



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 7.2 of the Provisional Agenda

### Twentieth Regular Session

Rome, 24–28 March 2025

## DETAILED REPORT ON THE DEVELOPMENT OF THE DOMESTIC ANIMAL DIVERSITY INFORMATION SYSTEM

### TABLE OF CONTENTS

|  | Page |
|--|------|
| I. Introduction.....                                       | 2    |
| II. Development of the information system.....             | 3    |
| III. Activities related to SDG indicator 2.5.2.....        | 5    |
| IV. Technical support to countries to fill data gaps ..... | 5    |
| V. Conclusions.....  | 7    |

## I. INTRODUCTION

The Domestic Animal Diversity Information System (DAD-IS) was established in 1996 as the tool for the recording of information on the world's livestock breeds, and is used as the primary source of data for monitoring the status of the global diversity of animal genetic resources for food and agriculture. DAD-IS is also the source of the data used for calculating Indicators 2.5.1b<sup>1</sup> and 2.5.2<sup>2</sup> of Target 2.5 of the Sustainable Development Goals (SDGs).<sup>3</sup> The Commission on Genetic Resources for Food and Agriculture (Commission), at its Nineteenth Regular Session,<sup>4</sup> stressed once again the importance of DAD-IS as the international clearing-house mechanism for animal genetic resources.

At its Nineteenth Regular Session, the Commission requested FAO to further maintain and develop DAD-IS, and to continue to increase its user friendliness, including through the development of tools that facilitate data entry, export and updating, and storage and visualization of the geographic distributions of national breed populations, and to consider the inclusion of additional data fields, including for digital object identifier (DOI) or PubMed ID records, which would increase the visibility and use of DAD-IS.<sup>5</sup> Moreover, it recommended that the FAO Council request FAO to propose data fields related to genomic, pedigree and/or demographic indicators of within-population genetic diversity for DAD-IS, and that countries and FAO continue working on the interoperability of DAD-IS with existing regional data information systems to avoid duplication of efforts.

It noted the need for countries and FAO to raise the awareness of the United Nations Statistical Commission on the need to broaden the scope of SDG Indicator 2.5.2 to include all breeds registered in DAD-IS and thus account for the entire spectrum of animal genetic resources.<sup>6</sup>

The Commission also recommended that the FAO Council request FAO to explore cost-efficient approaches to data collection for SDG Indicator 2.4.1, and to continue developing and/or refining cost-efficient methodologies for estimating the sizes of national breed populations and providing technical support to countries with the estimation of breed population sizes and other data relevant to monitoring the diversity of livestock breeds and managed bee populations.

This document provides a detailed summary of FAO's activities related to DAD-IS since the Commission's Nineteenth Regular Session in 2023. The activities described are grouped into three major topics: (i) development of the information system; (ii) activities undertaken related to SDG Indicators 2.4.1 and 2.5.2; and (iii) technical support to countries to fill data gaps. More detailed information on the content of DAD-IS is provided in the information document *Status and trends of animal genetic resources – 2024*.<sup>7</sup>

---

<sup>1</sup> <http://www.fao.org/sustainable-development-goals/indicators/251b>

<sup>2</sup> <http://www.fao.org/sustainable-development-goals/indicators/252>

<sup>3</sup> <https://sdgs.un.org/goals>

<sup>4</sup> CGRFA-19/23/Report, paragraph 100.

<sup>5</sup> CGRFA-19/23/Report, paragraph 101.

<sup>6</sup> CGRFA-19/23/Report, paragraph 102.

<sup>7</sup> CGRFA-20/25/7.2/Inf.2.

## II. DEVELOPMENT OF THE INFORMATION SYSTEM

FAO continued during the reporting period to further develop DAD-IS with Regular Programme resources. These activities included (i) development of DAD-IS tools for entering, storing and visualizing data related to the geographic distribution of breeds within and among countries, (ii) general improvements to the user friendliness of the system, and (iii) introduction of new data fields, and (iv) improved interoperability.

### a. Geographic distributions of breeds

The DAD-IS tools for geographic breed distribution comprise (i) a visualization tool and (ii) a data-entry module.<sup>8</sup> The visualization tool has been developed to allow users to observe the locations of domesticated animal species and breeds around the world. Population data present in the DAD-IS database, such as breeds' occurrence at subnational level or across countries, and their respective population numbers and density, can be displayed on a map of the world or of any specific smaller region. By making use of various "layers" of information already existing in the underlying geographical information system, such as information related to altitude, climate or disease outbreaks, it is possible to show the relationship between breeds and aspects of the production environments they live in. The tool makes use of layers found in different catalogues in the *FAO Hand-in-Hand Geospatial Platform*,<sup>9</sup> including DAD-IS breeds and species, Landcover/Use, Climate, Topography, and Boundaries/Backgrounds. A test version of the tool was developed with breed distribution data kindly provided by France, Serbia and Spain. The test version was made available to all National Coordinators for the Management of Animal Genetic Resources (NCs-AnGR) in December 2023 and the feedback received by February 2024 was taken into account when finalizing the tool. Several NCs-AnGR provided additional data for the new tool before its publication. As of July 2024, 17 countries had provided geographic distribution data for at least one of their national breed populations. Figure 1 provides an example a screenshot showing the distribution and population density of the Cheviot sheep breed in Norway.

Figure 1: Geographic distribution and population density of Cheviot sheep in Norway



Source: <https://data.apps.fao.org/dad-is/?lang=en&hideFeedback=1&hideStory=1>

Notes: The boundaries and names shown and the designations used on these map(s) do not imply the expression of any opinion whatsoever on the part of FAO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers and boundaries. Dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

<sup>8</sup> <https://www.fao.org/dad-is/data-export-bees/en/>

<sup>9</sup> FAO. 2024. *FAO Hand-in-Hand Geospatial Platform*. [Cited 21 June 2024]. [www.fao.org/hih-geospatial-platform](http://www.fao.org/hih-geospatial-platform)

The associated data-entry module allows NCs-AnGR to select the administrative units within the country where a breed is present. The NCs-AnGR can choose to indicate only the presence of a breed in the respective administrative units or to provide more detailed information, such as the number of populations and population density. The system also has an option for a bulk upload. In this case, Global Positioning System (GPS) coordinates (longitude and latitude) can also be provided, as the tool has a built-in algorithm that assigns the appropriate administrative units based on the GPS coordinates. Manuals explaining how to use the visualization tool and how to enter data are currently in preparation.

*b. Increased user-friendliness*

In terms of improving the general user friendliness of DAD-IS, the focus was on data input by NCs-AnGR. This work included the expansion of options for bulk uploading of breed data. DAD-IS has allowed the bulk-upload of population size for several years. However, as described above, the capability for bulk upload for geographical distribution was introduced during the reporting period. In addition, DAD-IS now also allows the bulk upload of information for (i) performance data, (ii) breeding programmes and (iii) breed uses and ecosystem services. To help ensure data quality, a system has been introduced that alerts NCs-AnGR to unexpected population dynamics, such as an extreme increase or decrease in the number of animals from one reporting year to the next or the reappearance of animals after the breed has been reported as extinct. These warnings allow NCs-AnGR to validate the data entered and provide a textual explanation for unusual population dynamics, thus reducing errors caused by typos and increasing overall data quality and information content.

Finally, the Chinese version of the system was tested and completed with the support of the Chinese Academy of Agricultural Sciences, Institute of Apicultural Research. In addition, potentially better solutions for the automatic translation of DAD-IS content were tested. Four translation services, namely Adaptive Translation, AutoML Translation, Neural Machine Translation (NMT) Large Language Model (LLM) Translation, were compared, and their performance evaluated with the help of native speakers. The tests involved translating various texts and assessing the quality of translations for accuracy and fluency. As no clear performance advantages were observed among the services, the decision was made to use NMT because of its cost-effectiveness. Additionally, NMT can handle all six FAO languages.

*c. New data fields*

During its Twelfth Session, the International Technical Working Group on Animal Genetic Resources for Food and Agriculture (ITWG-AnGR) recommended that FAO extract from DAD-IS the data relevant for the country-reporting questionnaire for the preparation of the *Third Report on the State of the World's Animal Genetic Resources for Food and Agriculture* (Third Report). The ITWG-AnGR also recommended that new data fields relevant to the questionnaire be added to DAD-IS. As a result of this request, new data fields were created to enable the provision of more detailed information on breeding programmes, in particular to provide information on the elements of breeding programmes implemented in each country and the breeding methods used.

With regard to the Commission's request to add data fields for information sources, including for DOI or PubMed ID records, this feature was in fact already available in DAD-IS. Action was therefore taken to improve awareness by increasing the visibility of breed-specific publications. This was done by amending the Data Export tool of DAD-IS to allow the export of a specific category of information corresponding to publications provided by NCs-AnGR about the respective breed.

To address the request for data fields describing within-population genetic diversity, fields were created for estimates of effective population sizes based on geographic, genomic or pedigree data for specific years. The fields selected were based on the recommendations presented in the document *Methods for estimation of within-population genetic variation*.<sup>10</sup> The data can be downloaded with the

---

<sup>10</sup> CGRFA-19/23/10.2/Inf.4.

DAD-IS data export tool<sup>11</sup> by choosing the option “Effective population size” under the “Type of data” category.

#### *d. Improved interoperability*

FAO continued working on the interoperability of DAD-IS with existing regional data information systems such as the Animal Germplasm Resources Information Network (A-GRIN)<sup>12</sup> and the Online Mendelian Inheritance in Animals database (OMIA)<sup>13</sup> and collaborated with the ad hoc task force on “Improving interoperability of the databases used in AnGR management”<sup>14</sup> of the European Regional Focal Point for Animal Genetic Resources (ERFP)<sup>15</sup>. FAO was not approached by any other database owner to establish the interoperability between the systems.

The interoperability of DAD-IS was exploited to develop a new tool that enables the uploading of breed images by using the dynamic DAD-IS breed list.<sup>16</sup> The images can be saved after a user selects a specific country and breed name. Furthermore, when a breed name is changed in DAD-IS, this change is automatically transferred to the image collection tool. In May 2024, NCs-AnGR were asked to provide images of cattle breeds in a password-protected area. Images can also be provided without a password by people who are not NCs-AnGR. However, such images will require eventual validation by the corresponding NC-AnGR to ensure that they truly depict the specified breed. The collection of images is intended to be used for an image recognition software application that will support the identification of breeds in the field and potentially allow enumerators to collect breed-related data, such as those required for SDG Indicators 2.4.1 or 2.5.2. The pilot version of the app will initially focus on cattle breeds.

### **III. ACTIVITIES RELATED TO SDG INDICATOR 2.5.2**

The Secretariat of the ITWG-AnGR and the FAO Statistics Division, which oversees the development and validation of SDG indicators under FAO custodianship, prepared a document proposing the broadening of SDG Indicator 2.5.2 to include all breeds registered in DAD-IS. This document was shared with the Inter-agency and Expert Group on SDG Indicators (IAEG-SDG),<sup>17</sup> the body created by the United Nations Statistical Commission to develop and implement the global indicator framework for the goals and targets of the 2030 Agenda for Sustainable Development.

The document proposed that the core methodology for calculating SDG Indicator 2.5.2 should remain unchanged but that the proportion of breeds at risk of extinction among all breeds with known risk status should be reported separately for local and transboundary breeds. For transboundary breeds, the risk status would be calculated at the global level only and then used for reporting at national level for all countries in which the breed population is updated. The global risk status is based on the total population size, i.e. the sum of all the national breed populations of the respective transboundary breed. Therefore, a breed with a small national population size in a particular country but a sufficiently large number of animals at global level will not be considered at risk in the respective country. Upon approval by the IAEG-SDG, the DAD-IS visualization tools and data export tools for this indicator will be adjusted accordingly.

### **IV. TECHNICAL SUPPORT TO COUNTRIES TO FILL DATA GAPS**

Although the country coverage and the frequency of data updates in DAD-IS have improved significantly in recent years, breed-related information still remains far from complete. More details

---

<sup>11</sup> <https://www.fao.org/dad-is/dataexport/en/>

<sup>12</sup> <https://www.ars-grin.gov/>

<sup>13</sup> <https://omia.org/home/>

<sup>14</sup> <https://www.animalgeneticresources.net/index.php/event/improving-interoperability-of-the-databases-used-in-an-gr-management/>

<sup>15</sup> <https://www.animalgeneticresources.net/index.php/about-erfp/>

<sup>16</sup> <https://cattle-image-retrieval-microservice-tzpoevo4wq-ew.a.run.app/>

<sup>17</sup> <https://unstats.un.org/sdgs/iaeg-sdgs/>

are available in the document *Status and Trends of animal genetic resources – 2024*.<sup>18</sup> To help overcome these limitations, FAO has continued to provide technical support to countries based on three pillars: (i) organization of DAD-IS-related training workshops; (ii) provision of simplified procedures and direct support for the uploading of information related to new data fields; and (iii) the preparation of a document providing guidance on the best approaches and methods for collecting or estimating population size data.<sup>19</sup>

To address gaps in knowledge among NCs-AnGR on how to use DAD-IS, FAO continued its series of virtual training workshops in November and December 2023. The November workshops were provided in two sets at different times, one held in English and French during the European morning hours and the other in English and Spanish during the afternoon, thus allowing convenient participation by countries in different time zones and using different languages. The December workshop was national in scope and was organized for local stakeholders by the National Focal Point of South Africa, which invited FAO to provide information and training on DAD-IS.

In 2024, with the generous financial support of the Government of Germany, a series of regional, in-person workshops were held between April and June. The first of these workshops, which took place in Panama, was for the NCs-AnGR from the Americas and was organized in cooperation with FAO regional and country offices. This was followed by a workshop in Cyprus for NCs-AnGR from the Near and Middle East, North Africa, and Europe and the Caucasus regions. This workshop was organized back-to-back with regional working group meetings of the ERFP<sup>20</sup> and a regional conference organized by the European Federation of Animal Science (EAAP).<sup>21</sup> The third workshop, which was held in Kenya, was for African NC-AnGR and was organized in cooperation with the African Union – Interafrican Bureau for Animal Resources (AU-IBAR). The final workshop was for the Asian and Southwest Pacific regions and was organized in Malaysia with the National Department of Veterinary Services and the Malaysian Agricultural Research and Development Institute (MARDI).

The objectives of the in-person workshops held in 2024 were threefold: (i) provision of assistance with the completion of country report questionnaires for the Third Report, (ii) DAD-IS training and capacity development, and (iii) facilitation of discussions related to issues of regional importance. Thanks to these efforts, people from more than 60 countries received in-person training. Six virtual workshops were also held between November 2023 and June 2024 for NCs-AnGR who had been unable to attend any of the in-person meetings or who had further questions.

Prior to the formal launch of the process for the compilation of country report questionnaires for the Third Report in October 2023, all NCs-AnGR were requested via e-mail to update the new data fields on breeding programmes, as well as existing fields on the uses of, and ecosystem services provided by, their national breed populations. To facilitate this activity, each country was provided with a custom-made Microsoft Excel® form listing its specific national breed populations and an extract of data already available in DAD-IS. The NCs-AnGR were further asked to provide written consent allowing FAO to upload the information provided in the form into DAD IS. As of end of August 2023, completed forms had been received from 45 countries (22 from Europe, 8 from Africa, 5 from Latin America, 5 from Asia, and 5 from the Near East), containing information on ecosystem services for 2 758 national breed populations. Individual bilateral follow-up communications with the NCs-AnGR offered ongoing support with the completion of the forms and with the updating of data on population sizes and cryopreservation.

To address the specific problem of the lack of data on breed population sizes, FAO has developed and tested a methodology for the collection and/or estimation of such data. The document *Collection and estimation of population size data for risk classification in DAD-IS – A sampling methodology*<sup>22</sup> was

---

<sup>18</sup> CGRFA/WG-AnGR-12/23/4/Inf.1.

<sup>19</sup> Data document in other docs.

<sup>20</sup> <https://www.animalgeneticresources.net/index.php/about-erfp/events/working-group-meetings/>

<sup>21</sup> <https://regional2024.eaap.org/>

<sup>22</sup> FAO. 2022. *Collection and estimation of population size data for risk classification in DAD-IS – A sampling methodology*. Rome. <https://openknowledge.fao.org/server/api/core/bitstreams/2b567039-786a-4fee-9e2d-490ea71e3535/content>

presented at the Twelfth Session of the ITWG-AnGR and has since been further developed to provide more general guidance on the best methodologies for use in specific national contexts. The new document, *Alternative methods to estimate breed population size in a cost-efficient way: a brief guide*,<sup>23</sup> not only reviews the sampling methodology but also provides an overview of data sources and approaches, experiences from countries offering solutions for filling data gaps, a decision tree to help identify the most appropriate way forward in different contexts, and some information on emerging technologies that could support the collection of livestock data.

## V. CONCLUSIONS

Under the governance of the Commission, and based on suggestions received from NCs-AnGR, DAD-IS has been further developed during the reporting period. Development and improvement of the system is a continuous process. Provided sufficient funding is available, the following main activities are planned for the development and maintenance of DAD-IS in the second half of the current (2024–2025) biennium: (i) routine bug fixing; (ii) development of new user manuals and updating of existing ones; (iii) updating of the tools for SDG Indicator 2.5.2 to include all breeds reported in DAD-IS; (iv) continued collection of breed images for a breed identification tool; and (v) further improvement of the automatic translation of DAD-IS content and the user friendliness of the system.

---

<sup>23</sup> FAO. 2024. *Alternative methods to estimate breed population size in a cost-efficient way: a brief guide*. Rome. <https://openknowledge.fao.org/server/api/core/bitstreams/1d067f4e-6738-4c28-aed9-b02b3346324b/content>