SECTION XX: STATUS AND TRENDS OF ANIMAL GENETIC RESOURCES

1. Introduction

The monitoring system for the implementation of the Global Plan of Action for Animal Genetic Resources (FAO, 2007a) consists of two elements. One line of reporting focuses on the process of implementing the Global Plan of Action (see Part 3 and FAO, 2024a). The other focuses on the animal genetic resources (AnGR) themselves, as the state of these resources constitutes a measurable indicator of the success of the Global Plan of Action (FAO, 2024b).

Data for monitoring the status and trends of AnGR on a worldwide scale are drawn from the Global Databank for Animal Genetic Resources, a database of breed-related data that FAO began to populate in the early 1990s. Since 1995, the Global Databank has formed the backbone of the Domestic Animal Diversity Information System (DAD-IS). Data from the Global Databank were used to prepare three editions of the *World Watch List for Domestic Animal Diversity* (FAO/UNEP, 1993; 1995; 2000), as well as *The State of the World's Animal Genetic Resources for Food and Agriculture* (first SoW-AnGR) (FAO, 2007b) and *The Second Report on the State of the World's Animal Genetic Resources for Food and Agriculture* (FAO, 2015). They have subsequently been used to prepare biennial reports on the status and trends of AnGR (FAO, 2009; 2011; 2013a; 2014; 2016; 2018; 2021; 2023; 2024b).

This section presents a global overview of the diversity and status of AnGR. The analysis is based on DAD-IS data made available by countries by August 2025. It serves as an update of the analyses presented in the first and second SoW-AnGR, which were based on data from 2006[1] and 2014.[2] Box 1B1 outlines changes in the approach to reporting and data analysis that were introduced for the second SoW-AnGR process, and Box 1B2 provides some definitions for the classifications used in this section.

The section begins by describing the state of reporting on AnGR and the progress made in this respect during the period between June 2014 and August 2025. A description of the current regional distribution of livestock species and breeds is then presented, followed by an overview of the risk status and trend in risk status of the world's livestock breeds. Status and trends in cryoconservation of livestock breeds are then described. This chapter concludes with an investigation of thestate of reporting for managed bee populations in DAD-IS.

[1] FAO, 2007a, Part 1 Section B (pages 23–49).
[2] FAO, 2015, Part 1 Section B (pages 25–42).

Box 1B1. Developments since the publication of the first report on The State of the World's Animal Genetic Resources for Food and Agriculture

Following the publication of *The State of the World's Animal Genetic Resources for Food and Agriculture* (first SoW-AnGR) and the adoption of the Global Plan of Action for Animal Genetic Resources in 2007, the Commission on Genetic Resources for Food and Agriculture (in 2009) agreed on a schedule and a format for reporting on the status and trends of animal genetic resources (AnGR). It was agreed that a report would be prepared every two years, based on a template derived from the structure of relevant section of the first SoW-AnGR (Part 1 Section B).

In 2013, the Commission agreed to the use of the following set of indicators:

- the number of locally adapted breeds;
- the proportion of the total population accounted for by locally adapted and exotic breeds; and
- the number of breeds classified as at risk, not at risk and unknown.

Also in 2013, the Commission agreed to additional changes to the framework for global reporting on the status and trends of AnGR. A decision was taken to introduce a ten-year "cut-off point", beyond which a breed is re-assigned to the "unknown" risk-status category if no more recent population data have been reported. Second, it was agreed that trends in breed risk status should be calculated based on the most up-to-date current and historical data available in DAD-IS at the time of calculation, rather than by comparing current data to those presented in older reports. Historical population data recorded in DAD-IS can be updated at any time, as can countries' breed inventories (breed records can be added or deleted).

Box 1B2. Glossary: populations, breeds, breed classification systems and regions

Breed classification related to geographic distribution

National breed population: animal belonging to one specific breed in one specific country

Local breeds: breeds that occur only in one country.

Transboundary breeds: breeds that occur in more than one country.

Regional transboundary breeds: transboundary breeds that occur only in one of the seven SoW-AnGR/DAD-IS regions.

International transboundary breeds: transboundary breeds that occur in more than one SoW-AnGR/DAD-IS region.

Breed classification related to adaptedness

Locally adapted breeds: breeds that have been in the country for a sufficient time to be genetically adapted to one or more of traditional production systems or environments in the country. The phrase "sufficient time" refers to time present in one or more of the country's traditional production systems or environments. Taking cultural, social and genetic aspects into account, a period of 40 years and six generations of the respective species might be considered as a guiding value for "sufficient time", subject to specific national circumstances. Native breeds, also termed "autochthonous" or "indigenous" breeds, form a subset of locally adapted breeds.

Exotic breeds: breeds that are not locally adapted. Exotic breeds comprise both recently introduced breeds and continually imported breeds.

SoW-AnGR/DAD-IS regions

Seven regions were defined for the first SoW-AnGR and consequently used for DAD-IS computations: Africa, Asia, Europe and the Caucasus, Latin America and the Caribbean, the Near and Middle East,

North America and the Southwest Pacific[3]. This classification may slightly differ with the one used in the rest of the report.

2. The state of reporting

Inasmuch as breed population data are provided by individual countries, the fundamental unit upon which analyses of global status and trends are based, is the national breed population. The number of national breed populations recorded in the Global Databank for Animal Genetic Resources increased from 2 719 in 1993 to 5 330 in 1999 and 14 017 in 2006 when the first SoW-AnGR was drafted. By 2014 for the second SoW-AnGR, the total number of entries had risen to 14 869, and in 2025, it increased to 15 715 (Table 1B1). While the number of national breed populations recorded rose sharply during the period preceding the preparation of the first SoW-AnGR, the percentage of breeds for which any population data had been recorded declined. This percentage has improved since 2006 as countries have provided more population datafor the databank (Table 1B1). However, as shown in Figure 1B1, many gaps remain, with the amount of of information varying among regions. Moreover, even where some population data have been reported since 2006, many have not been recently updated (see further discussion below). The national breed inventories recorded in DAD-IS may not be complete. As discussed in Part 3 Section B, many countries have not yet established comprehensive breed inventories at national level, and it is also likely that some formally identified breeds have not been entered into DAD-IS, particularly in the case of species that are not regarded as priorities in the respective countries.

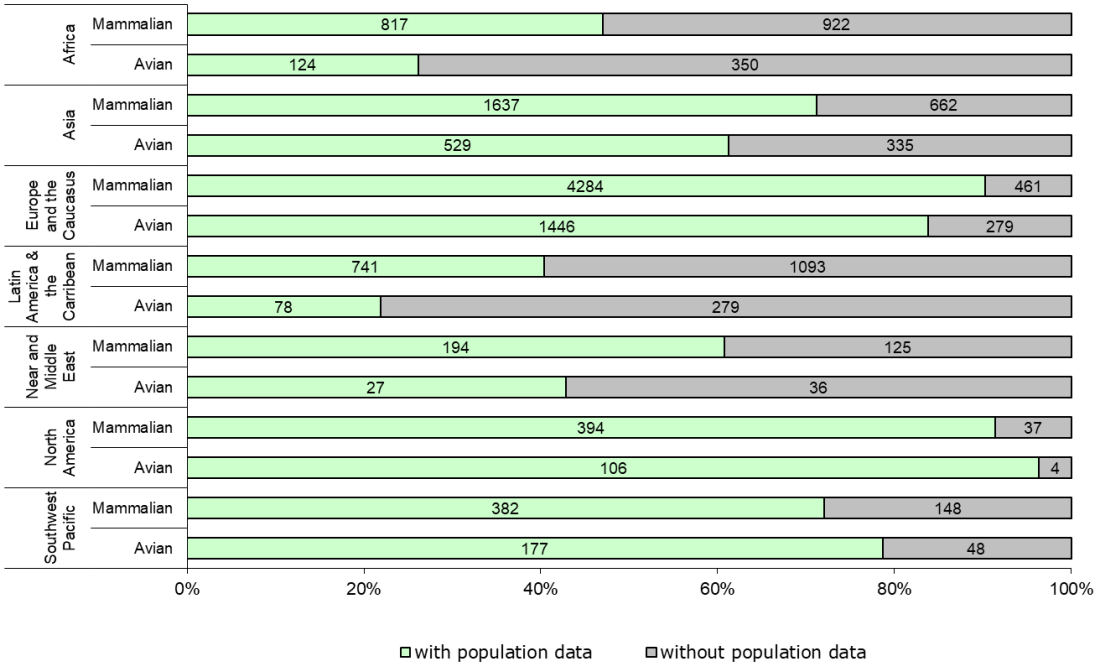
Table 1B1. Status of information recorded in the Global Databank for Animal Genetic Resources

Year of analysis	Mammalian species		Avian species		Countries covered
	Number of national breed populations	% with population data	Number of national breed populations	% with population data	
1993	2719	53	-	-	131
1999	5330	63	1049	77	172
2006	10512	43	3505	39	181
2014	11062	60	3807	56	182
2025	**11897**	**71**	**3818**	**65**	**185**

Note: As of August 2025, no breed data had been recorded in DAD-IS from Andorra, Brunei Darussalam, Liechtenstein, Marshall Islands, Micronesia (Federated States of), Monaco, Nauru, San Marino, Singapore, South Sudan, Timor-Leste, and Western Sahara. "With population data" figures refer to breed populations for which population data have been recorded for any year, even if in the distant past. The ten-year cut-off point (see Box 1B1) is not applied to these figures.
Source: FAO (2015) and DAD-IS (accessed August 2025).

[3] FAO, 2015, Figure 1.

Figure 1B1. Proportion of national breed populations for which population figures have been reported

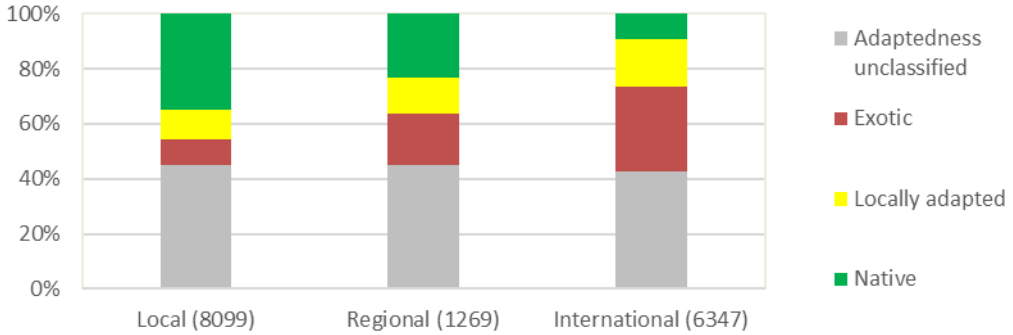


Note: "With population data" figures refer to breed populations for which population data are recorded for any year up to 2025. The ten-year cut-off point (see Box 1B1) is not applied to these figures.
Source: DAD-IS (accessed August 2025).

As of August 2025, 6 921 national breed populations (44 percent) remained unclassified with respect to their adaptedness (locally adapted versus exotic), compared to 12 504 (84 percent) in 2014 (FAO, 2014). Currently, 2 958 national breed populations are classified as exotic (19 percent) versus 5 836 national breed populations (37 percent) as locally adapted., the majority of which are classified as native (3 692 national breed populations, 23 percent of the total).

While the proportion of national breed populations that remain unclassified for adaptedness is relatively stable across local breeds and those linked to regional or international transboundary breeds (Figure 1B2), the proportion classified as native decreases progressively from local to regional and then to international transboundary breeds. Conversely, the proportion classified as exotic increases along the same gradient. Interestingly, 767 national breed populations are simultaneously classified as both local and exotic. This apparent contradiction often stems from the fact that these breeds have not been linked to any recognized transboundary breed, highlighting a gap in reporting. Although the proportion of classified national breed populations has continued to increase over time, the proportion was still considered too small to justify further analysis of national breed populations according to their adaptedness.

Figure 1B2. Repartition of national breed populations in adaptedness and geographic classification



Note: Number of national breed populations in bracket
Source: DAD-IS (accessed August 2025).

3. Species diversity and distribution

DAD-IS records breed-related information on 21 mammalian species, 16 avian species and two fertile interspecies crosses (Bactrian camel × dromedary and duck × Muscovy duck). As was the case when the first two SoW-AnGR were published, five species – cattle, sheep, chickens, goats and pigs (the so-called "big five") – are widely distributed across the world and have particularly large global populations. The first three are the most widely distributed livestock species globally, while the latter two are more heterogeneously distributed (Figure 1B3). The total global population of each of these species increased between 2013 and 2023 (last year available by FAOSTAT), except for pigs. Figures from FAO's statistical database FAOSTAT show an increase of 22 percent in the chicken population, 16 percent in the goat population, 12 percent in the sheep population, 9 percent in the cattle population and a decrease of 2 percent in the pig population over this period. Across all regions, Africa is the only one where the population size increased for each of the big five species.

The world's cattle population reached almost 1.6 billion in 2023. Asia accounts for 29 percent of the total; the largest cattle populations in Asia are found in India and China, together representing about 17 percent of the world total). Latin America accounts for 29 percent of the global cattle population, with the highest number in Brazil, which alone provides 15 percent of the global total. Africa has 23 percent of the world's cattle (largest numbers in Ethiopia and the United Republic of Tanzania), Europe and the Caucasus 8 percent (largest numbers in the Russian Federation and France), North America for 6 percent (largest number in the United States of America), the Near and Middle East for 3 percent (largest numbers in Sudan and Egypt) and the Southwest Pacific for 2 percent (largest number in Australia). The pattern of regional distribution has not changed greatly since 2013. Latin America and the Caribbean and Africa have increased their shares of the world total, while the shares of North America, and Europe and the Caucasus hase declined. In the latter two regions, the cattle population has fallen slightly in absolute terms.

In 2023, the global sheep population exceeded 1.3 billion. As with cattle, Asia accounted for 36 percent of the total—led by China and India. However, distributions across other regions varied substantially when compared to cattle. Africa had the second greatest share of the global population with 29 percent, with the largest numbers in Nigeria and Chad. Europe and the Caucasus made up 13 percent (notably Türkiye and the United Kingdom), the Near and Middle East 9 percent (led by Sudan and Saudi Arabia), and the Southwest Pacific 7 percent (mainly Australia and New Zealand). The Americas have a much smaller proportion of sheep than cattle. Latin America and the Caribbean have 6 percent of the global population (primarily Brazil and Argentina), and North America has only 0.5 percent. Since 2013, Africa and Asia have increased their relative shares, while the Southwest Pacific, Latin America,

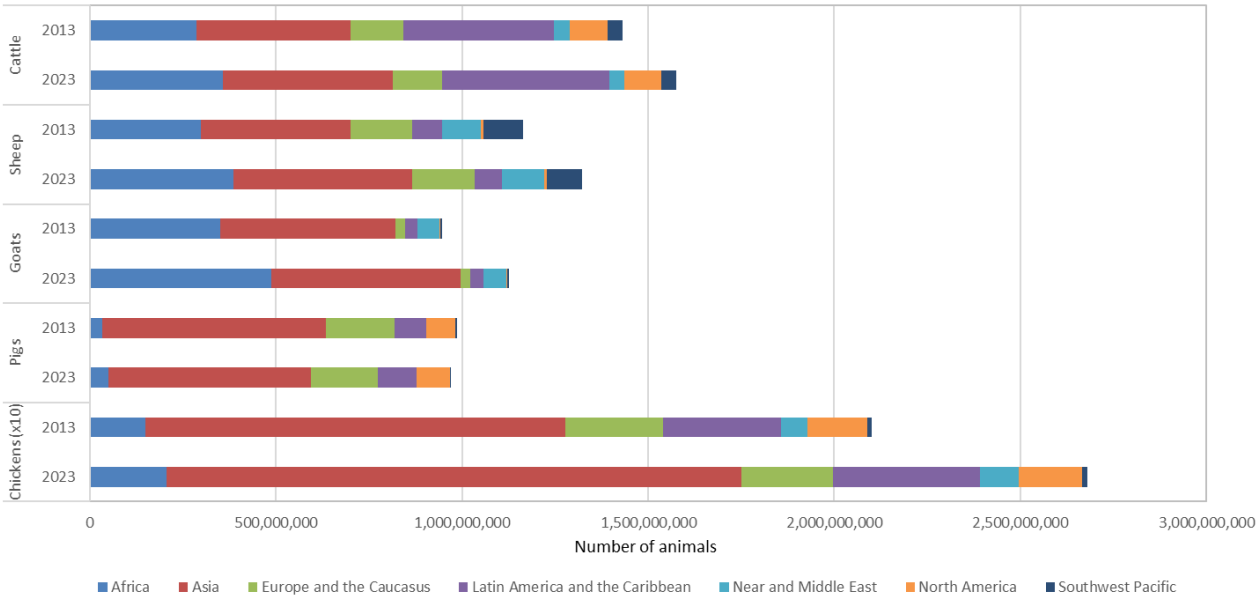
Europe, and the Caucasus hase all declined. In the Southwest Pacific, Latin America, and North America, the total number of sheep has also fallen in absolute terms over this period.

The world had approximately 1.1 billion goats in 2023. Goats are much more common in developing regions than in high-income countries. Asia (45 percent; highest numbers in India and China), Africa (43 percent; highest numbers in Nigeria and Ethiopia) and the Near and Middle East (6 percent; highest numbers in Sudan and Yemen) host more than 90 percent of the world's goats. There are also significant populations in Latin America and the Caribbean (3 percent; highest numbers in Brazil and Mexico) and in Europe and the Caucasus (2 percent; highest numbers in Türkiye and Greece). The main change since 2013 has been a large increase in Africa's goat population; the share of the global total increased by 6 percent, and the absolute population size grew 39 percent.

Despite the decrease in numbers during the last decade, the world's pig population remained close to 1 billion animals in 2023. Asia accounts for 56 percent of the world total, with China alone representing 45 percent. Europe and the Caucasus accounts for 18 percent (highest numbers in Spain and Germany), Latin America and the Caribbean for 11 percent (highest numbers in Brazil and Mexico), North America for 9 percent (highest number in the United States of America) and Africa for 5 percent (highest number in Nigeria). The pattern of regional distribution has not changed greatly since 2005, with the most notable change being a decrease in Asia's share by about 5 percent, possibly associated with outbreaks of African Swine Fever in that region during last decade (Mighell & Ward, 2021). The respective shares of Latin America and the Caribbean and Africa have increased by 2 percentage points. Although the region's contribution to the global population remains relatively small, the absolute pig population in Africa increased by an astounding 47 percent during the decade studied. This increase can be attributed to a number of factors, including population and income growth and associated demand for meat consumption, improvements in husbandry and productivity, and enhanced efforts to control diseases (Adesehinwa et al., 2024)

The world's chicken population reached almost 27 billion in 2023. More than half the total (58 percent) is found in Asia, where the largest producers are China and Indonesia. Latin America and the Caribbean accounts for 15 percent of the total (led by Brazil and Mexico); Europe and the Caucasus for 9 percent (largest numbers in the Russian Federation and Türkiye); North America for 6 percent (particularly the United States of America); Africa for 8 percent (highest numbers in Nigeria and Algeria) and the Near and Middle East for 4 percent (highest numbers in Egypt and Saudi Arabia). Since 2013, the chicken population has increased in all regions except for Europe and the Caucasus. Asia has increased its share of the total world population, while the shares of Europe and the Caucasus and North America have declined.

Figure 1B3. Regional distribution of livestock species in 2013 and 2023



Source: FAOSTAT (accessed August 2025).

4. Livestock breed diversity and risk status

This subsection discusses the geographical distribution of breeds belonging to both the local and the transboundary categories, presents a summary of the current risk status of the world's breeds and considers trends in breed risk status since the time the first SoW-AnGR was prepared.

4.1. Geographical distribution of local and transboundary breeds

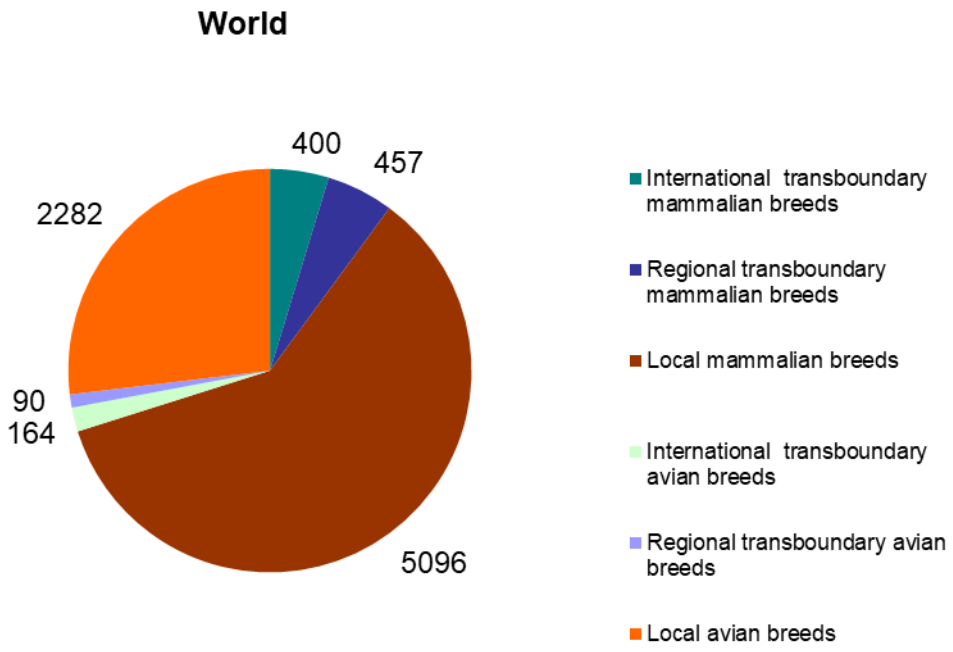
The Global Databank for Animal Genetic Resources currently contains data from 185 countries and 37 species and two fertile interspecies crosses. The total number of breeds (including extinct breeds) recorded in the Global Databank increased from 7 616 in 2006 to 8 774 in 2014, and 9 226 in 2025. Out of this total, 8 099 are local breeds (i.e. breeds reported by only one country – see Box 1B2); the equivalent figure in 2014 was 7 718. The remaining 1 127 are transboundary breeds (i.e. breeds reported by more than one country); the equivalent figure in 2014 was 1 056. Among transboundary breeds, 563 (compared to 510 in 2014) are regional transboundary breeds (occurring in only one region) and 564 (compared to 546 in 2014) are international transboundary breeds (occurring in more than one region). A total of 737 breeds (compared to 647 in 2014) are classified as extinct. Sixteen of these extinct breeds (compared to four in 2014) are transboundary breeds (all of them being regional transboundary).[4]

Figure 1B4 shows the share of local, regional transboundary and international transboundary breeds among the mammalian and avian breeds of the world (excluding extinct breeds). The shares of the breed classes have remained more or less constant since 2006. Figure 1B5 presents a regional breakdown of the figures. The number of local breeds is likely overestimated, as previously noted, because several national breed populations—although related to transboundary breeds—have not been formally linked to them and are therefore classified as local breeds.

As in 2014, more than two-thirds of reported breeds belonged to mammalian species and mammalian breeds outnumbered avian breeds in all regions of the world in 2025. The number of mammalian regional transboundary breeds is similar to the number of international transboundary breeds. In contrast, there are twice as many avian international transboundary breeds as there are avian regional transboundary breeds. The main regional contrast lies in the significantly higher proportion of transboundary breeds in North America, followed by the Southwest Pacific and, to a lesser extent, Latin America and the Caribbean.

[4] The 2006 and 2014 figures presented in this paragraph are taken from the two previous SoW-AnGR reports, i.e. they do not account for corrections that countries have made to their breed inventories in DAD-IS since then.

246 **Figure 1B4. Number of local and transboundary breeds at global level**



Note: Figures exclude extinct breeds.
Source: DAD-IS (accessed August 2025).

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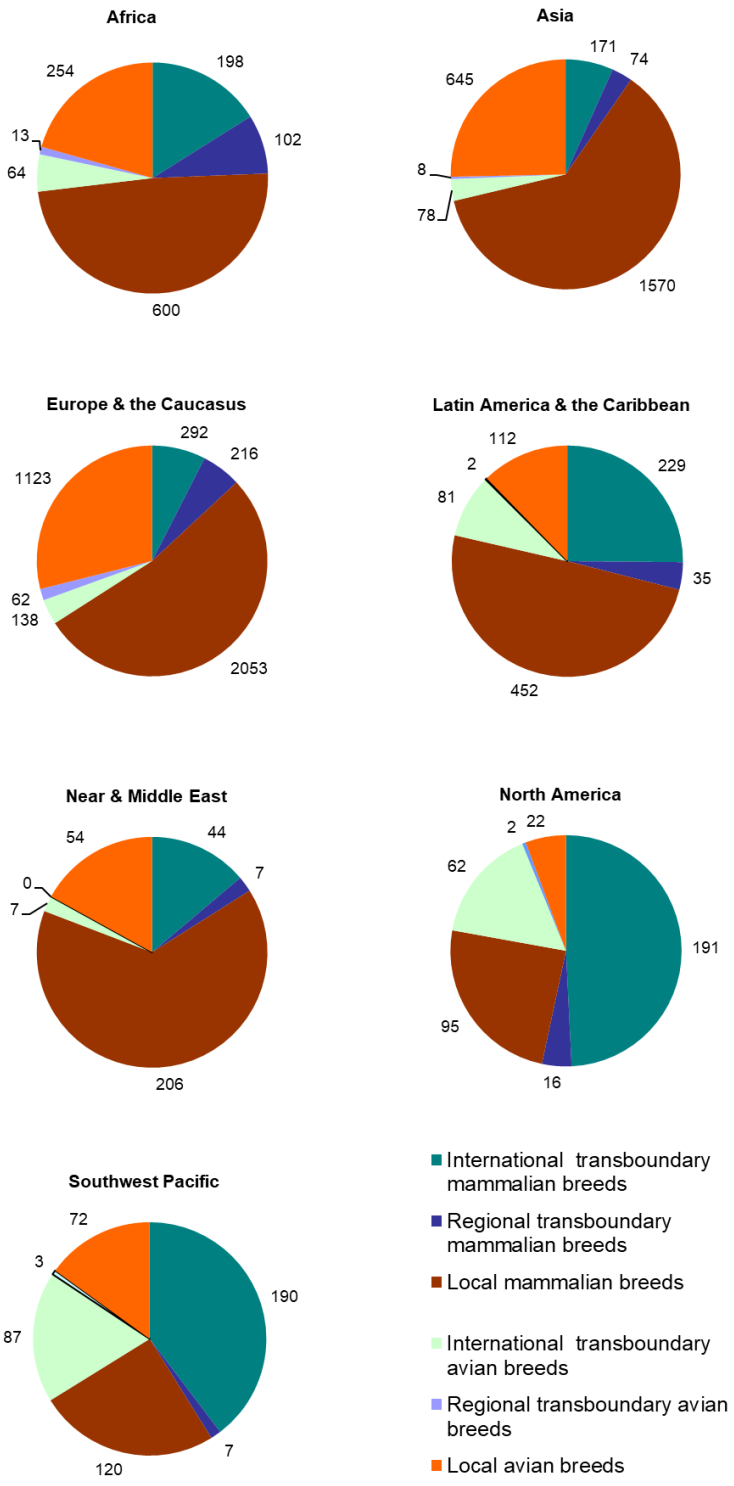
Figure 1B5. Number of local and transboundary breeds at regional level



Note: Figures exclude extinct breeds.
Source: DAD-IS (accessed August 2025).

Tables 1B2 and 1B3, respectively, show the number of reported local breeds of mammalian and avian species in each region of the world. The totals in some categories have fallen since 2014 because of corrections made by some countries to their breed inventories recorded in DAD-IS.

Table 1B2. Number of reported mammalian local breeds

Species	Africa	Asia	Europe and the Caucasus	Latin America and the Caribbean	Near and Middle East	North America	Southwest Pacific	World
Asses	26	39	45	26	24	6	3	169
Bactrian camels	0	11	2	0	1	0	0	14
Buffaloes	3	97	7	10	7	1	2	127
Cattle	170	271	365	140	60	14	31	1051
Dromedaries	43	13	1	0	44	0	1	102
Goats	90	219	209	39	89	7	14	667
Guinea pigs	4	0	0	13	0	0	0	17
Horses	53	125	377	72	33	23	21	704
Pigs	56	266	163	60	3	10	16	574
Rabbits	13	31	209	13	8	8	2	284
Sheep	101	275	568	64	104	21	29	1162
Yaks	0	33	2	0	3	1	1	40
Others	8	44	104	16	1	4	8	185
Total	**567**	**1424**	**2052**	**453**	**377**	**95**	**128**	**5096**

Note: Figures exclude extinct breeds. Figures for alpacas, American bison, deer, dogs, dromedary × Bactrian camel, gaurs, guanacos, llamas, mithuns and vicuñas are combined in the "others" category.
Source: DAD-IS (accessed August 2025).

Table 1B3. Number of reported avian local breeds

Species	Africa	Asia	Europe and the Caucasus	Latin America and the Caribbean	Near and Middle East	North America	Southwest Pacific	World
Chickens	154	367	758	67	58	12	43	1459
Ducks	16	117	104	21	3	1	13	275
Geese	10	46	116	6	3	0	3	184
Guinea fowls	34	3	14	2	1	0	0	54
Pigeons	8	18	40	1	10	1	2	80
Quails	3	24	16	4	0	0	0	47
Turkeys	13	9	49	10	4	8	3	96
Others	15	34	21	6	2	0	9	87
Total	**253**	**618**	**1118**	**117**	**81**	**22**	**73**	**2282**

Note: Figures exclude extinct breeds. Figures for cassowaries, Chilean tinamous, duck × Muscovy ducks, emus, Muscovy ducks, ñandus, ostriches, partridges, peacocks, pheasants and swallows are combined in the "others" category.
Source: DAD-IS (accessed August 2025).

Tables 1B4 and 1B5, respectively, show the number of reported regional transboundary breeds of mammalian and avian species in each region of the world. The existence of significant numbers of regional transboundary breeds has implications for the use and conservation of animal genetic resources, and highlights the need for cooperation at regional or subregional levels. Strengthening governance frameworks and facilitating germplasm exchange across borders are essential to ensure coordinated conservation efforts, promote sustainable use, and maintain genetic diversity within and among these breeds. For several mammalian species, including sheep, horses, rabbits and pigs, Europe and the Caucasus has the highest number of regional transboundary breeds. Africa has a relatively large share of regional transboundary breeds in most of the species listed and has more regional transboundary breeds of cattle than any other region. Europe and the Caucasus has by far the highest number of regional transboundary breeds among avian species.

278 **Table 1B4. Number of reported mammalian transboundary breeds**

Species	Regional transboundary							International transboundary	World
	Africa	Asia	Europe and the Caucasus	Latin America and the Caribbean	Near and Middle East	North America	Southwest Pacific		
Alpaca	0	0	0	0	0	0	0	2	2
American Bison	0	0	1	0	0	0	0	0	1
Ass	4	4	4	1	0	0	0	4	17
Bactrian camel	0	0	0	0	0	0	0	2	2
Buffalo	1	8	1	1	0	0	0	4	15
Cattle	40	16	28	10	1	3	1	115	214
Deer	0	1	1	0	0	0	0	9	11
Dog	0	0	2	0	0	0	0	0	2
Dromedary	1	1	0	0	0	0	0	2	4
Goat	14	12	14	2	3	3	1	38	87
Guanaco	0	0	0	0	0	0	0	1	1
Guinea pig	0	0	0	1	0	0	0	0	1
Horse	9	11	37	5	0	3	0	70	135
Llama	0	0	0	1	0	0	0	1	2
Mithun	0	1	0	0	0	0	0	0	1
Pig	3	2	17	4	0	2	0	33	61
Rabbit	4	0	32	1	0	0	0	25	62
Sheep	26	18	79	9	3	5	5	94	239
Total	**102**	**74**	**216**	**35**	**7**	**16**	**7**	**400**	**857**

279 *Note: Figures exclude extinct breeds. Source: DAD-IS (accessed August 2025).*

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Table 1B5. Number of reported avian transboundary breeds

Species	Regional transboundary							International transboundary	World
	Africa	Asia	Europe and the Caucasus	Latin America and the Caribbean	Near and Middle East	North America	Southwest Pacific		
Cassowary	0	0	0	0	0	0	0	1	1
Chicken	11	2	36	1	0	1	3	111	165
Duck	0	2	10	0	0	0	0	13	25
Duck x Muscovy duck	1	0	0	0	0	0	0	0	1
Emu	0	0	0	0	0	0	0	1	1
Goose	0	2	7	0	0	0	0	14	23
Guinea fowl	0	0	0	1	0	0	0	4	5
Muscovy duck	0	0	0	0	0	0	0	1	1
Ostrich	1	0	0	0	0	0	0	3	4
Pigeon	0	1	2	0	0	0	0	0	3
Quail	0	1	0	0	0	0	0	0	1
Turkey	0	0	7	0	0	1	0	16	24
Total	**13**	**8**	**62**	**2**	0	**2**	**3**	**164**	**254**

Note: Figures exclude extinct breeds. Source: DAD-IS (accessed August 2025).

4.2. Risk status of livestock breeds

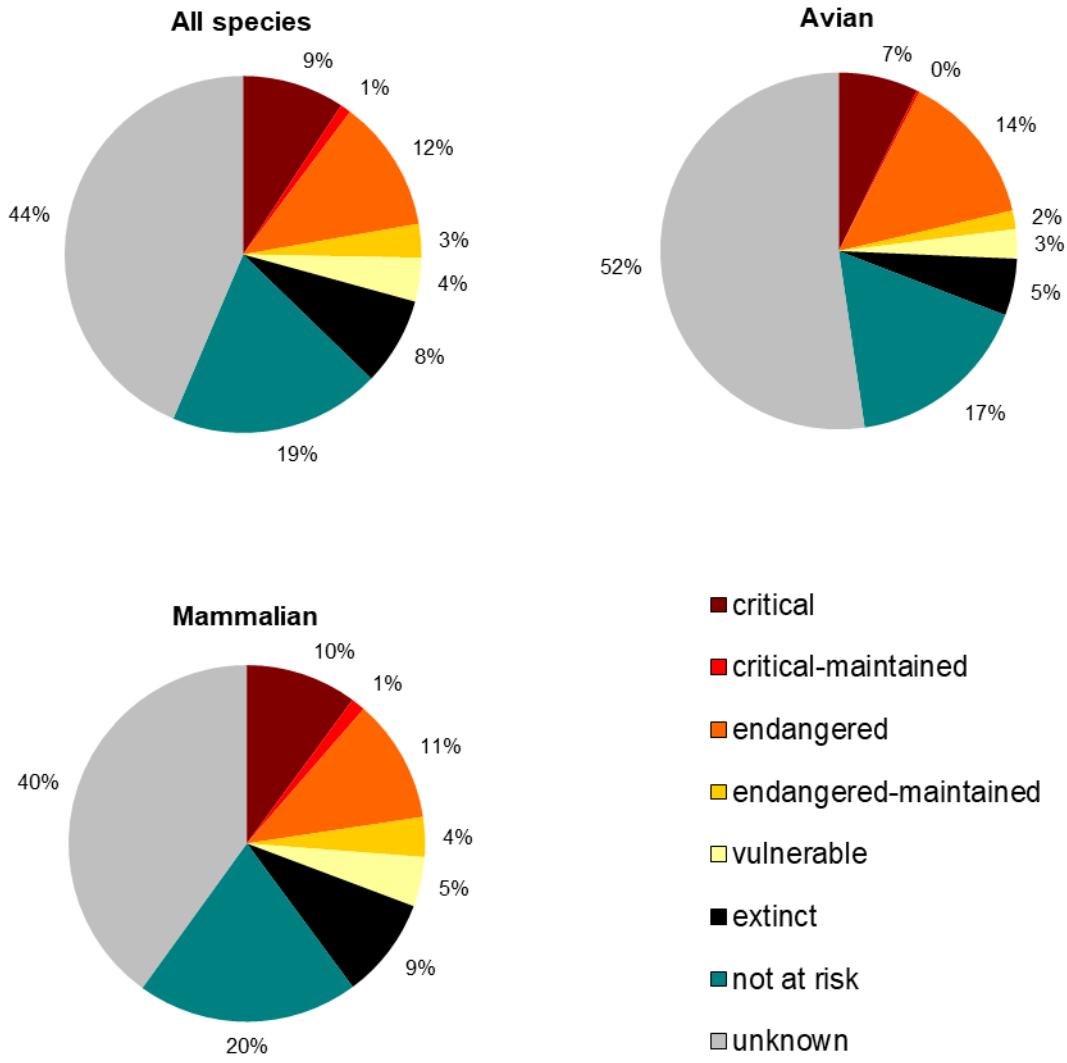
The method used to assign risk status to breeds is based on demographic parameters, with species-specific thresholds, and considers the existence of a conservation programme (FAO, 2013b). When recent population data is available, a breed can be classified as extinct (no breeding males or breeding females remaining), critical, critical-maintained, endangered, endangered-maintained, vulnerable, or not at risk. Breeds classified as either critical, critical-maintained, endangered, endangered-maintained or vulnerable are further considered to be at risk of extinction. A ten-year cut-off is applied: if no population data have been reported within the past ten years, the breed's risk status is classified as unknown. The proportion of breeds classified as being of unknown risk status decreased from 58 percent in 2014 (as calculated for the second SoW report – FAO, 2015) to 44 percent in 2025, because of improved data reporting by countries. When considering all breeds (including also extinct breeds and breeds of unknown risk status), 29 percent (2 700 breeds) are classified as being at risk.

Among the Sustainable Development Goals (SDG) indicators adopted at the UN Post-2015 Summit[5], Indicator 2.5.2 considers the percentage of local and transboundary livestock breeds classified as being at risk of extinction. Non-extinct breeds are excluded from this calculation. In relation to SDG Indicator 2.5.2, among not extinct breeds with known risk status, 63 percent of local and 50 percent of transboundary breeds are classified as being at risk.

Figure 1B6 summarizes the risk status by species and shows that, when considering all breeds—including those classified as extinct or with unknown risk status— the proportion of mammalian breeds at risk (31 percent) is higher than that of avian breeds (26 percent). In absolute terms (Figure 1B6 and 1B7), the number of breeds at risk is far greater among mammals (2013 breeds) than among birds (687 breeds).

[5] https://sdgs.un.org/

Figure 1B6. Proportion of the world's breeds by risk status category



Source: DAD-IS (accessed August 2025).

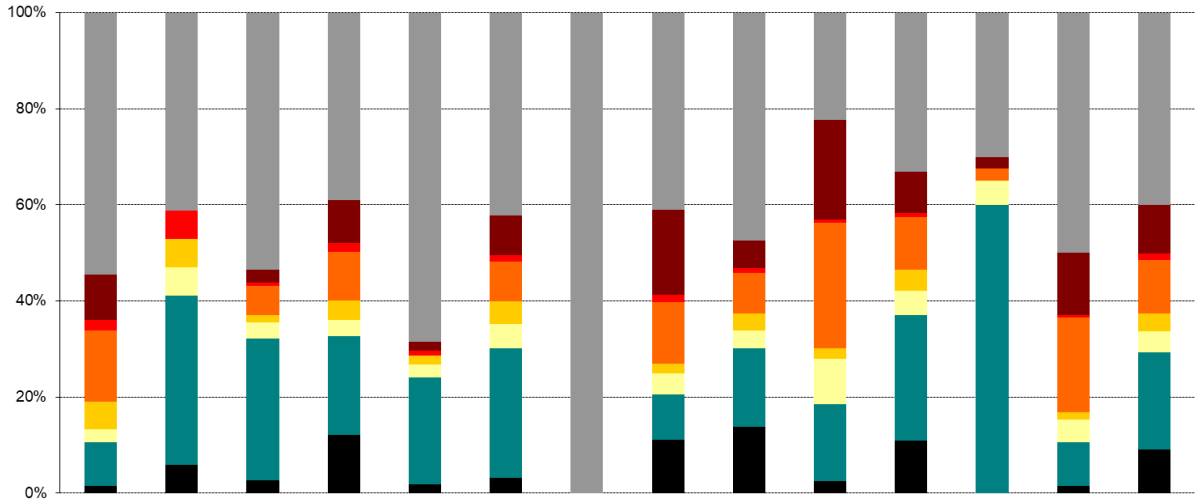
Figure 1B7 presents detailed risk-status data for the main mammalian species. Horses, sheep and cattle have the greatest numbers of breeds at risk. However, rabbits (61 percent) have by far the greatest proportion of breeds at risk, followed by horses (39 percent) and asses (36 percent). In addition, 39 percent of the breeds of "other", less common, species are at risk of extinction. Figure 1B6 also accentuates the large number of breeds for which no risk-status data are available. The problem is particularly significant in some species – 100 percent for guinea pig breeds, 69 percent for dromedary breeds and 53 percent for ass and buffalo breeds. This lack of data is a serious constraint to effective prioritization and planning of breed conservation measures. Cattle are the species with the greatest number of breeds (174) reported as being extinct, whereas pigs have the largest proportion of extinct breeds (14 percent). Large numbers of extinct breeds of sheep (171), horses (105).

Among avian species, chickens have by far the highest number (474) of breeds at risk (Figure 1B8). However, geese are the avian species with the highest proportion of breeds at risk (31 percent), followed by chickens (28 percent) and turkeys (26 percent). As in the case of mammalian species, there are a large number of avian breeds for which population figures are unavailable. Globally, 52 percent of avian breeds have an unknown risk status, a figure notably higher than that for mammalian breeds (40 percent). The lack of data on avian breeds may stem from several factors, including a societal tendency to

overlook the corresponding species, and the fact that many avian breeds are managed by private industry, which is generally less inclined to share population data publicly. This discrepancy may also explain the lower representation of avian breeds in other risk categories. Extinct breeds have mainly been reported among chickens and ducks.

The regions with the highest proportion of their breeds classified as at risk (Figures 1B9 and 1B10) are Europe and the Caucasus (51 percent of mammalian breeds and 39 percent of avian breeds), Southwest Pacific (40 percent of mammalian breeds and 60 percent of avian breeds) and North America for mammalian breeds (41 percent). These are the regions that have the most highly specialized livestock industries, in which production is dominated by a small number of breeds. In the case of the Southwest Pacific, the majority of breeds are reported by Australia and New Zealand, which strongly influences the region's overall risk profile. In absolute terms, Europe and the Caucasus has by far the highest number of at-risk breeds (1 899 breeds). However, it should also be acknowledged that in Europe and the Caucasus an exhaustive inventory and characterization of the breed populations have been completed, which brings the status of all breeds to light. Conversely, in regions where national breed populations are not comprehensively characterized, a substantial proportion of breeds may be at risk. However, this risk remains largely undetected due to the high percentage of breeds for which risk status has not yet been assessed. Consequently, the extent of the problem in these regions may be obscured by the prevalence of breeds with unknown risk status. In this sense, the percentage of breeds with unknown risk status amounts to 27 percent in Europe and the Caucasus, whereas this percentage goes over 70 percent in Africa (79 percent), Latin America and the Caribbean (77 percent) and Near and Middle East (73 percent). While a majority (55 percent) of mammalian transboundary breeds are not at risk, a much higher proportion of avian breeds are either at risk (41 percent) or of unknown status (37 percent), probably in relation to the large proportion of either fancy or industrial lines with limited information reported across countries.

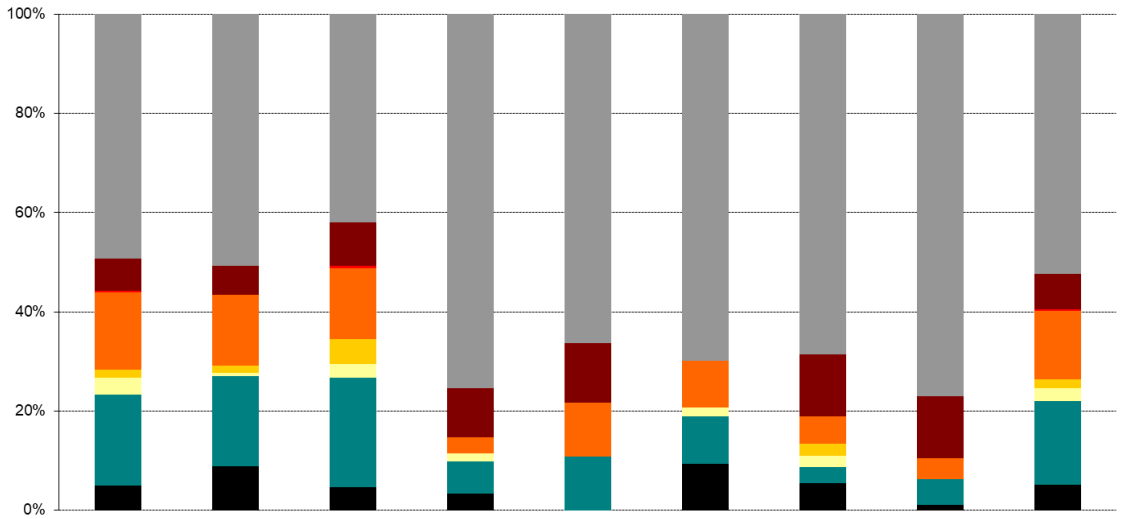
Figure 1B7. Risk status of the world's mammalian breeds by species in August 2025



	Ass	Bactrian Camel	Buffalo	Cattle	Drome dary	Goat	Guinea pig	Horse	Pig	Rabbit	Sheep	Yak	Other*	Total
Unknown	101	7	78	552	74	324	18	384	347	71	516	12	104	2588
Critical	19	0	4	130	2	66	0	168	42	80	134	1	27	673
Critical-maintained	4	1	1	28	1	11	0	15	7	2	14	0	1	85
Endangered	29	0	9	144	0	64	0	123	62	95	174	1	41	742
Endangered-maintained	11	1	2	60	2	38	0	18	29	8	67	0	3	239
Vulnerable	5	1	5	48	3	39	0	42	27	33	83	2	10	298
Not at risk	17	6	43	303	24	212	0	89	121	57	413	24	19	1328
Extinct	3	1	4	174	2	25	0	105	102	9	171	0	3	599
Total	**189**	**17**	**146**	**1439**	**108**	**779**	**18**	**944**	**737**	**355**	**1572**	**40**	**208**	**6552**

Note: "Other" refers to Bactrian camel × dromedary crosses, guanacos, vicuñas and dogs.
Source: DAD-IS (accessed August 2025).

354 **Figure 1B8. Risk status of the world's avian breeds by species in August 2025**

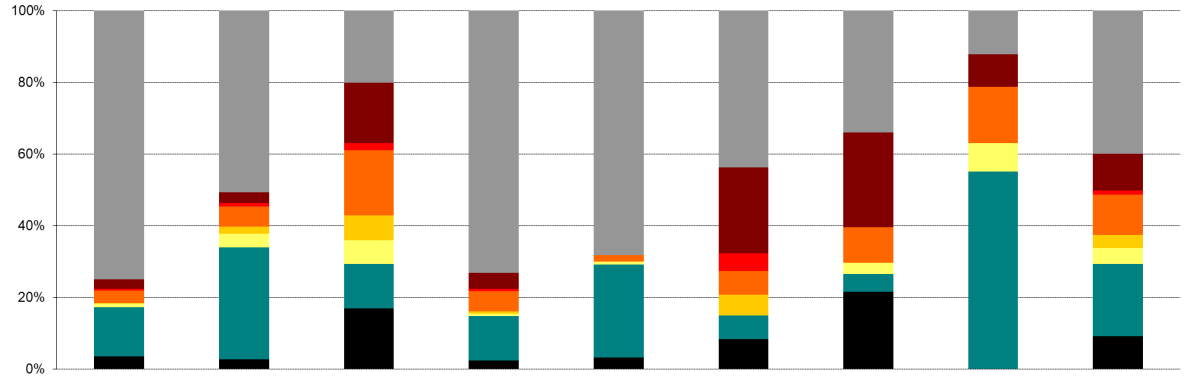


	Chicken	Duck	Goose	Guinea fowl	Pigeon	Quail	Turkey	Other*	Total
Unknown	833	164	91	46	55	37	82	74	1382
Critical	112	19	19	6	10	0	17	12	195
Critical-maintained	6	0	1	0	0	0	0	0	7
Endangered	269	47	31	2	9	5	8	4	375
Endangered-maintained	26	5	11	0	0	0	3	0	45
Vulnerable	61	2	6	1	0	1	5	0	76
Not at risk	317	63	48	4	9	5	5	5	456
Extinct	84	29	10	2	0	5	7	1	138
Total	**1708**	**329**	**217**	**61**	**83**	**53**	**127**	**96**	**2674**

355
356 *Note: "Other" refers to duck × Muscovy duck crosses, Chilean tinamous, cassowaries, emus, Muscovy ducks, ñandus,*
357 *partridges, peacocks,pheasants and swallows.*
358 *Source: DAD-IS (accessed August 2025).*

359

360 **Figure 1B9. Risk status of the world's mammalian breeds by region in August 2025**

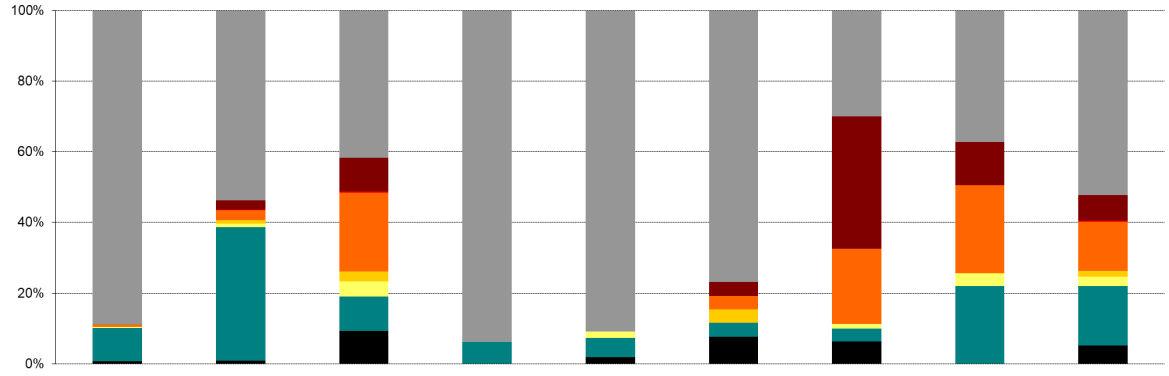


361

	Africa	Asia	Europe & the Caucasus	Latin America & the Caribbean	Near & Middle East	North America	Southwest Pacific	International transboundary breeds	World
Unknown	546	855	550	365	150	53	55	49	2623
Critical	19	51	462	22	0	29	43	36	662
Critical-maintained	4	18	52	4	0	6	0	0	84
Endangered	25	94	498	28	4	8	16	63	736
Endangered-maintained	1	35	190	3	0	7	0	0	236
Vulnerable	7	64	182	3	2	0	5	32	295
Not at risk	100	527	335	62	57	8	8	220	1317
Extinct	26	45	464	12	7	10	35	0	599
Total	**728**	**1689**	**2733**	**499**	**220**	**121**	**162**	**400**	**6552**

362
363 *Note: The figures for each region include local breeds and regional transboundary breeds. International transboundary*
364 *breeds (breeds present in more than one region) are listed separately.*
365 *Source: DAD-IS (accessed August 2025).*

366 **Figure 1B10. Risk status of the world's avian breeds by region in August 2025**



367

	Africa	Asia	Europe & the Caucasus	Latin America & the Caribbean	Near & Middle East	North America	Southwest Pacific	International transboundary breeds	World
Unknown	239	354	544	107	50	20	24	61	1399
Critical	0	17	125	0	0	1	30	20	193
Critical-maintained	0	2	5	0	0	0	0	0	7
Endangered	2	18	292	0	0	1	17	41	371
Endangered-maintained	0	7	37	0	0	1	0	0	45
Vulnerable	1	6	56	0	1	0	1	6	71
Not at risk	25	249	126	7	3	1	3	36	450
Extinct	2	6	122	0	1	2	5	0	138
Total	**269**	**659**	**1307**	**114**	**55**	**26**	**80**	**164**	**2674**

Note: The figures for each region include local breeds and regional transboundary breeds. International transboundary breeds (breeds present in more than one region) are listed separately.
Source: DAD-IS (accessed August 2025).

Tables 1B6 and 1B7 show the number of extinct mammalian and avian breeds, broken down by species and region. Europe and the Caucasus has reported far more extinct mammalian and avian breeds than any other region – 15 percent of all breeds reported from this region are extinct. The dominance of Europe and the Caucasus in terms of the number of breeds reported extinct may relate, at least in part, to the relatively advanced state of breed inventory and monitoring in this region.

Table 1B6. Number of extinct mammalian breeds reported

Species	Africa	Asia	Europe and the Caucasus	Latin America and the Caribbean	Near and Middle East	North America	South-west Pacific	World
American Bison	0	0	0	0	0	2	0	2
Ass	0	0	2	0	1	0	0	3
Bactrian camel	0	0	1	0	0	0	0	1
Buffalo	0	1	3	0	0	0	0	4
Cattle	18	19	117	8	5	0	7	174
Dromedary	1	0	0	0	0	0	1	2
Dromedary x Bactrian	0	0	0	0	0	0	1	1
Goat	1	2	20	0	0	0	2	25
Horse	6	1	86	2	0	6	4	105
Pig	0	16	84	1	0	0	1	102
Rabbit	0	0	8	1	0	0	0	9
Sheep	0	6	143	0	1	2	19	171
Total	**26**	**45**	**464**	**12**	**7**	**10**	**35**	**599**

Note: The figures for each region include local breeds and regional transboundary breeds. International transboundary breeds (breeds present in more than on region) are listed separately.
Source: DAD-IS (accessed August 2025).

Table 1B7. Number of extinct avian breeds reported

Species	Africa	Asia	Europe and the Caucasus	Latin America and the Caribbean	Near and Middle East	North America	Southwest Pacific	World
Chicken	0	5	77	0	1	0	1	84
Duck (domestic)	0	0	28	0	0	0	1	29
Goose (domestic)	0	0	8	0	0	0	2	10
Guinea fowl	2	0	0	0	0	0	0	2
Muscovy duck	0	1	0	0	0	0	0	1
Quail	0	0	5	0	0	0	0	5
Turkey	0	0	4	0	0	2	1	7
Total	**2**	**6**	**122**	**0**	**1**	**2**	**5**	**138**

Note: No extinct avian international transboundary breeds have been reported.
Source: DAD-IS (accessed August 2025).

Globally, the year of extinction has been reported for only 65 percent of extinct breeds (481). Nine breeds are reported to have become extinct before 1900, 100 between 1901 and 2000, 71 between 2001 and 2010, 116 between 2011 and 2020, and 185 after 2020 (Table 1B8). Figure 1B11 illustrates the increase in number of breeds reported as extinct, especially over the last three years. It should be emphasized that, due to the limited number of countries contributing data, observed trends may be heavily influenced by individual national reports. For instance, the increase in the number of extinct avian breeds from Europe in 2012 stems entirely from a single submission by Poland, which listed the

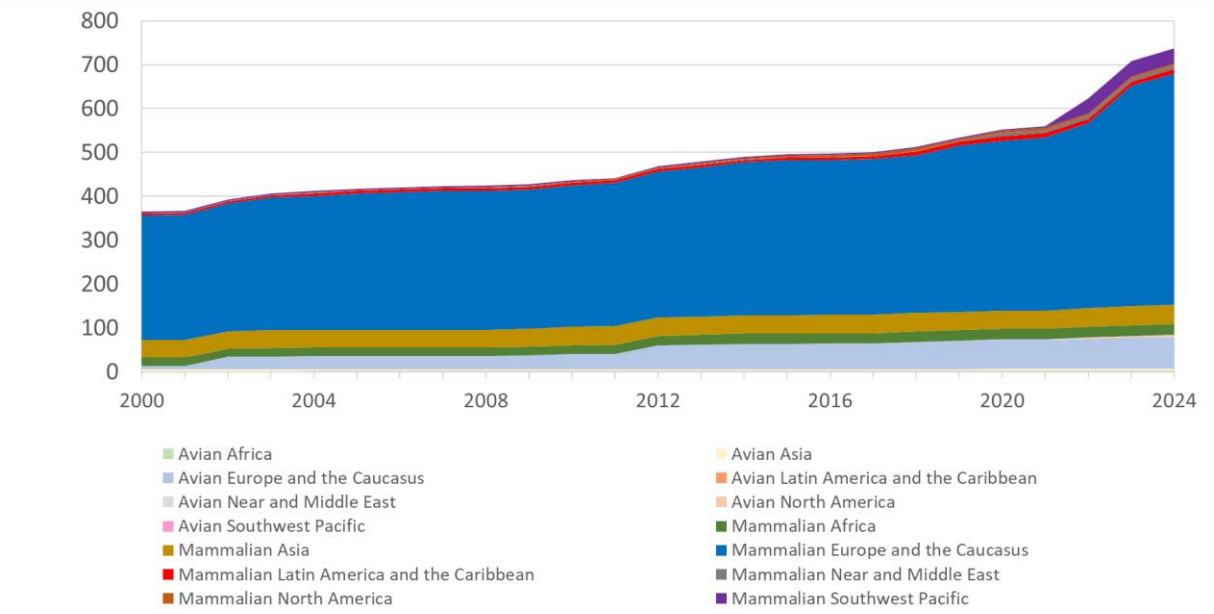
extinction of 20 industrial lines of chickens, ducks, and geese. Similarly, 75 percent of the extinctions observed between 2022 and 2023 are linked to reports from just three countries: Australia, France, and the Russian Federation. While these figures may suggest a rising trend in breed extinction, they should be interpreted with caution, as they may reflect changes in reporting practices rather than actual increases in extinction rates.

Table 1B8. Breed extinction over time

Year	Number of breeds	%
Unspecified	256	35
1900 and before	9	1
1901-2000	100	14
2001-2010	71	10
2010-2020	116	16
after 2020	185	25
Total	**737**	**100**

Source: DAD-IS (accessed August 2025).

Figure 1B11. Changes in number of extinct breeds reported in DAD-IS between 2000 and 2024



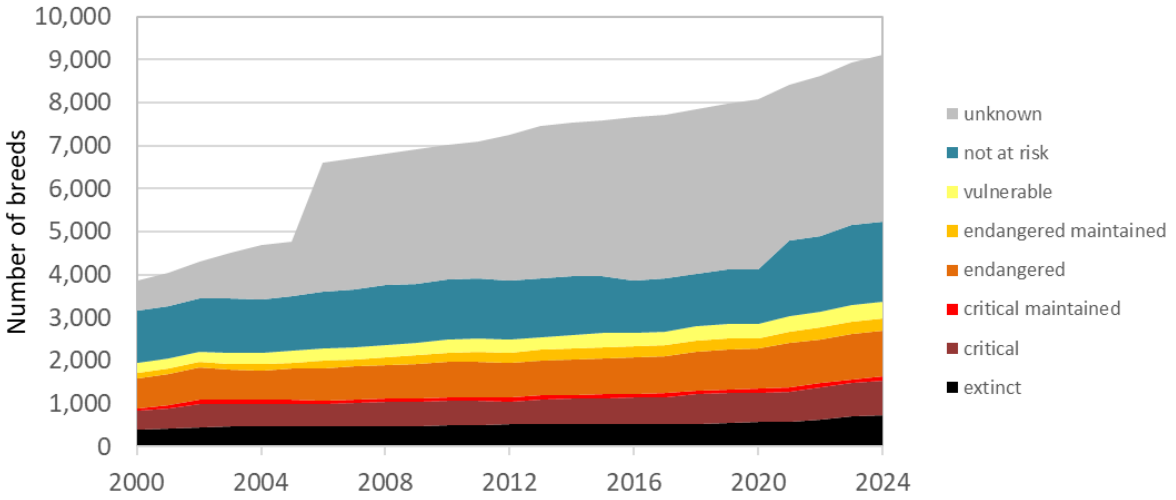
Source: DAD-IS (accessed August 2025).

4.3. Trends in risk status of livestock breeds

The number of breeds reported in the system has steadily increased over time, with a particularly sharp rise around 2006 (Figure 1B12). This surge was largely driven by efforts to consolidate and expand breed data during the process to prepare the first SoW-AnGR, which included the addition of many breeds with unknown risk status. While the overall number of breeds has grown significantly, the availability of data to assess their risk status has not kept pace, leaving a substantial proportion of breeds without sufficient information for proper classification. Since 2014, the proportion of breeds with unknown risk status initially fluctuated between 48 and 50 percent, until declining in recent years to 43

percent, which reflects the commitment of countries to improve data completeness for demographic risk status in DAD-IS (Box 1B3). The increase in the number of breeds with known risk status observed in 2021 is largely attributable to updates submitted by China, which reported more than 650 breed population updates during that year alone. Among breeds with a known status (excluding extinct breeds), the proportion of breeds classified as "at risk" has remained consistently around 60 percent over the past ten years.

Figure 1B10. Changes in risk status of breeds between 2000 and 2025



Source: DAD-IS (accessed August 2025).

Box 1B3. Estimating breed population size, challenges and efforts: lessons learned from Argentina

Throughout the existence of DAD-IS, population size data have been lacking for many breeds. The main reason for the data gap is a lack of population size data on country level. National livestock censuses, if carried out at all, are expensive and thus not sufficiently frequent relative to the annual SDG reporting. Moreover, they usually do not provide information on breed level. Therefore, countries need cost efficient solutions allowing them to estimate regularly the population sizes of their AnGR.

To support countries in data collection, FAO developed guidelines (FAO, 2024c) and implemented capacity building activities with countries in Asia, Africa and Latin America and the Carribean, largely through sample-based survey implementation.

In Argentina, activities were carried out between 2019 and 2022, with stratified sampling made over ecoregions. The main outcome was the identification of the country's rich breed diversity, with 73 breeds recorded. Population sizes were estimated for some breeds when sample sizes were adequate. Overall, population sizes were estimated for 4 of 15 cattle breeds, 8 of 15 sheep breeds, and 6 of 14 goat breeds. The method worked best for breeds with broad distribution or larger populations. However, many local breeds remain without estimates. This experience shows that to obtain reliable population size data for more breeds, especially local breeds, it is necessary to improve coverage through more surveys and finer ecoregion stratification

Provided by Carlos Reising and Gregoire Leroy.

5. Status and trends in cryoconservation of livestock breeds

5.1. Cryoconservation status of livestock breeds

Since 2017, DAD-IS has enabled countries to report information on cryoconservation programmes for each national breed population. The cryoconservation status of a breed is determined based on the quantity and type of genetic material stored—such as semen, embryos, somatic cells, and oocytes. Species-specific thresholds, as defined by FAO (2012), are applied to the number of donors and doses to assess whether the stored material is sufficient to allow for the reconsitution of the breed in the event of extinction.

A breed can be classified either as No material, Not sufficient, Sufficient, or No information. In contrast to risk status, no cut-off point is applied to the cryoconservation status, as countries are assumed to be maintaining their collections once established and cryoopreservedmaterial is presumed to remain biologically stable and viable in time. A subcategory common to both risk (extinct) and cryoconservation (sufficient) classifications is the category "cryopreserved only". The Global indicator framework for the SDG also includes an indicator dedicated to *ex situ in vitro* conservation. Specifically, SDG Indicator 2.5.1 is defined as "the number of local and transboundary breeds for which sufficient genetic resources are stored for reconstitution of the breed in case of extinction."

Semen is by far the most reported material used for cryoconservation, documented for 1 542 national breed populations—representing 10 percent of the total. In comparison, embryos are reported for 188 populations (1 2 percent), somatic cells for 127 populations (0.8 percent), and oocytes for just 36 populations (0.2 percent).

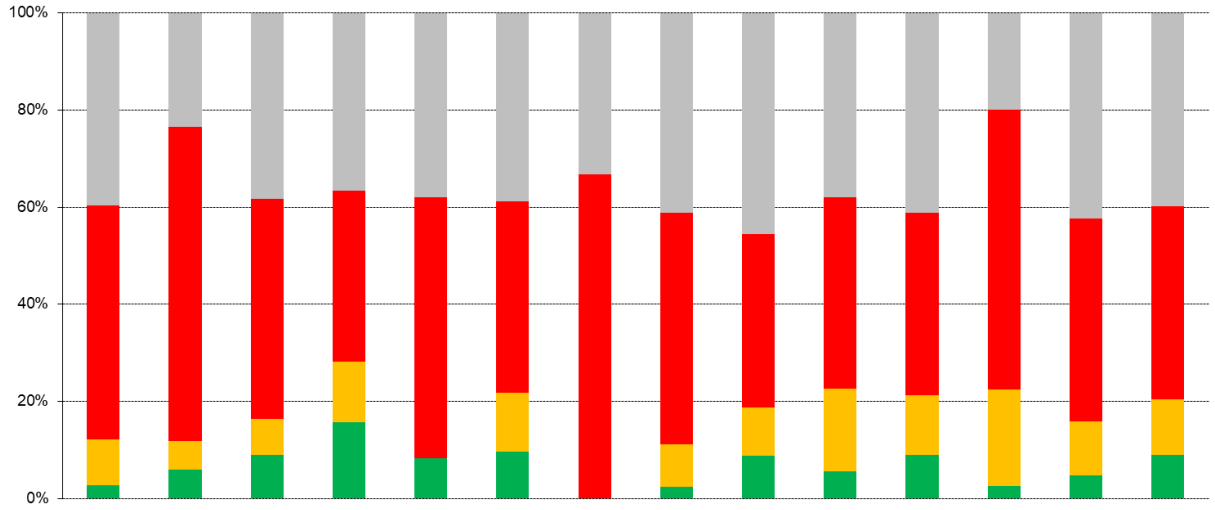
As of August 2025, the cryoconservation information in DAD-IS (Figures 1B11 and 1B12) is still far from being complete, with status being unknown for 42 percent of breeds (3 846 breeds). For a similar proportion of breeds (3 863 breeds), countries have reported that no material has been collected. For 7 percent (665 breeds) and 9 percent (852 breeds) of the breeds, the material stored is, respectively, considered sufficient or not sufficient to allow for reconstitution in case of extinction. Eleven breeds (all local) have been reported as cryopreserved only. In reference to SDG Indicator 2.5.1b, 475 local and 190 transboundary breeds are reported to have sufficient cryoconserved material to support their reconstitution if needed.

Among mammals, the knowledge on the cryoconservation status is relatively consistent across species, with the percentage of breeds with unknown status ranging from 20 to 46 percent. For ruminants higher levels of cryoconservation efforts are undertaken, with material collected for 16 percent of buffalo breeds, 21 percent of sheep breeds, 22 percent of goat breeds, 23 percent of yak breeds and 28 percent of cattle breeds. Cattle also have the highest proportion of breeds with sufficient material cryoconserved (16 percent). In comparison, avian species show a higher proportion of breeds with unknown status—ranging from 43 percent (chickens) to 70 percent (quails). The percentage of breeds with material collected is also notably lower, ranging from an absence material for Guinea fowls and other species) to an upper extreme of only 11 percent for pigeons and just 9 percent for chickens. A plausible explanation for these results is that cryopreservation of semen tends to be more challenging for avian species, relative to mammals, and embryo cryopreservation in the former is not even possible.

Regionally, most areas report cryoconservation data for the majority of their mammalian breeds, with the notable exception of the Southwest Pacific, where 97 percent of breeds lack information (Figure 1B13). North America (31 percent) and Europe and the Caucasus (25 percent) report the highest proportions of breeds with material stored, followed by Asia (18 percent). In both Asia and North America, 12 percent of breeds are reported to have sufficient material. When considering the geographical status of breeds and their level of cryoconservation, international transboundary mammalian breeds (data not shown), 56 percent are reported to have material collected, including 33 percent with sufficient material, compared to only 18 percent and 7 percent for local and regional breeds.

Regarding avian breeds (Figure 1B14), the proportion of breeds with no information ranges from 12 percent (North America) to 91 percent (Southwest Pacific). Only North America (15 percent), Asia (11 percent) and Europe (6 percent) report a significant number of avian breeds with material stored. No cryoconservation of material for avian species has been reported in the South Pacific. Even among international transboundary avian breeds, less than 20 percent are reported with material stored.

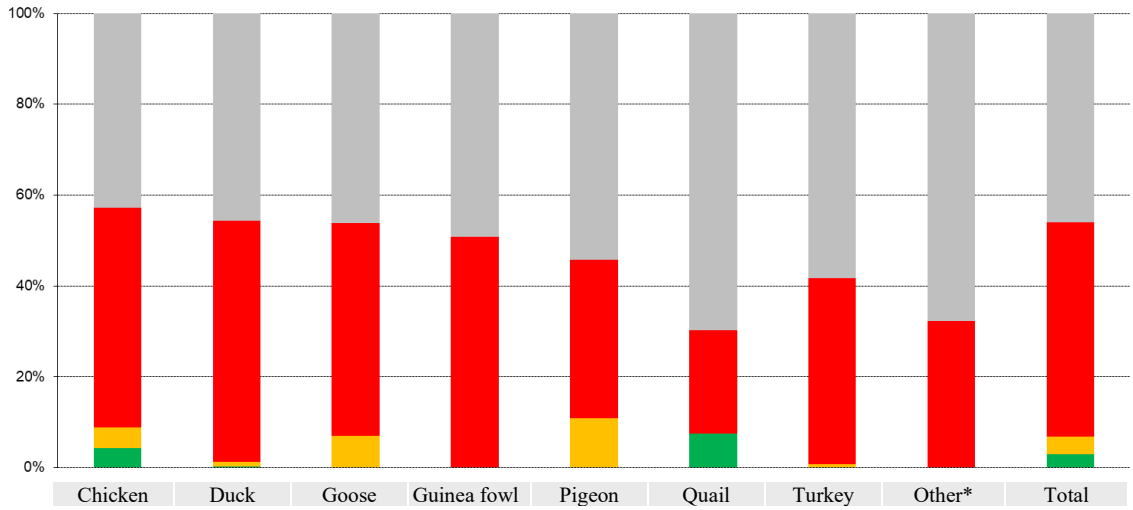
Figure 1B11. Cryoconservation status of the world's mammalian breeds by species in August 2025



	Ass	Bactrian Camel	Buffalo	Cattle	Drome dary	Goat	Guinea pig	Horse	Pig	Rabbit	Sheep	Yak	Other*	Total
No information	75	4	56	527	41	303	6	388	336	135	647	8	88	2614
No Material	91	11	66	507	58	306	12	451	263	140	590	23	87	2605
Not Sufficient	18	1	11	180	0	95	0	82	73	60	195	8	23	746
Sufficient	5	1	13	225	9	75	0	23	65	20	140	1	10	587
Total	**189**	**17**	**146**	**1439**	**108**	**779**	**18**	**944**	**737**	**355**	**1572**	**40**	**208**	**6552**

Note: "Other" refers to Bactrian camel × dromedary crosses, guanacos, vicuñas and dogs.
Source: DAD-IS (accessed August 2025).

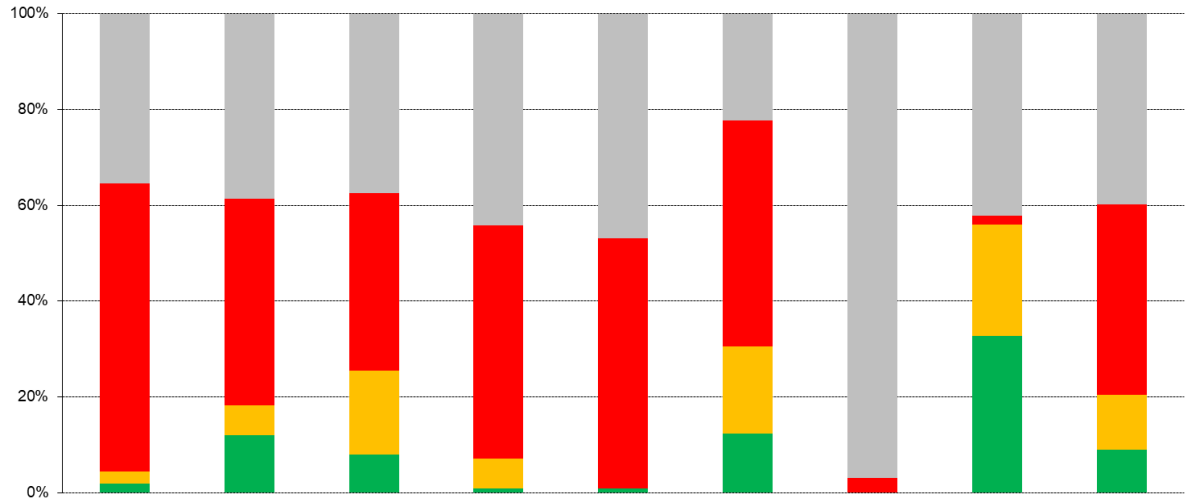
Figure 1B12. Cryoconservation status of the world's avian breeds by species in August 2025



No Information	731	150	100	30	45	37	74	65	1232
No Material	826	175	102	31	29	12	52	31	1258
Not Sufficient	78	3	15	0	9	0	1	0	106
Sufficient	73	1	0	0	0	4	0	0	78
Total	**1708**	**329**	**217**	**61**	**83**	**53**	**127**	**96**	**2674**

Note: "Other" refers to duck × Muscovy duck crosses, Chilean tinamous, cassowaries, emus, Muscovy ducks, ñandus, peacocks and swallows.
Source: DAD-IS (accessed August 2025).

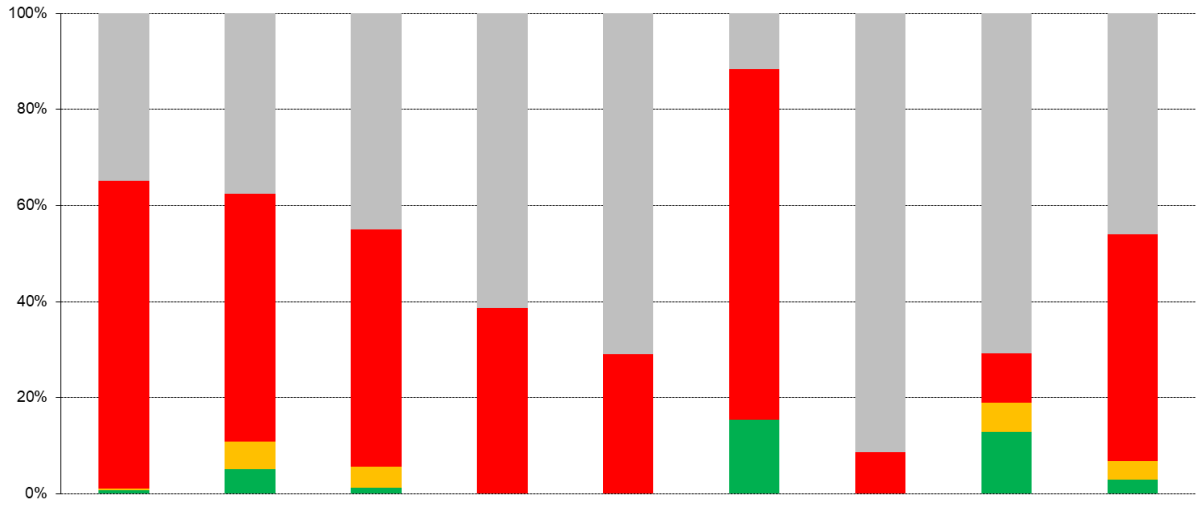
Figure 1B13. Cryoconservation status of the world's mammalian breeds by region in August 2025



	Africa	Asia	Europe & the Caucasus	Latin America & the Caribbean	Near & Middle East	North America	Southwest Pacific	International transboundary breeds	World
No Information	258	654	1025	221	103	27	157	169	2614
No Material	438	726	1014	243	115	57	5	7	2605
Not Sufficient	18	107	475	31	0	22	0	93	746
Sufficient	14	202	219	4	2	15	0	131	587
Total	**728**	**1689**	**2733**	**499**	**220**	**121**	**162**	**400**	**6552**

Note: The figures for each region include local breeds and regional transboundary breeds. International transboundary breeds (breeds present in more than one region) are listed separately.
Source: DAD-IS (accessed August 2025).

Figure 1B14. Cryoconservation status of the world's avian breeds by region in August 2025



	Africa	Asia	Europe & the Caucasus	Latin America & the Caribbean	Near & Middle East	North America	Southwest Pacific	International transboundary breeds	World
No Information	94	248	589	70	39	3	73	116	1232
No Material	172	339	644	44	16	19	7	17	1258
Not Sufficient	1	38	57	0	0	0	0	10	106
Sufficient	2	34	17	0	0	4	0	21	78
Total	**269**	**659**	**1307**	**114**	**55**	**26**	**80**	**164**	**2674**

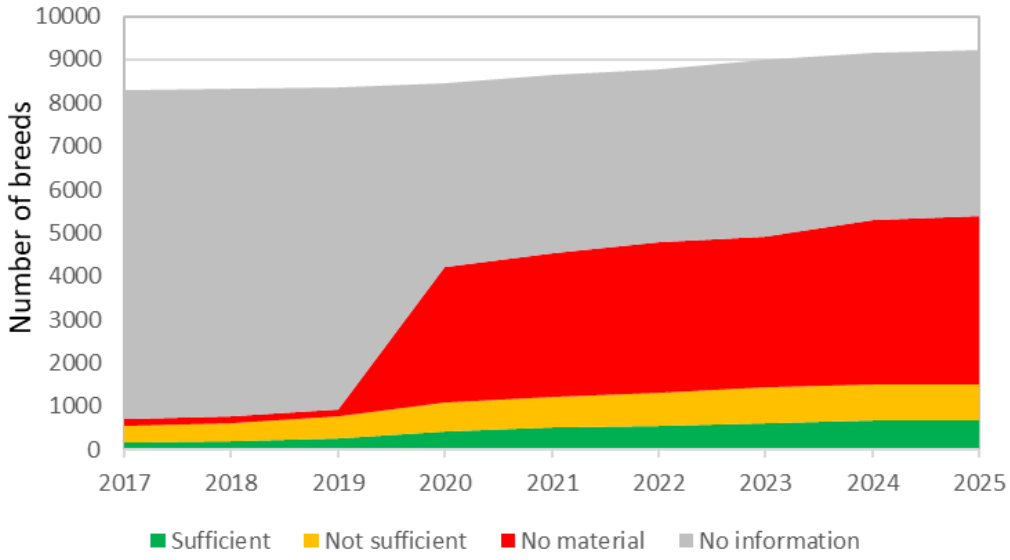
Note: The figures for each region include local breeds and regional transboundary breeds. International transboundary breeds (breeds present in more than one region) are listed separately.
Source: DAD-IS (accessed August 2025).

5.2. Trends in cryoconservation status of livestock breeds

Figure 1B15 illustrates the annual changes in cryoconservation status of breeds between 2017 and 2025,as reported in DAD-IS. Reporting improved significantly over time. Since 2017, the proportion of breeds with known status has increased from 9 percent to 58 percent, with a notable upturn in 2020, when a targeted data collection campaign was carried out. This effort directly engaged National Coordinators, each of whom were provided with data collection sheets tailored for his or her respective country. Since 2020, among breeds with a known status, the share of breeds with no material collected has decreased slightly, from 74 percent in 2020 to 72 percent in 2025. Over the same period, the

proportion of breeds with sufficient material stored increased from 10 to 12 percent, while the proportion with some, but insufficiently plentiful material remained relatively stable at around 16 percent.

Figure 1B15. Changes in cryoconservation status of breeds between 2017 and 2025



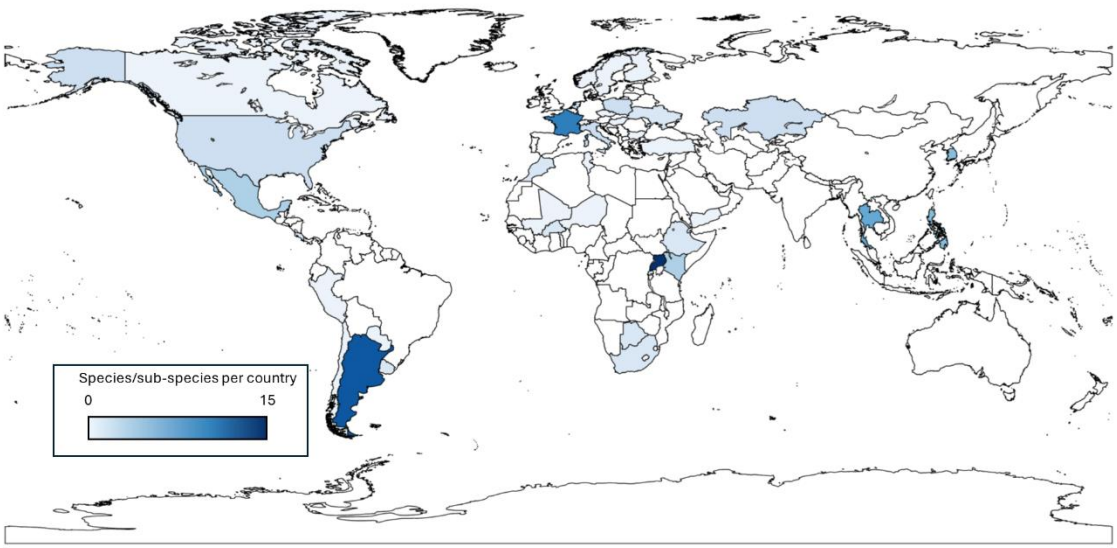
Source: DAD-IS (accessed August 2025).

6. State of reporting for managed bee populations

Since the end of 2020, DAD-IS allows the entry of data on managed bees for food and agriculture. As of August 2025, 41 countries had submitted data for 109 national bee populations, corresponding to a total of 48 species and subspecies (see Figure 1B16). Among the national species and subspecies of bees reported by countries, 48 national bee populations have been documented with colony numbers. For several of these populations, data have been provided across multiple years, enabling the presentation of time-series information. The current amount and geographical coverage of data are

nevertheless not yet sufficient to inform the development of regional or international policies and strategies to conserve the genetic diversity of managed bees.

Figure 1B16. Numbers of managed bee species and subspecies recorded by countries in DAD-IS



Source: United Nations Geospatial. 2020. Map of the World. United Nations. Cited 02 July 2024. www.un.org/geospatial/file/3420/download?token=TUP4yDmF modified with DAD-IS; https://www.fao.org/dad-is DAD-IS (accessed August 2025)
Notes: Final boundary between the Sudan and South Sudan has not yet been determined. Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

7. Conclusions

Since the second SoW-AnGR, the number of national breed populations recorded in DAD-IS has continued to increase. New data sets have been added, regarding cryoconservation and domesticated bees for food and agriculture. However, breed-related information remains far from being complete. For 44 percent of all reported breeds, the risk status remains unknown because of a lack of population data. The data gaps highlighted in the second SoW-AnGR persist, with missing information still evident for certain regions and species. For example, in Africa, Latin America and the Caribbean and Near & Middle East, over 90 percent of avian breed populations have no recorded population data for any of the past ten years. Among breeds with known risk status, the majority is considered to be at risk of extinction, due to a small population size, while the number of extinct breeds has continued to increase. The comparison with the figures provided in the second SoW-AnGR shows that threat of genetic erosion in the livestock sector is greater than ever, inasmuch as the percentage of breeds classified as at risk has risen globally from 17 percent in 2014 to 29 percent in 2025.

DAD-IS now allows countries to report the cryoconservation status of livestock breeds, with an increasing number of populations being documented as having genetic material stored. Nevertheless, the cryoconservation status is 42 percent of breeds and only 7 percent of breeds a quantity of genetic material stored to allow the reconstitution of the breed in case of extinction. Relatively high levels of cryoconservation efforts have been reported for ruminant species, especially for cattle, but less than 7 percent of breeds from avian species have any stored material and for most of these breeds the quantity stored would not be sufficient to reconstitute the population. Therefore, especially for avian breeds,

579 increased efforts are required to improve cryoconservation, including through the use of new
580 technologies, such as primordial germ cells (Nakamura, 2016). The SDG target 2.5 “By 2020, maintain
581 the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related
582 wild species” has not been achieved by far regarding its livestock component. Further efforts are hence
583 required to fill knowledge gaps in population monitoring, as well as in the implementation of
584 conservation efforts, both *in situ* and *ex situ*.

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