

# Development of models assessing the breeds risk status by utilization of population and relevant georeferenced data

## **ERFP project**

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# Aim of the Project

- **Strategic priority of the Global Plan for Action (GPA)**
  - monitoring of trends and risks and the establishment of country based early warning and response systems.
- **Geographical dimension of livestock diversity**
  - Evaluate the population density as important additional criterion for a breed's status classification, in and between the countries
  - A common base on the information that should be collected and their format, including the spatial dimension
  - The integration of different types of information (demography, phenotypes, husbandry practices, socio-economic status, environmental data, etc.) into the estimation process of risk status and trends of the breeds
- **Investigate the possibility of developing models combining the different threatening factors into an index appropriate to classify the breeds according to their degree of endangerment.**

## Assessment of breeds' risk status (B)

Criteria for classification	Vulnerable	Endangered	Critical
<b>Numerical</b>			
▪(poultry/pigs)	<b>2000</b>	<b>1000</b>	<b>100</b>
▪(cattle/sheep/goats/horses)	<b>6000</b>	<b>3000</b>	<b>300</b>
<b>Geographical</b> (75% of the population within)	<b>50 km</b>	<b>25 km</b>	<b>12.5 km</b>
<b>ΔF</b>	<b>0.5% -1%</b>	<b>1%-3%</b>	<b>&gt;3%</b>

Breeds are categorized as vulnerable, endangered, or critical, according to the criteria described in in vivo guidelines , FAO, 2013 .

# Role of GISs' in Management of AnGR

- ❖ Relationships between livestock and environment, land use management, disease monitoring, biodiversity and genetic conservation.
  
- ❖ Investigate, visualize and integrate different types of information
  - Demography
  - Phenotypes
  - Husbandry practices
  - Socio-economic status
  - Environmental data
  
- ❖ Geographical referencing can be derived from different sources at different scales, such as coordinates, post codes, municipality location.

**The Project team has carried out case studies with data from several countries for breeds of different species using different methods of geographical referencing.**

## Geographical distribution of the investigated breeds

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Breed /species	Country	Population size (n of breeding females)	Radius of buffer including 75% of population (km)
Rough Fell sheep	United Kingdom	14100	14
Boreray sheep	United Kingdom	221	180
Brachykeratiki cattle	Greece	4143	114
Frizarta sheep	Greece	50000	36
Bela Krajina sheep	Slovenia	695	11
Bovec sheep	Slovenia	2002	8
Jezersko-solcava sheep	Slovenia	4469	64
Rendena cattle	Italy	3998	63
Maronesa cattle	Portugal	5226	18
Olkuska sheep	Poland	876	219

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# Material and methods: data collection

## Population data (at farm level):

- N of breeding females (or at least herd size)
- Farm location: Municipality (or village)

## Geographical data:

- Best: Geographic coordinates of farm
- Minimum: Geographic coordinates of the centroid of the municipality



# Classification of the investigated breeds in categories of Risk of Extinction

Breed /species	Using Population Size		Using Geographical Distribution	
	Population size (breeding females)	Status of Endangerment	Radius of buffer including 75% of population (km)	Status of Endangerment
Rough Fell sheep	14100	Not at Risk	15	Endangered
Boreray sheep	221	Endangered	180	Not at Risk
Brachykeratiki cattle	4143	Vulnerable	114	Not at Risk
Frizarta sheep	50000	Not at Risk	36	Vulnerable
Bela Krajina sheep	695	Endangered	11	Critical
Bovec sheep	2002	Endangered	8	Critical
Jezersko-solcava sheep	4469	Vulnerable	64	Not at Risk
Rendena cattle	3998	Not at Risk	63	Not at Risk
Maronesa cattle	5226	Vulnerable	18	Endangered
Olkuska sheep	826	Endangered	219	Not at Risk

Breed /species	Using Population Size		Using Geographical Distribution	
	Population size (breeding females)	Status of Endangerment	Radius of buffer including 75% of population (km)	Status of Endangerment
<b>Rough Fell sheep</b>	14100	Not at Risk	15	<b>Endangered</b>
<b>Boreray sheep</b>	221	<b>Endangered</b>	180	Not at Risk



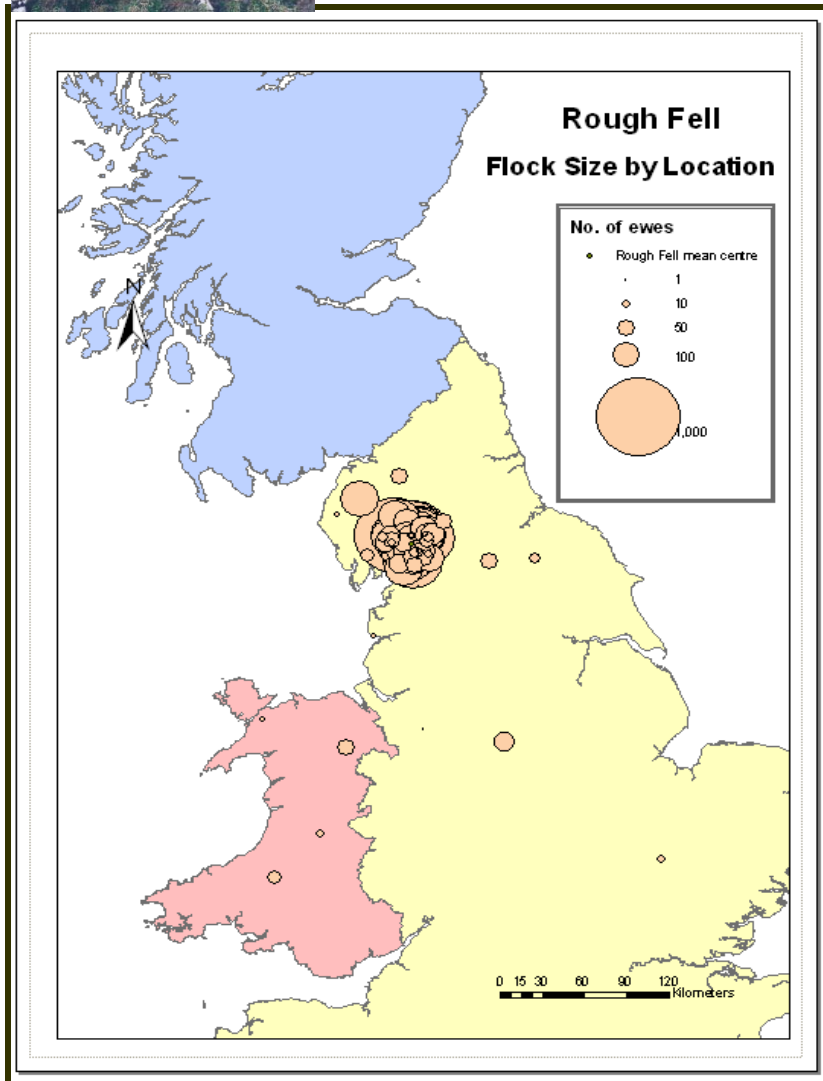
# Rough Fell 2006

Population size (breeding females)

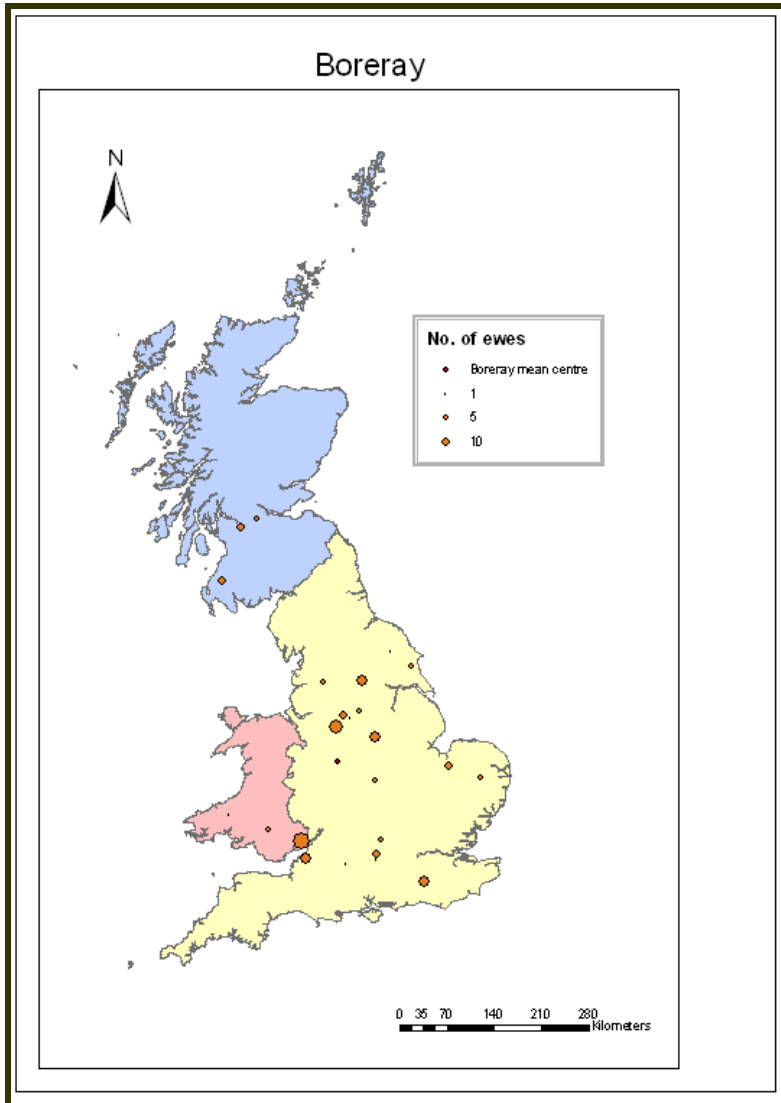
14100

Radius of buffer including 75% of population (km)

15



# Boreray 2006



**Population size (breeding females)**

**221**

**Radius of buffer including 75% of population (km)**

**180**

## Extinction Risk Index

is formed according to the following general formula:

**Extinction Risk Index =**

**b\_PopulationSize (CN/CV/CE/CC) +**

**b\_GeographicalConcentration (CN/CV/CE/CC )+**

**b\_RateOfInbreeding (CN/CV/CE/CC)**

To each category that characterize the degrees of risk of extinction a score of, 0, 1, 2, 3, respectively

Breed/ species	Not at Risk	Vulnerable	Endangered	Critical
	CN	CV	CE	CC
	0	1	2	3

The criteria of classification of the breeds into the categories of the risk of extinction are given weighting factors 1, 0.75 and 0.50, respectively.

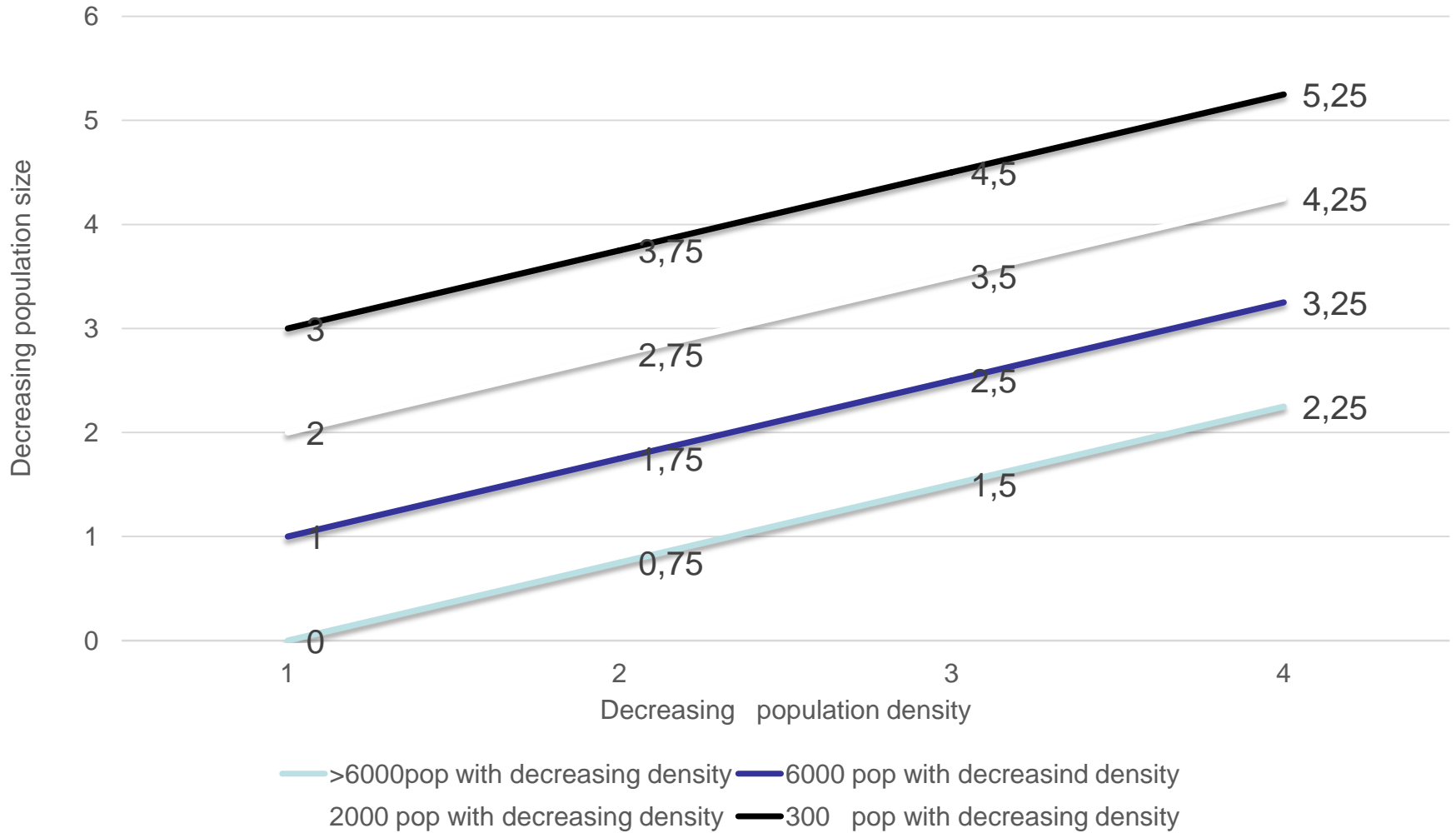
Breed/ species	Population size (Numerical)	<b>P</b>	1.00
	Radius of buffer (Geographical)	<b>R</b>	0.75
	Rate of inbreeding (D-F)	<b>F</b>	0,50

## Index evaluation of the breeds status of endangerment

Breed/ species				Not at Risk		Vulnerab le	Endan gered	Critical	Score by criteria	Final Score
				CN		CV	CE	CC		
				0		1	2	3		
Rough Fell sheep	Population size (Numerical)	P	1.00	0		-	-	-	0	1.5
	Radius of buffer (Geographical)	R	0.75	-		-	2	-	1.5	
	Rate of inbreeding (D-F)	F	0,50							
Boveray sheep	Population size (Numerical)	P	1.00	-		-	2	-	2	2
	Radius of buffer (Geographical)	R	0.75	0		-	-	-	0	
	Rate of inbreeding (D-F)	F	0,50							



## Extinction Risk Index



## Rank of the breeds

1 is indicating highest priority and 7 the lowest

Species / Breeds	Index	Rank (place)
Bela Krajina sheep	4,25	1
Bovec sheep	4,25	1
Maronesa cattle	2,5	2
Boveray sheep	2	3
Olkuska sheep	2	3
Rough Fell sheep	1,5	4
Brachykeratiki cattle	1	5
Jezersko-solcava sheep	1	5
Frizarta sheep	0,75	6
Rendena cattle	0	7

# Conclusions (A)

- Geographical approaches should be used to define risk status of local breeds
- Key points:
  - Uniformity of data collection: municipality or farm level, geographic coordinates (UTM better than national coordinates system), completeness of the dataset
  - Breeding females (most appropriate) or herd size, (in cases breeding females are not known)
  - Non conventional cases:
    - Large herd size, wide distribution, but few farms
    - Geographical concentration in more than one area

# Conclusions (B)

- All the systems of analysis produced comparable outcomes.
- Proposal of a model rather efficient and simple to apply combining the different threatening factors into an index appropriate to classify the breeds according to their degree of endangerment
- It is important for future development that
  - a consistent and standardized system is agreed and
  - that each country is using these tools to produce a reliable outcome.
- The same procedure could be used to evaluate the biodiversity status of the country

**THANK YOU  
FOR YOUR ATTENTION**