European Regional Focal Point for Animal Genetic Resources

ERFP Task Force – Risk Status and Indicators

Final Report

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In all levels, global, regional and national, it is requested to develop indicators to better describe the trends and developments of animal genetic resources. In 2007, the Global Plan of Action (GPA) emphasizes the importance of developing Early Warning System Tools. These surveillance systems will necessarily be based on indicators. Countries agreed the GPA in Interlaken, and Europe has naturally set to work to develop indicators from the database EFABIS, but also think about the different tools, indicators, that could be added to EFABIS. Meanwhile, other regional bodies (European Environmental Agency, EEA), has set to work to achieve the 2010 target: reduce biodiversity loss. Genetic Resources are whole parts of Biodiversity. In order to "reduce biodiversity loss," we must be able to describe it (what is done in EFABIS and DAD IS), and describe its evolution, and the pressures that occur on animal genetic resources.

Since 1992, biodiversity, and thus the AnGR, are under national responsibility. Breeds have been developed over time through any genetic exchanges between populations of animals, and selection of livestock groups of a particular color, a particular characteristic, a particular performance. These breeds are not fixed; the breeding programs evolve constantly to meet the economic, social or cultural expectations. With the development of international trade, groups of farmers can be now more attracted to exotic breeds, with some options available: to appropriate the entire management of the population imported or stay connected more or less important with the starting population. The question therefore arises: "What are the breeds existing today in my country which are part of a national heritage? ". Now that the human and financial resources are limited to conserve, manage, enhance the national breeds, we must have a series of indicators that will allow assessing the evolution of the "genetic health" of populations, as well as the socioeconomic context in which they operate. It will be increasingly able to target assistance and capacity to maintain the heritage we have inherited... and we created. The conservation, improvement and enhancement of these breeds can thus only become better.

The FAO member countries share a number of definitions, which were the subject of considerable discussion before being accepted. European countries have felt the need to characterize their breeds on additional definitions in order to increase the set of tools and indicators that highlight our links and differences between countries. The first step of work on the native breeds was developed in an outer frame to the FAO, within the EEA in 2008.

Consensus between European countries was then found to develop an indicator based on the notion of native breed. The first step was declarative: each country should declare what are the native breeds or not.

However, an indicator must be calculated automatically, without being obliged to interact with a large number of intermediaries before making public the results of the analysis. Therefore it is indispensable to have a common terminology, on which we could categorize our breeds within EFABIS. These three years of exchange of ideas led to additional categories to those in DAD IS EFABIS and to develop regional indicators, while understanding perfectly that these definitions may correspond only to one regional vision but not being in accordance with global level. This will subsequently implement the rule of European genetic resources, and may even help the national coordinators to better know their breeds.

Task Force –Indicators and definitions – Part 1

Native – Locally adapted – Exotic breeds, what Europe need to define for a better understanding and comparison between farm animals populations?

2013

What is a native breed for Europe?

The definition of "native" must take into account everything that contains genetically but also historically the development of breeds. No one can deny the importance of genetic exchanges between countries in the development of most? breed, The idea is not to claim any liability (in the sense "return on investment") on breeds that each country could develop according to its own needs, but rather to help the national recognition of conserved populations, managed. It is important for us to have a category including populations moderately developed, and yet have and help shape our country. Having this category "native" will also allow us to distinguish between small herds exogenous episodic and small herds of breeds we should support.

European meetings (Tekirdag 2011, Padua 2012) Task Force "indicators" have resulted in a common definition of "native breed." It became necessary to produce and distribute a document illustrating this definition with different European breeds.

Native Breed: A breed in its country of origin (i.e. the country where the breed was created originally from genetic material that was available when the initial breed development commenced). It is important to note that a breed may be a native breed in more than one country if it has a transboundary origin.

Different FAO documents[1] have already proposed breeds categories. Indigenous breeds, also called indigenous or native are defined as follows: "Originating from, adapted to and utilized in a particular geographic region, from a subset of the available locally adapted breeds." "Originating from a particular geographic region" fits well with the definition we have of "Native breed" even though FAO defined geographically and ERFP administratively defined the area of origin. A breed may be native from different countries if border intersects with the geographical origin.

[1] Guidelines or the development of country reports (FAO, 2000), The Legal Framework for the management of animal genetic resources (FAO, 2005)

Locally Adapted Breeds

In order to categorize all breeds of a country, we defined "Locally adapted breed", and the criteria that lead a breed to adapt to the local environment, production system, and reveal the strong and long-term involvement of breeders who manage the breed.

Locally Adapted Breed: A foreign/exotic breed that has become adapted to local environment and/or production system.

Here we have a difference with the meaning ascribed by FAO for Locally Adapted Breed ("Which have been in the country for a sufficient time to be genetically adapted to one or more of traditional production systems or environment in the country"). By clarifying the definition of "native breed" as a subset of "Locally adapted breed", FAO considers locally adapted breeds as broad and gathering indigenous breeds with those imported and managed from an enough long time to be adapted. With European definitions, we make a difference between populations originally developed in the national territory of those from exotic populations that we adapt to our own genetic management, production systems.

Thus a Locally adapted breed is a breed of exotic origin (thus departing native of another country), imported in the national territory, and limited genetic relationship with the original population. It is majority-controlled group of local breeders. We agree on the fact that locally adapted breed can become native.

A locally-adapted breed may become native if:

~ it has existed in the country for 40 years plus minimum 6 generations, **and**
~ there has been limited interbreeding with the breed in other countries, **and**
~ it has diverged into a distinct type
Note: it should be given a new name (for example add the name of the country)

After different sessions of the ITWG-AnGR in FAO, and in CGRFA, at its 14th session, para34 of the report, *the Commission [...] requested FAO to further develop DAD-IS so as to facilitate the entry of data, including those related to the new locally adapted versus exotic breed classification set out in the document Report of a consultation on the definition of breed categories, and so as to give countries the option of indicating that a given locally adapted breed is native to the respective country.*

To assist the development of policy to implement the international commitments of the CBD, to enable decision makers to help breeds who are not in immediate danger of extinction but have a strong heritage issue, the National Coordinators must promptly provide this information in EFABIS and/or DAD IS.

Categorisation of some breeds in UK *(source : comm. L.Alderson, 2012)*		
Large White (Yorkshire) pigs	native UK	'international' elsewhere
Dexter cattle	native Ireland	locally adapted UK
Connemara pony	native Ireland	locally adapted UK
Bazadaise cattle	native France	exotic UK

THOROUGHBRED

Twilight, the Thoroughbred mare who serves as the subject of the Equine Genome Project

The foundation of the Thoroughbred horse was created when Arabian, Barb and Turkoman horses, imported mainly during the 17C and 18C, were mated with native British horses (ponies)

All animals trace in tail male to one of three stallions known as the Foundation sires, Byerley Turk (1680-1696), Darley Arabian (1700-1733) and the Godolphin Arabian (1724-1753).

The Thoroughbred horse was developed in England where it was bred for racing and exported across the world. The pedigree of every horse can be traced back to the General Stud Book which was published in 1791 and since 1793 Weatherbys have recorded the pedigree of every foal born to thoroughbred race horses in the General Stud Book. From the early 1800s the only horses that could be called Thoroughbreds" and allowed to race professionally are those listed in the General Stud Book.

During the 18th and 19th centuries, the Thoroughbred breed spread throughout the world; they were imported into North America starting in 1730 and into Australia, Europe, Japan and South America during the 19th century. Millions of Thoroughbreds exist today, and 120,000 foals are registered each year worldwide.

Matchem, a grandson of the Godolphin Arabian, from a painting by George Stubbs

Summary:

- Basic genetic material: Middle East, North Africa, Britain 17C and 18C
- Creation and development of breed: Britain 18C and 19C
- Current distribution: Worldwide.
- UK Decision: Native breed of Britain

HUTSUL

The name of the breed is derived from the Hutsule population, now living in the provinces of Bucovine and Galicia, but originating in Ukraine. It is claimed to have 'emerged' in the 13C, maybe with tarpan and/or Mongolian influence, and introduced by migratory peoples into its current territory in the east Carpathians, especially Poland, Romania, Slovakia, and Ukraine, where they are adapted to the natural conditions.

They later spread into Hungary. They remained in that area isolated from other equine populations, and became robust and accustomed to the severe climatic conditions.

The first stud farm was created in 1856 in Romania, in Radauti (Bucovine) and some breeding lines were developed (Goral, Hroby, Ousor, Pietrosu and Prislop – the latter no longer exists) which were distinct in type. In 1933 Hutsul horses were sent in Czechoslovakia to establish a new stud farm and the Gurgul line).

A breed 'society' was formed in 1970 in Czechoslovakia and a register of animals the following decade. FAO recognised the critical endangerment of the breed in 1979 and the International Federation of Hutsul (HIF) was created in 1994. Currently there are circa 1740 breeding mares (reported in EFABIS in08/2013). Most of them live in Poland, Slovakia, Romania, the Czech Republic, and Ukraine.

Hutsul horses are classified as a pony breed; height 140 cm, weight 400-425 kg. It is strong, muscular and short-legged. Summary:

- Basic genetic material: Ukraine (but via various intermediate countries) 13C onwards
- Creation and evolution of breed: eastern Carpathians
- Current distribution: eastern Europe
- Decision: Native breed of the different countries (give names)

Hutsul in the Carpathian Mountains near Yasinia

MANGALICA

The Hungarian royal Archduke Jozsef was credited with the creation of the breed in 1833 when the blonde Mangalica was developed from older hardy types of Hungarian pig (*Bakonyi* and *Szalontai*) crossed with the *Sumadija* from Serbia and later with others such as the *Alföldi*, *Šiška* (Croatia/Bosnia/Serbia) and *Syrmien*.

The development in Hungary in the early 19C resulted in a fast-growing lard pig that became very popular in Hungary. In 1927 the National Society of Fat-Type Hog Breeders (*Mangalicatenyésztők Országos Egyesülete*) was established and the Mangalica was the most prominent swine breed in the region until the mid-20C.

Now the keeping of Mangalicas has become a popular hobby and there are currently slightly over 7000 Mangalitsa sows in Hungary. Mangalica fat is more unsaturated than normal pig fat, melts at a lower temperature and has a distinctive taste. It also is also healthier and keeps longer, due to higher levels of oleic acid. Meat from Mangalica can be easily found in Hungary, as Hungarian farmers produce about 60.000 animals each year. It is a lard-type breed and is unusual as it grows a hairy 'fleece'.

Summary:

- Basic genetic material: mainly Serbian and neighboring countries; early 19C
- Creation and evolution of breed: Hungary
- Current distribution: Hungary and neighboring countries Decision: Native breed of Hungary

Native breed of Hungary

SOUTHDOWN

The Southdown is a breed of sheep from England.

The Southdown is a native of southern England sheep. It was introduced precociously in France, on the occasion of the World Exhibition in Paris in 1855, when the Count de Bouille important first breeding in the Nièvre. This is one of the English breeds which is best established in France, used purebred or improve French breeds by crossbreeding. There are 196,000 animals Southdown in France in 1932, and numbers have increased to 600,000 expected in 1963. Since they are in decline and estimated the current number of sheep 175 0001.

Summary:

- Basic genetic material: South Downs in the South of England
- Creation and evolution of breed: England but no genetic links between French population and other populations in the world, specific breeding programme, different from the origin
- Current distribution: UK, France, Australia, New Zealand and America and many other countries across the globe
- Decision: Locally adapted in France, Native breed of UK

Task Force –Indicators and definitions – Part 2

In order to increase our knowledge and understanding of the evolution of AnGR we have to develop indicators on status and trends on AnGR. This will help to develop targeted programs for each breed, better appropriate to each of them.

TF is following the works of Genetic Resources Group of Environment European Agency on SEBI2010. The TF rely on different meetings, and on works done before and during the TF. During the work of the TF, different proposals have been integrated in EFABIS. It is a stone to better describe the evolution of breeds and for developing an Early Warning System tool in every country, as suggested in the Global Plan of Action.

The aim of the TF provide a box of tools to monitor AnGR, based on tools that are already used by different countries, and proposing some news tools and definitions where needed.

During the discussions, we classified the different tools in two major categories, which help to address the status of resources by diverse points of view

The indicators are classified as:

- Primary indicators
  - Numerical indicators
  - Genetic erosion
  - Geographic concentration of the population
- Secondary indicators, on social, economical, environmental and political aspects.

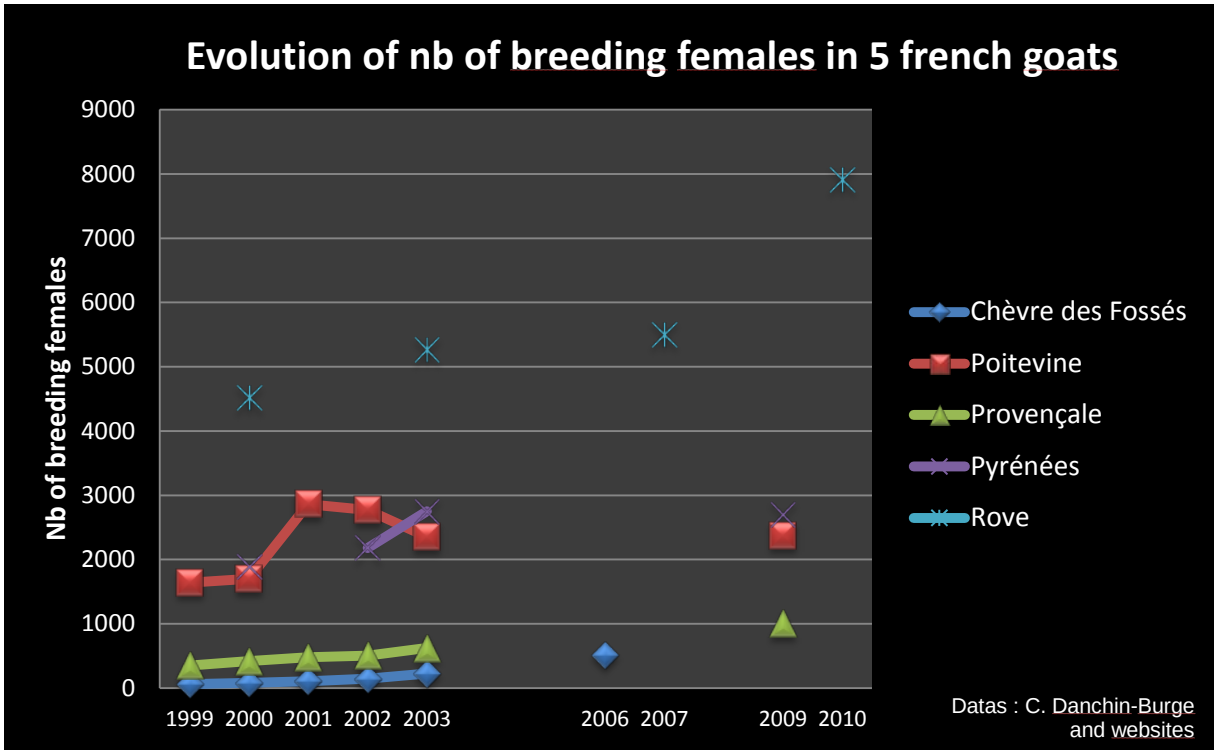
Considering that the same period ERFP supported a project that was dealing with the aspects of the geographic concentration of the breeds, and also on additional parameters that influence the trends of the breeds,i.e. social, economical and environmental aspects, it has been decided to work in common with the project group (lead : Christina Ligda and Andreas Georgoudis) (Tekirdag meeting, October 2011). ERFP project would work on " what could be developed " by testing the geographical criteria (primary indicators) and work on socio-economic indicators (additional parametes). The aim of the two groups is to provide tools and recommendations to ERFP NCs, and to the large community

of AnGR in Europe. The report of the project group is presented in the ERFP Assembly (Copenhagen 2014).

I - Primary indicators

1. Numerical indicators: Number of breeding females

Following earlier discussions, particularly during the SEBI 2010 meetings, it was agreed to use changes in the number of breeding females for approaching closely the evolution of the population of a breed, which is an approach where we can build on. This is the most common approach used to understand changes in population size, and provides an easy assessment of the evolution of the population.



Aiming to improve the level of awareness on the endangerment of a breed, or its possible evolution towards a heightened risk, thresholds were developed. FAO, EU, each country has its own thresholds. After several discussions, it was suggested that for simplification, it is acceptable to use thresholds regardless of the species, making a distinction between slow reproducing species or rapid reproduction (see the table below).

It was proposed to follow the example of the UK and to change the thresholds of the FAO (FAO-ERFP Workshop in situ management of AnGR June 2011, NL) for species with rapid reproduction.

Table 1. Number of breeding females – New Thresholds

Category	Cattle	Sheep	Goats	Equines	Pigs	Poultry
Critical	300	300	300	300	100	100
Endangered	3000	3000	3000	3000	1000	1000
Vulnerable	6000	6000	6000	6000	2000	2000
Not at risk	More than 6000	More than 6000	More than 6000	More than 6000	More than 2000	More than 2000

If we take the figures for 2003 for the 5 French breeds of goats here is the comparison chart of the results of different thresholds and our proposal :

Table 2. Categorization in risk status categories fo 5 french goat breeds

Year 2003	**FAO**	**Proposed thresholds**
Chèvre des Fossés 225 females	Endangered (100-1000)	Critical (less than 300)
Provençale 623 females	Endangered (100-1000)	Endangered (300-3000)
Poitevine 2353 females	Not at risk (more than 1000)	Endangered (300-3000)
Pyrenees 2750 females	Not at risk (more than 1000)	Endangered (300-3000)
Rove 5263 females	Not at risk (more than 1000)	Vulnerable (3000-6000)

Indicator 2: Genetic erosion

Countries generally do not rely on the simple indicator of number of breeding females. Indeed the effective population size (Ne) is regarded as the key criterion for assessing the endangerment status of a specific breed because it is closely related to inbreeding and THUS TO INCREASE LOSS OF ALLELES.

In DAD IS and EFABIS, Ne (mass selection) originates from the model proposed by Santiago and Caballero (1995, Genetics, vol. 139:1013-1030), that is here implemented in a simplified way as Ne x 0.7. A breed is classified as:

Class/Species	**Cattle/Bufalo**	**Sheep/Goat**	**Horse/Ass**	**Pigs**
Critically Endangered	Ne<14	Ne<20	Ne<11	Ne<33
Endangered	14<=Ne<20	20<=Ne<28	11<=Ne<16	33<=Ne<47
Minimally Endangered	20<=Ne<32	28<=Ne<45	16<=Ne<25	47<=Ne<74
Potentially Endangered	32<=Ne<67	45<=Ne<95	25<=Ne<52	74<=Ne<157
Not Endangered	>=67	>=95	>=52	>=157

According to this classification the breeds can be assigned to 5 categories. However, in order to facilitate the communication and understanding of policy makers, it is more convenient and efficient to keep the same categories as described previously**: critical – Endangered – Vulnerable – Not at risk**

Also, include the inbreeding rate / generation could provide more on population dynamics approaching genetic erosion.

Proposed thresholds:

		Genetic criteria Inbreeding rate / generation		
Species category[b]	***Endangerment Category***[c]	**> 3%**	**>1% =<3%**	**>.5% =<1%**
High reproduction capacity	*Critical* *Endangered* *Vulnerable*			
Low reproduction capacity	*Critical* *Endangered* *Vulnerable*			

	Year	Ne (mass selection)	Estimated ↑ in F per generation	Risk status (FAO - National level)	Risk status (EAAP - National level)	Proposed classification
Chillingham (UK)	1999	22	2,28	critical-maintained	Critically Endangered	Endangered
Katerini (Greece)	2013	70	0,71	endangered-maintained	Minimally Endangered	Vulnerable
Tarentaise (France)	2001	388	0,13	not at risk	Not Endangered	Not at risk
Albanian Prespa Cattle (Albania)	2013	50	1	endangered-maintained	Potentially Endangered	Vulnerable

With this new classification, we are in accordance with the definitions set before, in this document. It is more convenient than the use of 5 or 7 categories. Policy decisions need to be based on simple figures to be effective and applied on long term period.

We see that the 2 indicators, number of breeding females and F / generation, can give different results compare to the thresholds used by FAO. It's just meaning the population of the breed should be screened with the different indicators, more that through only one point of view. These two indicators are simple to use, and should be one elements of the different factors that describe the health of a population.

II - Secondary indicators, on social, economical, environmental and political aspects.

The work on the secondary indicators (additional parameters) is being developed by the team of the ERFP project, the report of this work is presented in the ERFP Assembly (Copenhagen, August 2014).

Considering the outcomes of the project team we propose an ad-hoc action as a means for the further development of the work on the socio-economic aspects, which requires expertise from scientists working on this domain, who will enrich the existing groups of ERFP in order to investigate the relevance of the different factors, the relation between them and how a routine system for collection of information, weighting of the parameters could be developed.

Conclusion

TF had a very important utility for the development of a European definition on Native breeds. It allows a better understanding of what we include under this "native" flag. Therefore, it became easier to discuss in the Commission on Genetic Resources of FAO. The new breed classification is being implemented in DAD-IS (locally adapted – exotic) and in EFABIS as (native – locally adapted – exotic).

The work on the geographic concentration and socio-economic and environmental parameters has been undertaken within the relevant ERFP project.

The further development of the work could be accomplished under an ad hoc action, in collaboration with the ERFP WG documentation and information, including also experts working on AnGR and socioeconomical aspects.

This is a proposal to be considered in the ERFP General Assembly.