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COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE

Item 3.2 of the Provisional Agenda

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

Eleventh Session

19 – 21 May 2021

GENOMIC CHARACTERIZATION OF ANIMAL GENETIC RESOURCES FOR FOOD AND AGRICULTURE

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I. BACKGROUND

1. The Commission on Genetic Resources for Food and Agriculture (Commission), at its Thirteen Regular Session,[1] endorsed the *FAO guidelines – Molecular genetic characterization of Animal Genetic Resources*,[2] which were published in 2011. The guidelines (i) outline the rationale for undertaking characterization of animal genetic resources, including molecular genetic characterization; (ii) describe the strategic choices to be made in planning molecular genetic characterization studies; (iii) provide explanations and recommendations on the steps to take while performing such studies, including animal sampling, genotyping and data analysis, highlighting potential pitfalls; and (iv) encourage standardization of data and integration of national studies into international analyses. The guidelines underline the need for their future refinement and periodic updating as experience with their use in the field is accumulated and as technologies for molecular characterization advance.

2. At its Seventeenth Regular Session, the Commission requested FAO to continue developing and updating guidelines to facilitate the application of new scientific discoveries related to the identification, characterization and conservation of animal genetic resources.[3] It further requested FAO to strengthen partnerships with stakeholders and donors to continue technical and policy support for country implementation of the Global Plan of Action for Animal Genetic Resources.[4]

3. Biotechnologies for the sustainable use and conservation of genetic resources for food and agriculture have advanced substantially in recent years.[5] In few fields has this development been more fast-paced or impactful than in genomics - the study of genes and their functions, and related characterization techniques.[6] Scientific developments such as whole-genome sequencing have led to greatly decreased costs per unit of genetic information that can be obtained from a single assay. Knowledge of the biology underlying phenotypes has increased as well, as a result. To help countries to benefit from these technological advancements, FAO has developed new draft guidelines on genomic characterization, which are given in the document *Genomic characterization of animal genetic resources – Draft updated technical guidelines*.[7] The guidelines are intended to update and supersede the *FAO guidelines – Molecular genetic characterization of animal genetic resources*.

4. The draft guidelines have been prepared in cooperation with the International Society of Animal Genetics (ISAG) – FAO Advisory Group on Animal Genetic Diversity (Advisory Group). ISAG is a scientific organization that focuses on basic and applied research on molecular genetics in domesticated animals.[8] FAO and ISAG have a longstanding history of collaboration. Members of the Advisory Group have in the past served as editors and/or contributors to the previous guidelines, as well as the *Secondary Guidelines - Measurement of Domestic Animal Diversity (MoDAD): Recommended Microsatellite Markers*,[9] which were published in 2004. Advisory Group members and other international experts contributed to the development of the draft updated technical guidelines.

5. The draft updated technical guidelines were developed based on previous guidelines and were designed to inform readers on how to undertake from start to finish a genomic characterization study on animal genetic resources. They explain different approaches for genomic analysis and consider different study objectives. The guidelines address: (i) the rationale for genomic characterization of animal genetic resources; (ii) the basics of carrying out molecular genetic studies; (iii) genomic tools and methods; (iv) assessment of genomic variation within-populations; and (v) general recommendations.

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[1] CGRFA-13/11/Report, paragraph 79.
[2] http://www.fao.org/3/i2413e/i2413e00.pdf
[3] CGRFA-17/19/Report, paragraph 84.
[4] CGRFA-17/19/Report, paragraph 86.
[5] CGRFA/WG-AnGR-11/21/8; CGRFA/WG-AnGR-11/21/Inf.11.
[6] https://www.who.int/genomics/geneticsVSgenomics/en/
[7] CGRFA/WG-AnGR-11/21/Inf.5.
[8] https://www.isag.us/
[9] http://www.fao.org/3/aq569e/aq569e.pdf

6. Assessment of genomic variation within-populations is important; maintenance of genetic diversity within species is referred to among the *Proposed Headline Indicators for the Post-2020 Global Biodiversity Framework of the Convention on Biological Diversity*.[10] For livestock species, monitoring the number of breeds and their risk of extinction contributes to the knowledge of genetic diversity, because both (i) increased numbers of breeds, and (ii) larger population sizes are associated with greater genetic diversity, but these metrics do not fully account for within-breed genetic diversity. Parameters such as "effective population size" do address within-breed diversity and can be calculated by utilizing genomics or demographic data and thus could complement breed population size as an indicator of genetic diversity. Various approaches to estimate these parameters exist, however, no consensus has been reached on the most appropriate approach. Moreover, the feasibility for countries to obtain the data to calculate the parameters is unknown. Research is required to assess the questions regarding the appropriateness of estimators and practicality of application within countries.

II. GUIDANCE SOUGHT

7. The Working Group may wish to:

(i) review the document *Genomic characterization of animal genetic resources – Draft updated technical guidelines*;

(ii) recommend that the Commission initiate an informal consultative process to allow Members and observers to provide detailed comments on and inputs to the document; and

(iii) recommend that the informal consultative process include:

- the possibility for Members and observers to provide comments and inputs in writing; and
- an informal online consultation to take place well in advance of the next session of the Working Group for Members and observers of the Working Group to review the consolidated document for consideration by the Working Group and the Commission.

8. The Working Group may further wish to recommend that the Commission:

- request FAO to undertake, subject to availability of financial resources, a feasibility study on the availability of, access to, and optimal use of genomic and/or breed demographic data to estimate parameters that may be suitable to complement breed population size data as indicators for monitoring the genetic diversity within livestock breeds;
- request FAO, in partnership with stakeholders and donors, to provide technical support to countries in the development and implementation of studies for genomic characterization and monitoring of animal genetic resources for food and agriculture; and
- request FAO to continue developing and updating guidelines and other technical documents to support implementation of the Global Plan of Action for Animal Genetic Resources.

[10] CBD/SBSTTA/24/3, Annex I, Goal A.; CBD/SBSTTA/24/3/Add.2, paragraphs 29-33.