

What is a hardy breed?

Results from a French scientific seminar

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Why this seminar?




REGULATION (EU) 2016/1012 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 8 June 2016

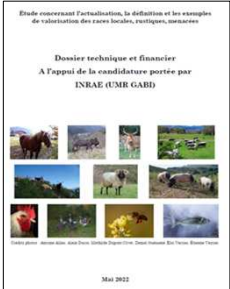
(41) The upgrading of offspring to the main section of breeding books should only be allowed through the female line, except in the case of equine species. However, for an endangered breed of the bovine, porcine, ovine and caprine species and **for 'hardy' sheep breeds** for which there are not enough purebred male reproductive animals, Member States should have the possibility to authorise the breed societies to apply less stringent rules for upgrading the progeny of those animals recorded in supplementary sections to the main section of the breeding book in order to avoid the further deterioration of the genetic diversity of those breeds.



Update of the List of endangered breeds?
Hardy breed? List of hardy sheep breeds?
Valorisation of local breeds?



Think tank with experts of AnGR
(from ruminants to fish and bees)



* Le Règlement Zootechnique Européen (RZUE, en vigueur dans tous les pays de l'Union depuis novembre 2018) impose de définir une liste de races ovines dites « rustiques »

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Two angles of view : Scientists and Breeders associations

Variable d'état

Temps

Modeling physiologists

Geneticists

Zootechnicians

Health specialists

Sociology

Ruminants - Breeders association

Monogastrics – Two selection companies

Local breeds – Breeder association

Regional conservatories of AnGR

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Scientists point of view

Variable d'état


Temps

Modeling physiologists

Geneticists

Zootechnicians

Health specialists



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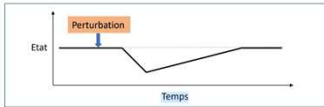
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Semantic issues

ANIMAL

Robustness: Robustness is the ability of the animal, in the face of environmental constraints, to keep doing the different things he needs to do to support his future reproductive ability

Resilience: Resilience is the animal's ability to cope with a temporary disturbance in its environment



PRODUCTION SYSTEM

Reflects the ability of the breeder to implement adjustments in response to external or internal disturbances and to quickly return the system to a routine regime

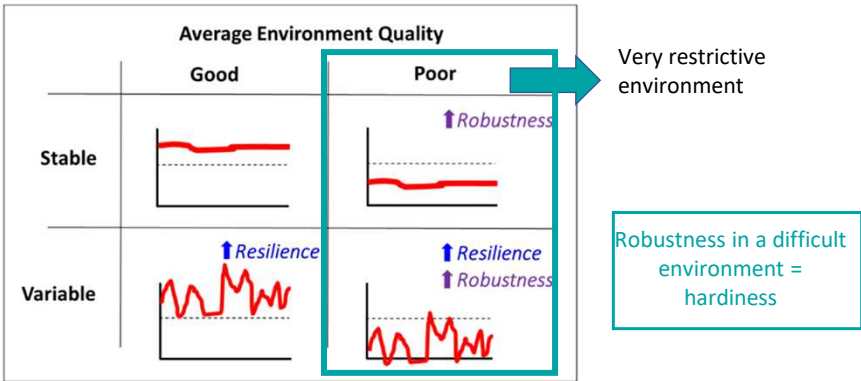
Hardyness??

Resilience capacities: ability to adapt

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What about hardyness?

Some scientist moved from Hardy breed to hardy animal, but for genetician and zootechnician, hardiness is about breed
Animal whose needs (nutrition, care, etc.) are low, which is by nature little affected by environmental constraints (very extensive environment)



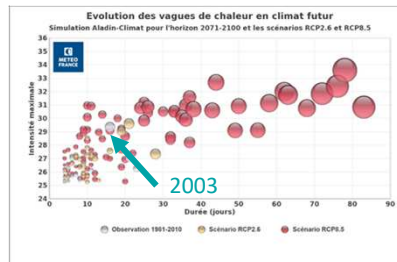
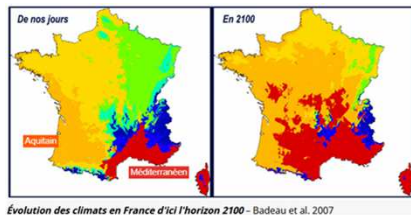
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Hardy animal is linked/undissociable from constraint of its environment/Production system

Disruptions to be considered more carefully

Beyond *stable vs. variable* :

- Duration: days/weeks/months
- Frequency
- Predictability



$$P = G + E$$

↓

$$P = G + E + G * E$$

Interaction génotype-
milieu

Which experimental models to describe production systems under changing environmental constraints?



INRAE

Séminaire races rustiques, vision des généticiens
20-23 Mars 2023 / Paris / Nicolas Bédère, Ingrid David

Vision des physiologistes modélisateurs
Laurence Pualet, Frédéric Douhard

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Conclusion

Robustness, resilience, hardiness: dynamic multi-criteria concepts

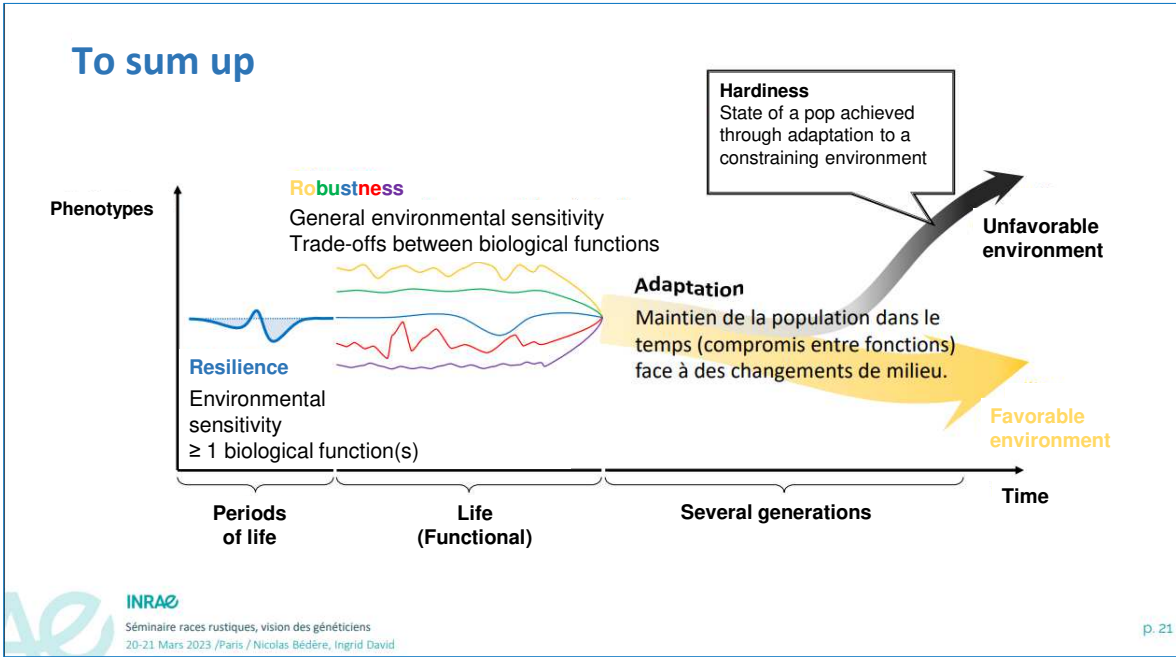
Systemic modeling : a framework to make these concepts more operational
(Resilience > Robustness >> Hardiness)

Hardiness: a form of robustness specific to difficult environments, with strong constraints linked in particular to very extensive driving methods

Hardy breeds are often local, but probably local breeds are not always hardy
(some have not necessarily had to adapt to difficult environments).

Hardiness is a concept for which it is still difficult to obtain a real consensus within the scientific community.

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Breeders associations point of view



- Ruminants - Breeders association**
- Monogastrics – Two selection companies**
- Local breeds – Breeder association**
- Regional conservatories of AnGR**

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Several projects linked with « hardiness »

- RUSTIC (French - 2016-2019): Towards an integrated approach to the **robustness** of small ruminants



Characteristics studied : Longevity, Dairy persistency

- SMARTER (H2020 2018-2023): Small Ruminants Breeding for Efficiency and **Resilience**



Characteristics studied : disease resistance, behaviour, survival of the young, longevity

⇒ Studying its use on the field and in particular by farmers

Final report GENAE 2014: most common skills cited spontaneously by small ruminants breeders (goat, dairy and meat sheep): **hardiness** 2nd or 3rd most frequently answered

⇒ It is a major and growing concern for small ruminants breeders.

Source: JM Astruc (Idele – seminar)

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Local breeds and highly constrained livestock systems : animals adapted to their territory

CORAM vision (Collective of local breeds of massifs)



Territory:

- difficult and rugged
- Forages with little richness and difficult to access
- Long distance travel
- Variable weather conditions

Skills

- Good legs
- Valuation of coarse fodder
- Reproduction / health
- Walking ability
- Mobilisation of physical reserves
- Longevity

Healthy animals that maintain their level of production to ensure an income for farmers

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Bretonne Pie Noir, a hardy breed: breeders as a measurement tool

Vision of the Union Bretonne Pie Noir

Bretonne Pie Noir: a dual purpose cattle breed. Smallest breed by its size and a threatened breed because of its number (around 3000 females).

Breed very often defined as a “hardy breed” but no numbers measure it.

Main issue: limiting the increase of inbreeding and maintained a maximum of genetic diversity as for all breeds with low numbers.

=> Maximising genetic variability allows breeders to find a variety of phenotypes adapted to their own system, which also makes them actors of the hardiness,



Source: R Chaabouni (Union Bretonne Pie Noir)

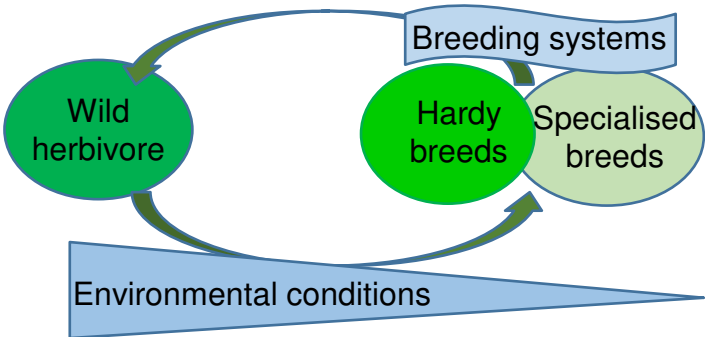
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Hardy breeds, what trajectories?

Vision of 2 conservatoires for local breeds



Hardy breeds are intermediate links between the primary herbivores and very specialised breeds



Source: L Calledé (Cons Aquitaine) – F Moyse (URGC)

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Most important skills for hardy breeds according to breed managers are :

- Ease of breeding
- Good reproduction capacity (fertility, calving)
- Valuation of local available fodder
- Behaviour adapted to the environment (ex: good legs..)
- Disease resistance
- Longevity
- Capacity of production to ensure an income



=> Which indicators to choose and use to measure the hardness of a breed ?

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Conclusion

- Hardiness often use as a marketing argument by breed because it sounds virtuous, authentic. But how to objectivate this notion ? Which criteria to choose and how measure them, with what limits ? Are there exclusive criteria?
- Hardiness directly linked with a constraint environment, but how to define it ? How to obtain a precise description of it and of the breeding systems?



*Have you already define
this in your own
countries?*

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