ERFP ad hoc action: Tools for the assessment of breeding programs for local breeds

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Rationale

- AnGR Strategy for Europe recommends the <u>development of sustainable breeding programs for local breeds aiming to improve performances maintaining the rusticity and resilience</u> of the breeds.

- Breeding programs are implemented by Breeders' Societies in Europe with varying level of success. Several European countries have established methods / indicators to monitor the effectiveness of the breeding programs. This is not the case in all countries.

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Objectives

- provide <u>tools to assess the effectiveness of the breeding programs</u> of local breeds in Europe, in terms of setting of breeding goals, management of genetic diversity, involvement of farmers. The integration of agro-ecological principles in the breeding programs will be also considered.

- The level of development (infrastructures, capacities etc) it is not the same in all cases, the AHA could propose various groups of indicators (or other tools) that could be appropriate in different conditions.

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Contribution to the goals of ERFP

The proposed Ad hoc action <u>supports the national capacities for the management of AnGR</u> and could enhance the work that is done at national level on the development of sustainable breeding programs.

It contributes

- to the implementation of the Global Plan of Action for AnGR in Europe

- to the enhancement of activities of NCs

- to the goals of AnGR strategy in Europe

- to the aims of WG Docu&Info

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Relevant previous ERFP work

- Final Report ERFP project: Socio-economic and environmental parameters and their applicability into a tool to evaluate risks and trends (2017)
    - Participating: France, Germany, Greece, Italy, Portugal, Spain (WG Docu Info)
- Material collected from NCs and WG members

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Group	Descriptors	Definition	New fields in EFABIS	Existing EFABIS fields
Breed viability (economic context)	Market recognition	Proportion of farms commercializing their most important product connected to the breed	Score	Specific product (text)
	Breed profitability	Profitability of the activities (all uses) involving the breed	Score	
	Continuity of activities	Proportion of young farmers and / or existence of successor	Score	
	Subsidies autonomy	Explanatory factor of breed viability (proportion of subsidies linked with the breed on the total net income). Not to be included in the charts, but only as explanatory statement in the output	Score	
Organization (genetic management of the breed)	Breeding/conservation program	Assessment of breeding / conservation programme based on elements described in the explanation box - Some information exist in EFABIS - a new text field need to be included	Score Text	% pure bred / AI / males in AI / description field on in vivo conservation
	Genebank	Level of GB developments (using 5 levels – from not existing to complete, 3 FAO categories + intermediate values) / Information on cryoconserved material exist in EFABIS	Score	Genetic material stored in Cryobanks

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Group	Descriptors	Definition	New fields in EFABIS		Existing EFABIS fields
Social context	Cooperation level	Level of cooperation between farmers and with other actors: assessment based on specific elements (provided in the explanation box)	Score	Text	Description of elements of the cooperation (see next sheet)
Cultural	Cultural value	Cultural value of the breed: assessment based on the specific elements described in existing text field in EFABIS	Score		Cultural value (text)

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Cooperation level	Implementation of research activities on the breed in collaboration with research bodies Cooperation with other Breeders' Associations Farmers cooperation in buying farm inputs Organization of visits to other farms of the breed Collaboration of breed markets
Cultural value	Has a role in maintaining handicrafts (taking into account local handicrafts that are directly or indirectly linked to the breed) Has a role in maintaining folklore (taking into account folklore and religious traditions that are directly or indirectly linked to the breed) Has a role in maintaining gastronomy (taking into account linkages between the breed and typical local products or recipes) Has a role in maintaining a specific landscape (taking into account the percentage of farms contributing to maintenance of a traditional landscape) Is represented in forms of higher artistic expression, such as figurative arts, poetry and prose Has a role as custodian of traditional farming practices, including the management of animals Level of cultural attachment of farmers to their breed
Breeding / Conservation programme	collective station, mating plan, use of Artificial Insemination % pure bred (low, intermediate, high), percentage of animals of the breed identified, percentage of farms under the performance recording scheme breeding index clearly defined, successful of breeding program (Does the breeding programme is achieving genetic gain in the breed population?; Genetic variability maintenance)

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Entering data in the socio-economic section

- All data entry forms and outputs separated from the standard entry and outputs sections.
- This section will be also under the NC account, with the option to choose whether the Outputs (and data) will be public or not (both options will be possible).
- Possibility to store data for multiple years.
- When the user enters the socio-economic environment, the score fields and descriptive text fields appear. The user can both update the descriptive fields and enter the values of the scores.
- Previous values of the score fields (and relevant descriptions) are stored as historical data.

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Proposed Outputs -1

1. Viewing the results of one breed

- The user selects a breed to view the socio-economic context at a given time. The layout is a dashboard containing:
- Basic information on the breed population, and risk status
- Radar Chart showing all scores for the most recent available year. The year of the data is also shown.
- Blocks of text around the chart containing the textual description of each score. Each description block is close to its respective score.
- The scores are not updated each year. The scores are valid for a period of years, not only for the year that the assessment is made.
- The user has the option to "scroll" the chart, i.e. to scroll through the years with available data. At each change of the year the scores on the chart and the descriptions are updated with the data stored for that year.

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Proposed Outputs -2

2. Viewing the results of several breeds

- to compare the socio-economic context of several breeds within a country. The user has to select breeds to compare.
- The layout is a set of radar charts, one for each chosen breed with the most recent data. The year of the scores assessment is also shown to each chart.

3. Searching tool.

- to search for a group of breeds matching to certain criteria based on the scores.
- The tool is comprised by two parts:
- search filters part - allowing to set a filter for each score (e.g. min and max value), filter for countries, filter for species
- results table containing list of breeds matching the search filters

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Proposed Outputs -3

3. Searching tool - With the search tool the user can find:

- Breeds with well developed genebank.
- Breeds with high cultural value, which are not part of well developed breeding programme.
- Profitable breeds, threatened by lack of new farmers.
- Breeds with poor market recognition, but in well developed breeding programme with good level of cooperation of the farmers, etc.

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Additional work – joint with the EAAP Med WG (in connection with the Workshop 2024, in Cyprus)

- Survey among colleagues within Mediterranean countries to assess the evolution of breeding programs

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12. Effectiveness of breeding programs for local breeds in the Mediterranean region and other harsh environments. (S+G, WG)

Prospects of breeding programs for small ruminant breeds in the Mediterranean region

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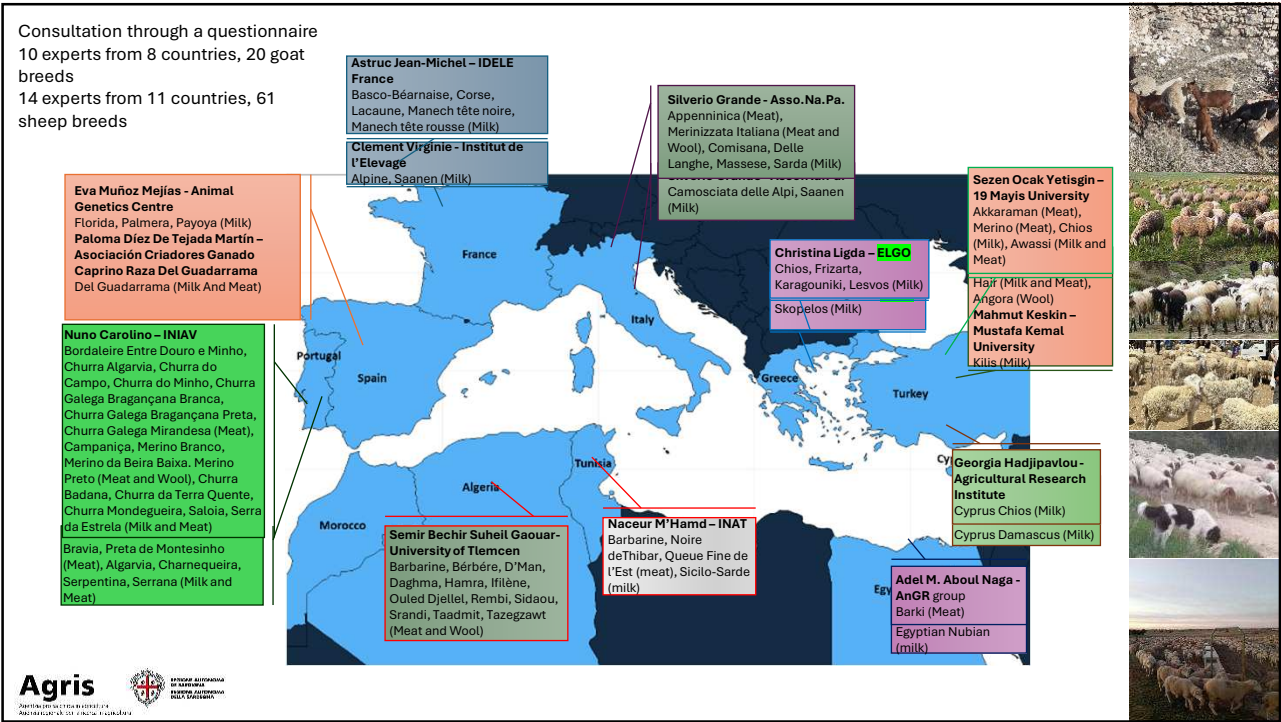75th EAAP Annual Meeting 1/5 September 2024 - Florence, Italy

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1) Describe the breeding scheme		
	a) Start date	Year
	b) Size (recorded population)	N / % of the total population
	c) Selection objectives including conservation	list the main
	d) Pedigree recording	Yes; No
	e) Artificial Insemination	Yes; No
	f) Single sire mating	Yes; No
	g) Multiple sire mating with pedigree discovery	Yes; No
	h) Performance recording	Yes; No
		list the main recorded traits
	i) Genetic evaluation	Yes; No
	j) Breeding center	Yes; No
	k) Gene Bank	Yes; No
	l) Are DNA analyses included in the breeding scheme?	Yes; No
	I) If yes for which goal:	
	Pedigree verification	Yes; No
	Pedigree discovery (multiple sire mating)	Yes; No
	Selection for candidate gene (ex. Scrapie)	Yes; No
	Genomic selection	Yes; No
	II) If no:	
	Do you plan to implement DNA analysis in the near future?	Yes; No
	For which goal(s)?	Please list
	m) Is there a plan to add/use innovative phenotypes for selection purposes?	Please list
	n) What is your evaluation of the effectiveness of the current breeding scheme?	Inefficient; Marginally Efficient
		Moderately Efficient; Highly Efficient; Optimal
	o) What are the main constraints that prevent the breeding scheme from reaching optimal efficiency levels?	
	I) cost and laboriousness of phenotypes and pedigree recording	
	II) cost, laboriousness and issues in using hormones of artificial insemination	
	III) cost of genomic applications (biological samples collection and/or genomic analyses)	
	IV) Other reasons: specify	
2) What will be the most likely evolution of the genetic management of this breed in the next ten years? (mark with X your choice)		
	a) No selection and/or conservation program	
	b) Traditional breeding scheme with performance and pedigree recording, and genetic evaluation. Artificial insemination program? Yes No	
	c) Breeding scheme based on genomic selection as in the traditional dairy cattle approach. Artificial insemination program? Yes No	
	d) Breeding scheme based on genomic selection and innovative approaches (genotyping of females, nucleus flocks, other ...)	

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- Description of the breeding scheme
    - a) Start date
    - b) Size (recorded population)
    - c) Selection objectives including conservation
    - d) Pedigree recording
    - e) Artificial Insemination
    - f) Single sire mating
    - g) Multiple sire mating with pedigree discovery
    - h) Performance recording
    - i) Genetic evaluation
    - j) Breeding center
    - k) Gene Bank
    - l) Are DNA analyses included in the breeding scheme?
    - m) Is there a plan to add/use innovative phenotypes for selection purposes?
    - n) What is your evaluation of the effectiveness of the current breeding scheme?
    - o) What are the main constraints that prevent the breeding scheme from reaching optimal efficiency levels?
        - I) cost and laboriousness of phenotypes and pedigree recording
        - II) cost, laboriousness and issues in using hormones of artificial insemination
        - III) cost of genomic applications (biological samples collection and/or genomic analyses)
        - IV) Other reasons: specify

- Evolution of the breeding scheme
    - a) No selection and/or conservation program
    - b) Traditional breeding scheme with performance and pedigree recording, and genetic evaluation.
        Artificial insemination program?
    - c) Breeding scheme based on genomic selection as in the traditional dairy cattle approach.
        Artificial insemination program?
    - d) Breeding scheme based on genomic selection and innovative approaches

(genotyping of females, nucleus flocks, other …)
    - e) ……………….. (other potential approaches: describe)

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Consultation through a questionnaire
10 experts from 8 countries, 20 goat breeds
14 experts from 11 countries, 61 sheep breeds

Astruc Jean-Michel – IDELE France
Basco-Béarnaise, Corse, Lacaune, Manech tête noire, Manech tête rousse (Milk)

Clement Virginie - Institut de l'Elevage
Alpine, Saanen (Milk)

Silverio Grande - Asso.Na.Pa.
Appenninica (Meat), Merinizzata Italiana (Meat and Wool), Comisana, Delle Langhe, Massese, Sarda (Milk)

Camosciata delle Alpi, Saanen (Milk)

Sezen Ocak Yetisgin – 19 Mayis University
Akkaraman (Meat), Merino (Meat), Chios (Milk), Awassi (Milk and Meat)

Eva Muñoz Mejías - Animal Genetics Centre
Florida, Palmera, Payoya (Milk) –
Paloma Díez De Tejada Martín – Asociación Criadores Ganado Caprino Raza Del Guadarrama
Del Guadarrama (Milk And Meat)

Christina Ligda - ELGO
Chios, Frizarta, Karagouniki, Lesvos (Milk)
Skopelos (Milk)

Hair (Milk and Meat), Angora (Wool)
Mahmut Keskin – Mustafa Kemal University
Kilis (Milk)

Nuno Carolino – INIAV
Bordaleire Entre Douro e Minho, Churra Algarvia, Churra do Campo, Churra do Minho, Churra Galega Bragançana Branca, Churra Galega Bragançana Preta, Churra Galega Mirandesa (Meat), Campaniça, Merino Branco, Merino da Beira Baixa. Merino Preto (Meat and Wool), Churra Badana, Churra da Terra Quente, Churra Mondegueira, Saloia, Serra da Estrela (Milk and Meat)
Bravia, Preta de Montesinho (Meat), Algarvia, Charnequeira, Serpentina, Serrana (Milk and Meat)

Semir Bechir Suheil Gaouar- University of Tlemcen
Barbarine, Bérbére, D'Man, Daghma, Hamra, Ifilène, Ouled Djellel, Rembi, Sidaou, Srandi, Taadmit, Tazegzawt (Meat and Wool)

Naceur M'Hamd – INAT
Barbarine, Noire deThibar, Queue Fine de l'Est (meat), Sicilo-Sarde (milk)

Georgia Hadjipavlou - Agricultural Research Institute
Cyprus Chios (Milk)
Cyprus Damascus (Milk)

Adel M. Aboul Naga - AnGR group
Barki (Meat)
Egyptian Nubian (milk)

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Has the traditional approach of selective breeding been feasible or successful everywhere?

Self evaluation		
Evaluation	Goat	Sheep
Highly Efficient	15%	11%
Moderately Efficient	55%	34%
Marginally Efficient	5%	25%
Inefficient	25%	30%

Highly efficient breeding schemes just in few dairy breeds, mainly in France, Spain and for some breeds in Italy and Greece

Lacaune, Assaf, Saanen, Alpine and some other breeds have been spreading in regions different from the original ones, as purebred or crossbreds, not always with appreciable outcomes

Most experts underline the great difficulties of correctly and efficiently applying the selection tools envisaged by the traditional approach

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Has the traditional approach of selective breeding been feasible or successful everywhere?

Main issues:

- Insufficient rates of artificial insemination and single sire mating

- Small effective size of the selected population

- Few recorded traits and low accuracy of phenotypes

- Low accuracy of pedigree

- No effective management of the genetic variability

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Has the traditional approach of selective breeding been feasible or successful everywhere?

Issues are the same all over the countries, but it seems that:

- In the northern Med shore, difficulties are due mainly to organizational problems and the lack of breeder awareness;

- In the southern Med shore, issues are due mainly to funding problems, technological delays and difficulties of data recording on a large scale mainly in very extensive systems

Successful implementation of selective breeding even less for meat breeds due to greater difficulties of performance recording in more extensive systems (greater use of performance test in Breeding Centers)

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Relevant questionnaire to assess the organization of Breeders and how they are involved in breeding decisions

- Information on the setting of breeding goals, management of genetic diversity, involvement of farmers
- To assess the constraints that impede the efficiency of the breeding scheme
- Reveal the links between local breeds and breeding practices within their production systems (aspects of integrating agro-ecological principles in the breeding programs will be also considered)

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Main topics	Specific elements	Remarks
Definition of stakeholders	Farmers / industry / regional administration /governement	*define the stakeholders (and role)*
Breeding association	Existing / not / % of farmers/	
Selection Scheme	Existing / not / % of farmers	
Tools applied by Selection Scheme	Milk recording, fat, protein, somatic cells, other traits? % under recording	*describe in details the scheme on the basis of the different elements provided*
	AI ? % of farms in AI?	
	Breeding Centre (yes/no)	
	Exchange of rams	
	Shearing ? Other common events?	
Definition of breeding goal	Definition of breeding goal? Genetic evaluation? Participation of farmers in defining breeding goal ?	*which organization ? Is there a dedicated arena? Who participates? (When? Where?) How the decisions are taken?*
Role of the Association / other activities	Main aims of the association	
	Cooperation with other Associations	
	Common provision of inputs	
	Common promotion of products; % of on farm selling	
	Implementation of research activities on the breed in collaboration with	

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Questions

- Setting up groups (in situ / Docu Info / ex situ)
- Which approaches
  - By species
  - Production system
  - Population size
  - Widespread breeds / Local breeds / endangered breeds

- Outputs .....
  - ERFP → enhance national capacities on the AnGR management
    - Tools and methodologies

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