EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS





EURC-EAB : Review and Proposal for the indicators used to assess the status of endangerement breeds

Stéphanie Minéry, **Coralie Danchin**
6-7 May 2025, Athens

ELGO - DIMITRA

WAGENINGEN UNIVERSITY & RESEARCH

INSTITUT DE L'ELEVAGE idele

Federal Office for Agriculture and Food

1

EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

Analyse of the 2023 Survey completed by email sollicitations (2024/2025)

- Number of answers : **35 countries**

Use the classification system given by FAO (2013)	Yes	14 countries	Croatia, Czech Republic, Denmark, Greece, Ireland, Italy, Latvia, Lithuania, Malta, Montenegro, The Netherlands, Rep. Of Cyprus, Slovenia, Sweden	≈50%
	Yes, but adjusted	2 countries	Norway, Portugal	
	No	14 countries	Austria, Belgium, Bulgaria, Estonia, France, Germany, Luxembourg, Poland, Serbia, Slovakia, Spain, Switzerland, UK, Iceland	≈50%
	No specified	5 countries	Finland, Georgia, Hungary, Romania, Armenia	

WAGENINGEN UNIVERSITY & RESEARCH

INSTITUT DE L'ELEVAGE idele

Federal Office for Agriculture and Food

2

EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

FAO, 2013. "In vivo conservation of animal"

➔ **Based on demographic data** :
population size, breeding females, population trend, pure-breeding

TABLE 3
Risk categories according to species' reproductive capacity

Reproductive capacity	Males (n)	Breeding females (n) ≤100	101 - 300	301 - 1 000	1 001 - 2 000	2 001 - 3 000	3 001 - 6 000	>6 000
High*	≤5							
	6 - 20							
	21 - 35							
	>35							
Low**	≤5							
	6 - 20							
	21 - 35							
	>35							

– critical, – endangered, – vulnerable and – not at risk.
*High reproductive capacity species – pigs, rabbits, guinea pigs, dogs and all poultry species.
**Low reproduction capacity species – horses, donkeys, cattle, yaks, buffaloes, deer, sheep, goats and camelids.

TABLE 4
Risk categories for species with high reproductive capacity* **Pigs, Rabbits, Poultry**

Population trend and pure-breeding proportion	Males (n)	Population size (n) ≤80	81 - 20	121 – 800	801 - 1 200	1201 - 1 600	1601 - 2 400	>2 400
Increasing trend and >80% pure-breeding	≤5							
	6 - 20							
	21 - 35							
	>35							
Stable or decreasing trend or ≤80% pure-breeding	≤5							
	6 - 20							
	21 - 35							
	>35							

– critical, – endangered, – vulnerable and – not at risk.
*High reproductive capacity species – pigs, rabbits, guinea pigs, dogs and all poultry species.

TABLE 5
Risk categories for species with low reproductive capacity* **Cattle, Sheep, Goats, Horses**

Population trend and pure-breeding proportion	Males (n)	Population size (n) ≤240	241 - 360	361 - 2 400	2 401 - 3 600	3 601 - 4 800	4 801 - 7 200	>7 200
Increasing trend and >80% pure-breeding	≤5							
	6 - 20							
	21 - 35							
	>35							
Stable or decreasing trend or ≤80% pure-breeding	≤5							
	6 - 20							
	21 - 35							
	>35							

– critical, – endangered, – vulnerable and – not at risk.
*Low reproduction capacity species – horses, donkeys, cattle, yaks, buffaloes, deer, sheep, goats and camelids.

3

EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

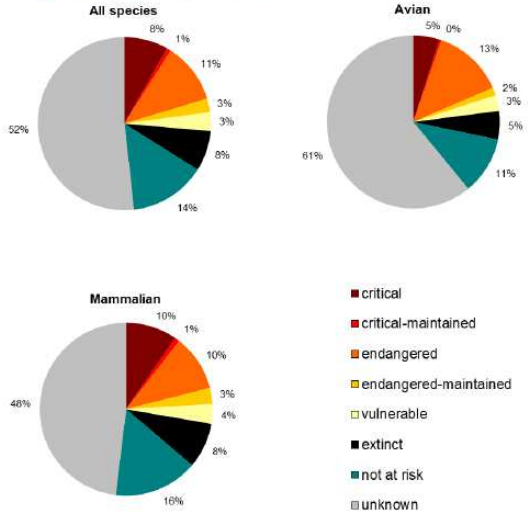
Status and trends of animal genetic resources 2024

FAO, March 2025

➔ **≈ 50% unknown** for the risk status, at a world level

WAGENINGEN UNIVERSITY & RESEARCH

Figure 4. Proportions of the world's breeds by risk status category, overall and according to species type (mammalian and avian)



Based on data reported by National Coordinators for the Management of Animal Genetic Resources to DAD-IS by June 2024.

4

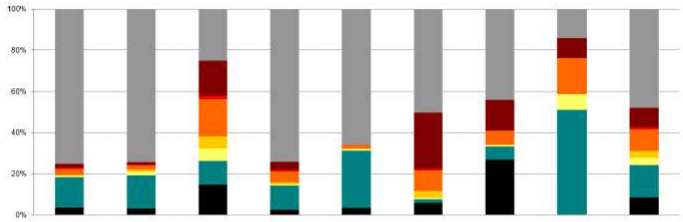
EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

Status and trends of animal genetic resources 2024

FAO, March 2025

➔ Europe & the Caucasus : **25% unknown** for the risk status for mammalian breeds

Figure 7. Risk status of the world's mammalian breeds in June 2024: absolute (table) and percentage (chart) figures by region and for international transboundary breeds



	Africa	Asia	Europe & the Caucasus	Latin America & the Caribbean	Near & Middle East	North America	Southwest Pacific	International transboundary breeds	World
Unknown	545	1103	679	377	136	61	56	56	3013
Critical	15	14	463	19	0	33	19	38	601
Critical-maintained	4	7	42	4	0	1	0	0	58
Endangered	21	29	489	27	4	12	9	69	660
Endangered-maintained	3	17	159	5	0	4	0	0	188
Vulnerable	6	25	164	3	2	1	1	30	232
Not at risk	106	241	309	60	57	2	8	202	985
Extinct	26	44	401	12	7	7	34	0	531
Total	726	1480	2706	507	206	121	127	395	6268

WAGENINGEN UNIVERSITY & RESEARCH

Based on data reported by National Coordinators for the Management of Animal Genetic Resources to DAD-IS by June 2024.

5

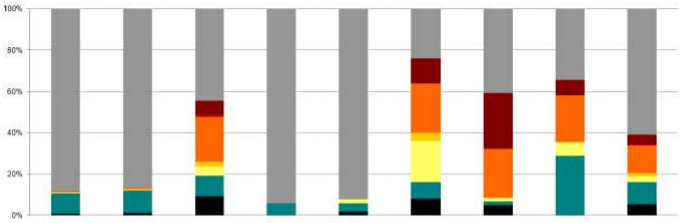
EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

Status and trends of animal genetic resources 2024

FAO, March 2025

➔ Europe & the Caucasus : **44% unknown** for the risk status for avian breeds

Figure 8. Risk status of the world's avian breeds in June 2024: absolute (table) and percentage (chart) figures by region and for international transboundary breeds



	Africa	Asia	Europe & the Caucasus	Latin America & the Caribbean	Near & Middle East	North America	Southwest Pacific	International transboundary breeds	World
Unknown	223	511	571	112	48	6	24	55	1550
Critical	0	0	94	0	0	3	16	12	125
Critical-maintained	0	0	9	0	0	0	0	0	9
Endangered	2	4	276	0	0	6	14	36	338
Endangered-maintained	0	3	33	0	0	1	0	0	37
Vulnerable	1	1	55	0	1	5	1	11	75
Not at risk	25	64	127	7	2	2	1	46	274
Extinct	2	7	120	0	1	2	3	0	135
Total	253	590	1285	119	52	25	59	160	2543

WAGENINGEN UNIVERSITY & RESEARCH

Based on data reported by National Coordinators for the Management of Animal Genetic Resources to DAD-IS by June 2024.

6

EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

Analyse of the 2023 Survey completed by email sollicitations (2024/2025)

- For countries **who don't use the FAO system** (14 countries) :

Country	Pop size	Pop trend	Ne	Nm	Nf	Others criteria
Austria	X	X	X			
Belgium		X	X	X	X	
Bulgaria		X	X		X	X
Estonia				X	X	
France		X	X		X	X
Germany			X			
Luxembourg						X
Poland		X	X		X	X
Serbia		X	X			x
Slovakia			X			
Spain		X		X	X	X
Switzerland	X	X	X	X	X	X
UK					X	
Iceland	X	X	X			

X : main criteria for the country

- 10 countries are using **Ne** (generaly computed from Nf and Nm)
- 8 countries are using **number of female breeding animals**
- 9 countries are using **population trend**
- 4 countries are using **number of male breeding animals**
- 3 countries are using **population size**

➔ Most countries use **several criteria**

7

EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

Analyse of the 2023 Survey completed by email sollicitations (2024)

- The « other criteria »

Country	For what ?	The other criteria
Bulgaria	To adjust thresholds	geographic concentration; number of farms; relative size of farms; cryo-preserved reproductive material in gene banks; market for products and services related to the breed; economic importance for the country; economic importance for the region
France	To adjust thresholds	trend Nf ; proportion of females bred as pure; effective population size; health risk; breeding organisation capacity; economic and social support
Poland	To compute risk status	geographical concentration ; demographic trend within the last 5 years; cultural value ; chain of custody (DNA testing) ; ex situ conservation ; anthropogenic factors (existence of breeders' organisations, financial support, activity and age of breeders).
Serbia	to categorizing the level of vulnerability	degree of inbreeding ; population trend; geographical distribution of the population ; potential risk of epidemics ; existence of a sustainable use program ; interest of public opinion for a certain race.
Spain	To allow a change of status, on an exceptional basis	inbreeding rate ; socio-economic technical criteria (geographic distribution; population trend; number of farms ; material stored in a germplasm bank) ; other sectoral or socio-economic factors
Switzerland	To compute risk status	pedigree information ; introgression ; geographic distribution ; cryo conservation plan ; socio-economic and environmental information. [**GENMON WebGIS platform**]

WAGENINGEN UNIVERSITY & RESEARCH

INSTITUT DE L'ELEVAGE idele

Federal Office for Agriculture and Food

8

EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

Comparison of thresholds Number of breeding Female (Nf)

Endangered	Cattle	Sheep	Goats	Horse	Pigs	Poultry
Austria*	7500	10000	10000	5000	15000	25000
France, basic	7500	6000	6000	8000	1000	500
France, adjusted	11250	9000	9000	12000	1500	750
Bulgaria, basic	7500	6000	6000	10500	3000	750
Bulgaria, adjusted	12500	10000	13000	16000	6000	1500
Poland	7500	6000	6000	10000	1000	500
UK*	7500	10000	10000	5000	15000	25000
Spain*	7500	10000	10000	5000	15000	25000
Estonia	1000	1000	1000	1000	1000	10000
FAO (2013) endangered	3000	3000	3000	3000	1000	1000
MEAN	**7275**	**7100**	**7400**	**7550**	**5950**	**9000**

* EU thresholds 2006

9

EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

Analyse of the 2023 Survey completed by email sollicitations (2024/2025)

- For countries **who don't use the FAO system** (14 countries) :

Country	Pop size	Pop trend	Ne	Nm	Nf	Others criteria
Austria	X	X	X			
Belgium		X	X	X	X	
Bulgaria		X	X		X	X
Estonia				X	X	
France		X	X		X	X
Germany			X			
Luxembourg						X
Poland		X	X		X	X
Serbia		X	X			x
Slovakia			X			
Spain		X		X	X	X
Switzerland	X	X	X	X	X	X
UK					X	
Iceland	X	X	X			

- 10 countries are using **Ne** (generaly computed from Nf and Nm)
- 8 countries are using **number of female breeding animals**
- 9 countries are using **population trend**
- 4 countries are using **number of male breeding animals**
- 3 countries are using **population size**

➔ Most countries use **several criteria**

10

EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

Analyse of the 2023 Survey completed by email sollicitations (2024/2025)

- The main « other criteria »

Country	Geographic concentration	degree of inbreeding	cryo conservation plan	Sanitary risk	Economic factors	Social factors
Bulgaria	X	Via Ne	X		X	X
France	X	Via Ne	X	X	X	X
Poland	X	Via Ne	X		X	X
Serbia	X	X		X	X	X
Spain	X	X	X		X	X
Switzerland	X	X	X		X	X

11

EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

Comparison of thresholds Effective population size (Ne)

	critical	endangered		monitored	not endangered
Serbia Slovakia* Poland	< 50		50-200	200-1000	> 1000
Germany*			< 200	200-1000	> 1000
Belgium*			< 100		
Austria			< 200		
Bulgaria			< 245		
France	< 45	95	145	195	> 245
Switzerland	50		250		

*Ne = main criterion

12

EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

Comparison of thresholds Number of Male (Nm)

Endangered	Cattle	Sheep	Goats	Horse	Pigs	Poultry
Spain	150	200	200	100	300	500
Estonia	20	20	20	20	20	1000
FAO (2013) endangered	20	20	20	20	20	20
FAO (2013) vulnerable	35	35	35	35	35	35

WAGENINGEN UNIVERSITY & RESEARCH

idele

Federal Office for Agriculture and Food

13

EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

Example of use of adjusted thresholds

- France example : for "local breed" defined as per French regulations (Code Rural, Article D-653-9) as "a breed mainly linked to a specific territory by its origins, its location, or its use", where "territory" means a small subsection of the country.

Verrier *et al.*, 2015

Last update : January 2023

Number of breeding females*	Cattle	Sheep	Goats	Horse	Pigs	Poultry
Basic thresholds	7,500	6,000	6,000	8,000	1,000	500
Adjusted thresholds	11,250	9,000	9,000	12,000	1,500	750

If **aggravating circumstances** (+50%)

WAGENINGEN UNIVERSITY & RESEARCH

idele

Federal Office for Agriculture and Food

*with at least one offspring

14

EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

What are « aggravating circumstances » ?

- France example

How to determine « **aggravating circumstances** » ?

6 modulating indicators => 6 Partials scores

1. Recent evolution of the number of breeding females => $SCORE_1$
2. Percentage of cross-breeding => $SCORE_2$
3. Effective population size => $SCORE_3$
4. Potential risk of epidemics => $SCORE_4$
5. Breeder organization and technical support => $SCORE_5$
6. Socio-economic context => $SCORE_6$

GLOBAL SCORE

0 — 5

No at risk — Maximum risk

Aggravating circumstances if

GLOBAL SCORE **> 2.5**

or 2 PARTIAL SCORES **> = 4**

WAGENINGEN UNIVERSITY & RESEARCH

idele

15

EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

The sanitary risk

- France example

Example of score of sanitary risk ($SCORE_4$)

0 — 5

No at risk — Maximum risk

Presence of epizootics	Geographic concentration		
	Low	Medium	High
Low	0	1	3
Medium	1	2	4
High	3	4	5

WAGENINGEN UNIVERSITY & RESEARCH

idele

Federal Office for Agriculture and Food

16

EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

Example of Score for breeder organization and technical support

- France

Score for **breeder organization and technical support** ($SCORE_5$)

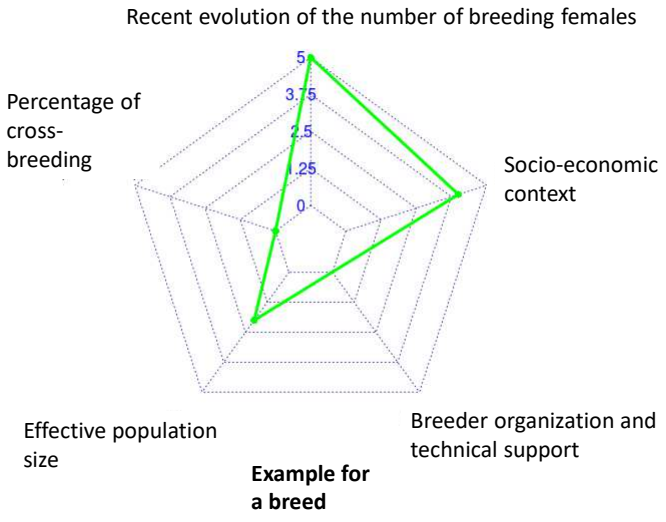
0 — 5
No at risk — Maximum risk

Indicators	SCORE
Professionalization and involvement of breeders	Majority of professionals involved = **0**; involved amateurs or professionals with little involvement = **0.5**; uninvolved amateurs = **1**
Breeders association present & Cohesion of breeders	Yes = **0**; intermediate = **0.5**; no = **1**
In situ management program	Yes = **0**; no = **1**
Stock in cryobank	Yes, with more than 10 donor animals = **0**; yes with less than 10 donor animals = **0.5**; no = **1**
Technical support present	Yes, with local experts and national support = **0**; yes, with either local experts or national support = **0.5**; no = **1**

17

EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

The breed RADAR



INRAE CTIG

➔ To identify the kind of risk for the endangered breed

0 — 5
No at risk — Maximum risk

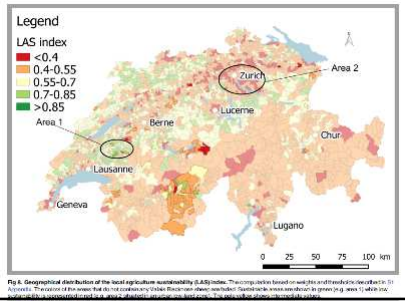
18

EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

Switzerland

A WebGIS platform for the monitoring of Farm Animal Genetic Resources (GENMON)

- Available for countries
- « Easy-to-use », multi-criteria, **BUT need available and suffisent data**
- Under dvt to used marker-based genetic information



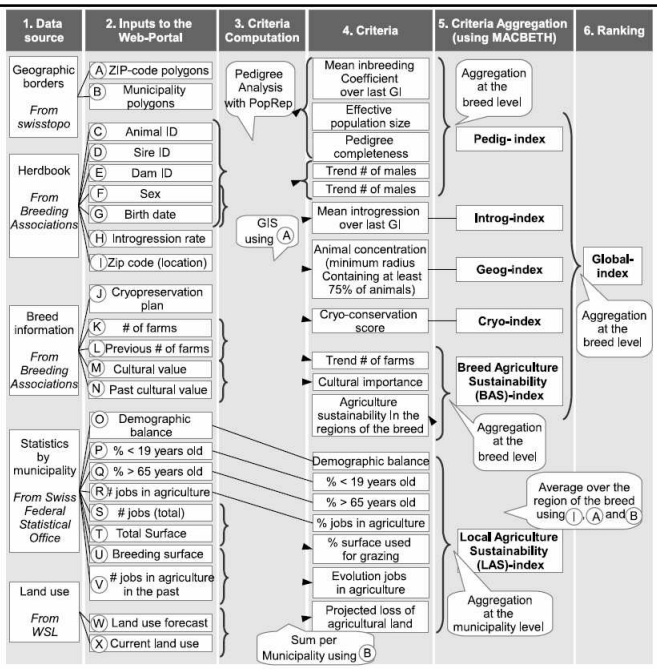


Fig 2. Overall GENMON Process. The process starts with data input followed by criteria processing, integration and aggregation; GI: generation interval, GIS: Geographic Information System, Pedig-Index: index accounting for pedigree and genetic diversity, Introg-Index: introgression index, LAS/BAS Index: Local/Breed Agriculture Sustainability indices, accounting for socio-economic and environmental sustainability of breeding conditions; swisstopo is the Swiss Federal Office of Topography (http://www.swisstopo.admin.ch/, WSL is the Swiss Federal Institute for Forest, Snow and Landscape Research.

19

EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

ERFP Task Force – Risk Status and Indicators – Final Report 2015

Indicators classified as

ERFP

- Primary indicators :
  - Numerical indicator : **Number of breeding females**
  - Genetic erosion : **Inbreeding rate / generation *(or Ne)***
  - Geographic concentration of the population
- Secondary indicators on social, economical, environmental and political aspects

WAGENINGEN UNIVERSITY & RESEARCH

INSTITUT DE L'ELEVAGE idele

Federal Office for Agriculture and Food

20

EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

Possible recommandations as EURC-EAB

- Primary indicators (demographic)

1. Number of breeding females (or population size)
2. Ne

Thresholds to be decided

When possible :

3. geographical distribution of the population
4. breeders organisation
5. socio-economic factors

Thresholds to be adjusted

=> Each country is in charge of the **adjusted thresholds + final SCORE**

WAGENINGEN UNIVERSITY & RESEARCH

idele

Federal Office for Agriculture and Food

21

EUROPEAN UNION REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

Next Steps : proposals

- Do you think about **any other kind of indicators** ?

- EURC-EAB goal : answering an EU country **asking for recommendations** about risk status

-Inclusion of ERFP WG experts in the guidelines review?

WAGENINGEN UNIVERSITY & RESEARCH

idele

Federal Office for Agriculture and Food

22