conservation plan Creation of database Training and capacity development	Planned outputs achieved	closed

<sup>a</sup>Number of national breed populations are indicated for regional projects.

**Annex 1****Expert meetings contributing to the development of guidelines, manuals and projects**

Meeting	SPA	Date	Location	Countries of participating experts
South Asian regional consultation workshop under the Pastoralist Knowledge Hub	2,4	March 2015	Gujarat, India	Afghanistan, Bangladesh, Bhutan, India, Pakistan, Sri Lanka
AGE Expert consultants meeting on “Application of nuclear and genomic tools for animal selection to improve livestock productivity”	2	April 2015	IAEA Headquarters, Vienna, Austria	Australia, Austria, India, Italy, South Africa, USA
Expert consultation on “Movement and exchange of animal genetic materials and implementation of the Nagoya protocol on ABS in Africa” (organized by AU-IBAR)	4	April 2015	Cotonou, Benin	Cameroon, Benin, Ethiopia, Kenya, Namibia, Germany, Tunisia
Latin American regional consultation workshop under the Pastoralist Knowledge Hub	2,4	May 2015	Santa Cruz de la Sierra, Bolivia	Argentina, Bolivia, Brazil, Paraguay, Peru
European regional consultation workshop under the Pastoralist Knowledge Hub	2,4	June 2015	Koblenz, Germany	Belgium, Bulgaria, Finland, France, Greece, Germany, Italy, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, Spain, United Kingdom



Meeting	SPA	Date	Location	Countries of participating experts
Central Asia regional consultation workshop under the Pastoralist Knowledge Hub	2,4	July 2015	Hustai National Park, Mongolia	China, Kazakhstan, Kyrgyzstan, India, Mongolia, Russian Federation, Tajikistan, Uzbekistan
AGE Research Coordination Meeting on “Genetic variation on the control of resistance to infectious diseases in small ruminants for improving animal productivity”	1	September 2015	IAEA Headquarters, Vienna	Argentina, Austria; Bangladesh, Brazil, Burkina Faso, China, Ethiopia, FAO, Indonesia, Iran, Italy, Kenya (ILRI) Nigeria, Sri Lanka, USA
AGE Regional Coordination Meeting on “Improving the reproductive and productive performance of local small ruminants by implementing reliable artificial insemination programmes”	2	November and December 2015	IAEA Headquarters, Vienna	Jordan, Iraq, Syria
Biodiversity Indicator Partnership (BIP) Technical Partner Meeting	1	January 2016	Cambridge, UK	The Biodiversity Indicators Partnership (BIP) is a global initiative, more than 15 partner organisations participated
North Africa/Near East Regional consultation workshop under the Pastoralist Knowledge Hub	2,4	January 2016	Hammamet, Tunisia	Algeria, Egypt, Iran, Jordan, Mauritania, Morocco, Saudi Arabia, Sudan, Tunisia, Turkey

Meeting	SPA	Date	Location	Countries of participating experts
Eastern/Southern Africa regional consultation workshop under the Pastoralist Knowledge Hub	2,4	January 2016	Lukenya, Kenya	Ethiopia, Kenya, Namibia, Somalia, South Africa, South Sudan, Tanzania, and Uganda
Expert meeting on guidelines related to development and strengthening of small-scale producers' livestock value chains and value addition to livestock products	2,4	February-2016	Zaragoza, Spain	Belgium, France, Germany, India, Italia, Kenya, Mexico, Morocco, Spain, The Netherlands, Tunisia
AGE Regional coordination meeting on "Decreasing the Parasite Infestation Rate of Sheep through breeding for enhanced host genetic resistance"	2	February-March 2016	Buenos Aires, Argentina	Argentina, Uruguay, Brazil, Bolivia, Costa Rica, Cuba, Dominican Republic, Mexico, Paraguay, Peru,
AGE Consultants' meeting on "New approaches and applications of radiation hybrid mapping for development of animal genetic tools in the genomic era"	1	May 2016	IAEA Headquarters, Vienna	Austria, Brazil, China, France, Italy, United Kingdom

**Annex 2****Regional workshops for National Coordinators for the Management of Animal Genetic Resources**

Title of workshop	SPA	Dates	Location	List of countries participating
2nd Workshop of Asian National Coordinators for Animal Genetic Resources (organized by Thailand)	4	November 2014	Bangkok, Thailand	Bangladesh, Indonesia, Nepal, Philippines, Republic of Korea, Thailand and Viet Nam
Sub-Regional Meeting on the Management and Conservation of Animal Genetic Resources in 5 SEC Countries	3,4	March 2015	Istanbul, Turkey	Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, and Turkey
International Symposium on “Animal Identification and Recording Systems for Traceability and Livestock Development in Sub-Saharan Africa”	2	April 2015	Pretoria, South Africa	30 countries, mostly African countries
Meeting of ERF Working Group Information and Documentation	1	May 2015	Ljubljana, Slovenia	Bulgaria, Croatia, Germany, Greece, Italy, Montenegro, Netherlands, Poland, Slovakia, Slovenia, Spain, Sweden, Turkey
European Regional Focal Point Meeting (organized by ERF)	4	August 2015	Krakow, Poland	Albania, Austria, Bulgaria, Bosnia & Herzegovina, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Macedonia, Montenegro, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, UK
Regional Focal Point Meeting for LAC (organized by RFP-LAC and FAO)	4	March, 2016	Havana, Cuba	Argentina, Bolivia, Brazil, Chile, Costa Rica, Cuba, Dominican Republic, Ecuador, Guatemala, Mexico, Peru, Suriname, Uruguay

Title of workshop	SPA	Dates	Location	List of countries participating
Meeting of ERF Working Group on <i>ex situ</i> conservation (co-organized with ERF)	3	April 2016	Gödöllo, Hungary	Albania, Austria, Croatia, Denmark, France, Germany, Hungary, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey
FAO workshop on in situ <i>ex situ</i> gene conservation (co-organized with ERF, back-to-back with the event listed above)	3	April 2016	Gödöllo, Hungary	Albania, Austria, Croatia, Denmark, France, Gambia, Georgia, Germany, Hungary, Islamic Republic Of Iran, Kosovo, Latvia, Lithuania, Macedonia, Montenegro, Netherlands, Norway, Poland, Portugal, Republic Of Moldova, Russian Federation, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine

**Annex 3****Technical training**

Training	Date	Location	List of countries participating
AGE National training course on Application of immunoassay techniques for reproductive hormone analyses in ruminants	November 2014	Bangkok, Thailand	10 participants from Thailand, two lecturers, each one from Indonesia and Sri Lanka.
AGE National training course on artificial insemination in small ruminants	January 2015	Ouagadougou, Burkina Faso	15 participants from Burkina Faso and one lecturer from Tunisia
AGE Regional training course on artificial insemination in sheep and goats	June 2015	Sassari, Italy	Iraq and Jordan
AGE national training on course on artificial insemination in small ruminants	June 2015	Amman, Jordan	Jordan
4th African Goat Improvement Network Workshop	February 2016	Rome, Italy	(Co-funding by USDA) Austria, China, Egypt, Ethiopia, France, Italy, Kenya, Madagascar, Malawi, Mozambique, South Africa, Sudan, Uganda, United Kingdom, United States of America, United Republic of Tanzania and Zimbabwe
AGE Inter-regional training course on analysis of nuclear and molecular genetic data for enhanced host resistance to gastro-intestinal parasites in sheep and goats. (age-iaea tc)	July 2016	IAEA Laboratory, Seibersdorf, Austria	10 participants from Asia and Africa

## Annex 4

### Publications since the Eighth session of the Working Group

#### *FAO documents<sup>61</sup>*

**FAO.** 2015. The Second Report on the State of the World's Animal Genetic Resources for Food and Agriculture, edited by B.D. Scherf & D. Pilling. FAO Commission on Genetic Resources for Food and Agriculture Assessments. Rome (available at <http://www.fao.org/3/a-i4787e/index.html>).

**FAO.** 2015. The Second Report on the State of the World's Animal Genetic Resources for Food and Agriculture – in brief. FAO Commission on Genetic Resources for Food and Agriculture Assessments. Rome (available at <http://www.fao.org/3/a-i5077e.pdf>).

**FAO.** 2015. Voluntary Guidelines to Support the Integration of Genetic Diversity into National Climate Change Adaptation Planning. Commission on Genetic Resources for Food and Agriculture. Rome (available at <http://www.fao.org/3/a-i4940e.pdf>).

**FAO.** 2015. Coping with Climate Change – The Roles of Genetic Resources for Food and Agriculture. Commission on Genetic Resources for Food and Agriculture. Rome (available at <http://www.fao.org/3/a-i3866e.pdf>).

**FAO.** 2016. Development of integrated multipurpose animal recording systems. FAO Animal Production and Health Guidelines. No. 19. Rome (available at <http://www.fao.org/3/a-i5702e.pdf>).

#### *Additional language versions of previously published documents*

**FAO.** 2015. Developing the institutional framework for the management of animal genetic resources. FAO Animal Production and Health Guidelines. No. 6. Rome. (available in Russian at <http://www.fao.org/3/3574df58-8b3a-47aa-a7a4-679ecfd66fce/BA0054R.pdf>).

#### *Scientific and technical papers and contributions to conferences*

### 2014

**Ajmone Marsan, P., Han, J.L., Achilli, A., Lancioni, H., Colli, L., Joost, S., Crepaldi, P., Pilla, F., Stella, A., Taberlet, P., Boettcher, P., Negrini, R., Lenstra, J.A. & the Italian Goat, Econogene & Globaldiv Consortia.** 2014. The characterization of goat genetic diversity: towards a genomic approach. *Small Ruminant Research*, 121:58-72.

**Boettcher, P.** 2014. Global climate change and the role of livestock. METHAGENE Training School on “Methane physiology for geneticists”, Dummerstorf, Germany. 30 September -2 October.

**Du, X., Servin, B., Womack, J.E., Cao, J., Yu, M., Dong, Y., Wang, W. & Zhao, S.** 2014. An update of the goat genome assembly using dense radiation hybrid maps allows detailed analysis of evolutionary rearrangements in Bovidae. *BMC Genomics*, 15: 625.

**Hussain, T., Periasamy, K., Nadeem, A., Babar, M.E., Pichler, R. & Diallo, A.** 2014. Sympatric species distribution, genetic diversity and population structure of Haemonchus isolates form domestic ruminants in Pakistan. *Veterinary Parasitology*, 206: 188-199

**Periasamy, K., Pichler, R., Poli, M., Cristel, S., Cetrá, B., Medus, D., Basar, M.A.K.T, Ramasamy, S., Ellahi, M.B., Mohammed, F., Teneva, A., Shamsuddin, M., Podesta, M.G. & Diallo, A.** 2014. Candidate gene approach for parasite resistance in sheep--variation in immune pathway genes and association with fecal egg count. *PLoS One*, 9: e88337.

<sup>61</sup> [http://www.fao.org/ag/againfo/resources/en/pubs\\_gen.html](http://www.fao.org/ag/againfo/resources/en/pubs_gen.html).

Vahidi, S.M., Tarang, A.R., Naqvi, A.U., Falahati Anbaran, M., Boettcher, P., Joost, S., Colli, L., Garcia, J.F. & Ajmone-Marsan, P. 2014. Investigation of the genetic diversity of domestic *Capra hircus* breeds reared within an early goat domestication area in Iran. *Genetics Selection Evolution*, 46:27.

Tittensor, D.P., Walpole, M., Hill, S.L.L., Boyce, D.G., Britten, G.L., Burgess, N.D., Butchart, S.H.M., Leadley, P.W., Regan, E.C., Alkemade, R., Baumung, R., Bellard, C., Bouwman, L., Bowles-Newark, N.J., Chenery, A.M., Cheung, W.W.L., Christensen, V., Cooper, H.D., Crowther, A.R., Dixon, M.J.R., Galli, A., Gaveau, V., Gregory, R.D., Gutierrez, N.L., Hirsch, T.L., Höft, R., Januchowski-Hartley, S.R., Karmann, M., Krug, C.B., Leverington, F.J., Loh, J., Lojenga, R.K., Malsch, K., Marques, A., Morgan, D.H.W., Mumby, P.J., Newbold, T., Noonan-Mooney, K., Pagad, S.N., Parks, B.C., Pereira, H.M., Robertson, T., Rondinini, C., Santini, L., Scharlemann, J.P.W., Schindler, S., Sumaila, U.R., The, L.S.L., van Kolck, J., Visconti, P., Ye, Y. 2014. A mid-term analysis of progress towards international biodiversity targets. *Science*, 346:241-424. doi: 10.1126/science.1257484.

## 2015

Baumung, R., Farkas, J., Boichard, D., Mészáros, G., Sölkner, J. & Curik, I. 2015. GRAIN: a computer program to calculate ancestral and partial inbreeding coefficients using a gene dropping approach. *Journal of Animal Breeding and Genetics*, 132:100-108. doi: 10.1111/jbg.12145.

Biscarini F, Nicolazzi EL, Stella A, Boettcher PJ, Gandini G. 2015. Challenges and opportunities in genetic improvement of local livestock breeds. *Frontiers in Genetics*, 6:33. doi: 10.3389/fgene.2015.00033.

Boettcher, P.J., Hoffmann, I., Baumung, R., Drucker, A.G., McManus, C., Berg, P., Stella, A., Nilsen, L.B., Moran, D., Naves, M. & Thompson, M.C. 2015. Genetic resources and genomics for adaptation of livestock to climate change. *Frontiers in Genetics*, 5:461. doi: 10.3389/fgene.2014.00461.2016.

Bruford, M.W., Ginja, C., Hoffmann, I., Joost, S., Orozco-terWengel, P., Alberto, F.J., Amaral, A.J., Barbato, M., Biscarini, F., Colli, L., Costa, M., Curik, I., Duruz, S., Ferenčaković, M., Fischer, D., Fitak, R., Groeneveld, L.F., Hall, S.J., Hanotte, O., Hassan, F.U., Helsen, P., Iacolina, L., Kantanen, J., Leempoel, K., Lenstra, J.A., Ajmone-Marsan, P., Masembe, C., Megens, H.J., Miele, M., Neuditschko, M., Nicolazzi, E.L., Pompanon, F., Roosen, J., Sevane, N., Smetko, A., Štambuk, A., Streeter, I., Stucki, S., Supakorn, C., Telo Da Gama, L., Tixier-Boichard, M., Wegmann, D. & Zhan, X. 2015. Prospects and challenges for the conservation of farm animal genomic resources, 2015-2025. *Frontiers in Genetics*, 6:314. doi: 10.3389/fgene.2015.00314.

Eynard, S.E., Windig, J.J., Leroy, G., van Binsbergen, R. & Calus, M.P.. 2015. The effect of rare alleles on estimated genomic relationships from whole genome sequence data. *BMC Genetics*, 16:24. doi: 10.1186/s12863-015-0185-0.

Hoffmann, I., Boettcher, P. & Leroy, G. 2015. Adaptive genetics and climate change in the livestock sector. Invited paper, 61th Annual Meeting of the Brazilian Society of Genetics, Aguas di Lindoia, Brazil. 8-11 September.

Leroy, G., Scherf, B., Hoffmann, I., Boettcher, P., Pilling, D., Baumung, R. 2015 Cross-breeding in developing countries: extent, constraints and opportunities. 66th EAAP Annual Meeting, Warsaw, Poland.

Leroy, G., Danchin-Burge, C., Palhière, I., SanCristobal, M., Nédélec, Y., Verrier E. & Rognon, X. 2015. How do introgression events shape the partitioning of diversity among breeds: a case study in sheep. *Genetics Selection Evolution*, 47:48. doi: 10.1186/s12711-015-0131-7.

Leroy, G., Phocas, F., Hedan, B., Verrier, E. & Rognon, X. 2015. Inbreeding impact on litter size and survival in selected canine breeds. *Veterinary Journal*, 203:74-8. doi: 10.1016/j.tvjl.2014.11.008.

- Mishra, B.P., Dubey, P.K., Prakash, B. Kathiravan, P., Goyal, S. Sadana, D.K., Das, G.C. Goswami, R.N., Bhasin, V., Joshi, B.K. & Kataria, R. S.** 2015. Genetic analysis of river, swamp and hybrid buffaloes of North East India throw new light on phylogeography of water buffalo (*Bubalus bubalis*). *Journal of Animal Breeding and Genetics*, 132: 454-66.
- Mueller, J.P., Rischkowsky, B., Haile, A., Philipsson, J., Mwai, O., Besbes, B., Valle Zárate, A., Tibbo, M., Mirkena, T., Duguma, G., Sölkner, J. & Wurzinger, M.** 2015. Community-based livestock breeding programmes: essentials and examples. *Journal of Animal Breeding and Genetics*, 132:155-68. doi: 10.1111/jbg.12136.
- Periasamy, P.** 2015. Genomics and breeding for food security in developing countries (Asia and Africa). International symposium on animal functional genomics, Piacenza, Italy, 27-29 July.
- Scherf, B, Pilling, D., Hoffmann, I., Besbes, B., Boettcher, P., Leroy, G., Baumung, R.** 2015 Gene banks for *ex situ* conservation of animal genetic resources – a global view. 66th EAAP Annual Meeting, Warsaw, Poland.
- Scherf, B, Baumung, R.** 2015 Monitoring the implementation of the Global Plan of Action for Animal Genetic Resources, Biodiversity, 16: 149-156. doi: 10.1080/14888386.2015.1075901.
- Smetko, A., Soudre, A., Silbermayr, K., Müller, S., Brem, G., Hanotte, O., Boettcher, P.J., Stella A., Mészáros, G., Wurzinger, M., Curik, I., Müller, M., Burgstaller, J. & Sölkner, J.** 2015. Trypanosomosis: potential driver of selection in African cattle. *Frontiers in Genetics*, 6:137. doi: 10.3389/fgene.2015.00137.
- Teneva, V. Gerzilov, M. Lalev, H. Lukanov, N. Mincheva, M. Oblakova, P. Petrov, P. Hristakieva, I. Dimitrova & Periasamy, K.** 2015. Current status and phenotypic characteristics of Bulgarian poultry genetic resources. *Animal Genetic Resources*, 56: 19-28.

## 2016

- Leroy, G., Baumung, R., Boettcher, P., Scherf, B. & Hoffmann, I.** 2016. Review: Sustainability of crossbreeding in developing countries; definitely not like crossing a meadow. *Animal*, 10:262-73. doi: 10.1017/S175173111500213X.
- Leroy, G., Besbes, B., Boettcher, P., Hoffmann, I., Capitan, A. & Baumung, R.** 2016. Rare phenotypes in domestic animals: unique resources for multiple applications. *Animal Genetics*, (in press) doi: 10.1111/age.12393.
- Leroy, G., Besbes, B., Boettcher, P., Hoffmann, I., Pilling, D., Baumung, R. & Scherf, B.** 2016. Factors and determinants of animal genetic resources management activities across the world. *Livestock Science* (accepted).
- Jawasreh, K. Boettcher, P.J. & Stella, A.** 2016. Genome-wide association scan suggests basis for microtia in Awassi sheep. *Animal Genetics*, (in press). doi: 10.1111/age.12431.
- Vahidi, S.M.F., Faruque, O. Falahati Anbaran, F., Afraz, F., Mousavi, S.M., Boettcher, P., Joost, S., Han, J.L., Colli, L., Periasamy, K., Negrini, R. & P. Ajmone-Marsan.** 2016. Multilocus genotypic data reveal high genetic diversity and low population genetic structure of Iranian indigenous sheep. *Animal Genetics* (in press).

## Book chapters

- Shamsuddin, M., Garcia-Podesta, M.** 2015. Dairy production in diverse regions: Southern Asia. Reference Module in Food Sciences. Elsevier, pp. 1–7. doi: <http://dx.doi.org/10.1016/B978-0-08-100596-5.00715-0>. (ISBN: 978-0-081-005965).