



Introduction, basics, history and present of livestock breeding.

Modul no. 2: Conservation and Sustainable Use of Animal Genetic Resources

Barbora Hofmanová

Czech University of Life Sciences Prague

Faculty of agrobiolgy, food and natural resources

Lecture content

- Domestication
- Breed – definition, origin and classification
- Present status – basic principles of breeding
- Current numbers of farm animals in the world



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Domestication

- The process of hereditary reorganization of wild animals into domestic forms according to the interests of people.
- Dated to the Neolithic period – so called „Neolithic revolution“.
- Centers of domestication distributed worldwide.
- Zooarcheology – studies remains of animals from archaeological sites, genetic analysis (ancient DNA)



The pathways of domestication

Prey

Sheep, goat, cattle, duck, pigeon, turkey, pig?

Prey

Game management

Extensive breeding



Direct pathway

Horse, donkey, camel, rabbit



Animal control
Intensive breeding

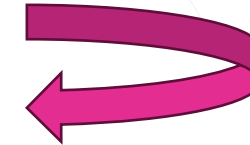
Commensals

Dog, cat, chicken, llama, yak, pig?

Anthropophilic

Habituation

Partnership



Adapted from Larson a Burger (2013)

REASONS FOR DOMESTICATION

- Source of food (meat, fat, eggs, milk)
- Source of materials (skin, fur, wool)
- Source of energy (draft and riding animals)



- Other purposes (rituals, companion, hobby, sport)

BENEFITS FOR DOMESTIC INDIVIDUALS

- protection against unfavorable climatic conditions
- regular care and nutrition
- no need to look for a breeding partner
- protection from predators
- increasing numbers of individuals
- increasing of a gene pool (a possibility of genetic modifications and further evolution)

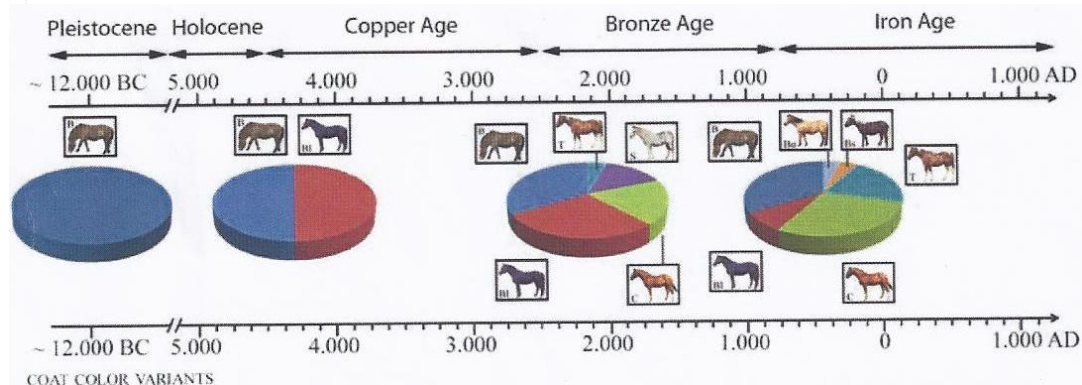


CHANGES RELATED TO DOMESTICATION



Changes related to domestication

- Morphology (body size change, organs size changes, body conformation changes).
- Changes in coat color and type of coat/plumage.
- Physiology (more frequent heat, changes of respiratory, circulatory and nervous systems).
- Ethology - behaviour (e.g. the loss of migration instinct, reduction of stress response to a human presence).



Ludwig et al., Science (2009)

Breeding

- The beginnings of breeding can be considered the creation of the first breeds – UK, 2nd half of the 18th century (industrial and agricultural revolution)
- **Robert Bakewell (1725-1795)**



Leicester sheep



Leicestershire Longhorn

Charles (1751 – 1836) a Robert (1749 – 1820) Colling



CHARLES AND ROBERT COLLING
1751-1836 1749-1820
Reproduced by the courtesy of the Royal Agricultural Society of England from the plate
in the Society's Journal for 1899



Shorthorn



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Thoroughbred (A 1/1)

The breed with well known origin.



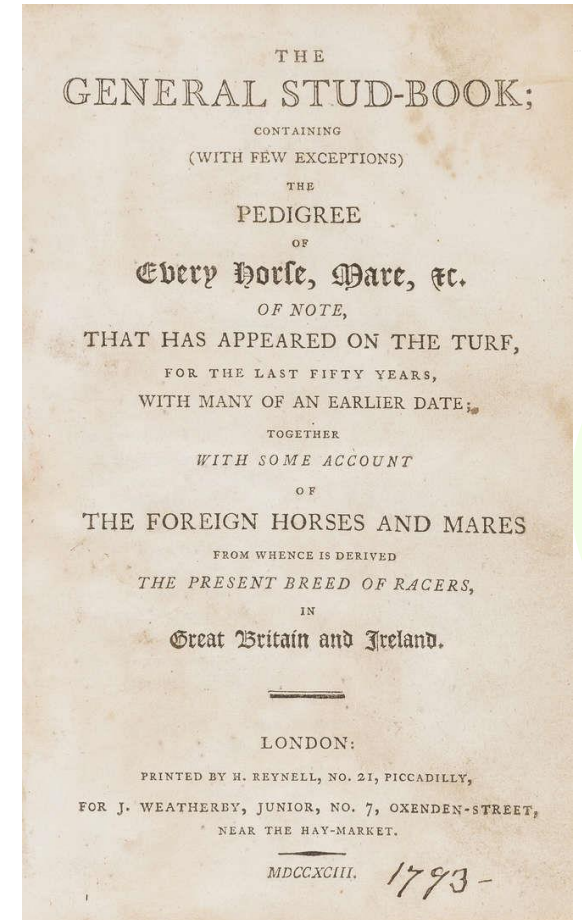
Byerley Turk



Darley Arabian



Godolphin Barb



Closed type of studbook (1793) – only purebreeding is acceptable, no possibility of crossing.

No artificial insemination used.

Selection criteria - speed, racing performance.

Breed

- **Breed** - a basic taxonomic unit of animal breeding.

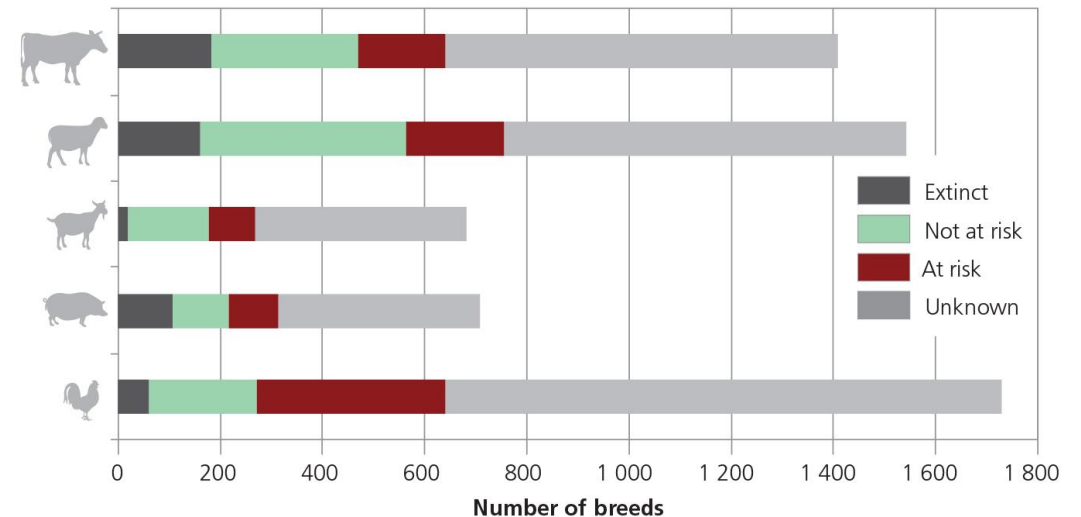
A breed is a specific group of domestic animals having homogeneous appearance (phenotype), homogeneous behavior, and/or other characteristics that distinguish them from other organisms of the same species. These characteristics are genetically determined, therefore they are passed to the progeny.

These typical (requested) traits are given by **BREED STANDARD**.

- A formation of breeds by selection and/or crossing.
- Humans are usually at least minimally involved in the creation of a breed, a breed exists if people are interested in its breeding.

- There are approximately 8,800 breeds of 38 different animal species worldwide (FAO, 2023)

Status of the world's livestock breeds



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Breeds classification

- There are different criteria for breed classification – e.g.

DEGREE OF BREEDING:

- **Primitive** breeds – they arise mainly as an adaptation of animals to certain environment, low efficiency/performance
- **Autochthonous (native, local)** breeds - often recognized as **GENETIC RESOURCES**
- **Cultural** breeds – formed by intensive breeding process

- Increasing of human influence on a formation and maintenance of the breeds.
- Increasing of productivity/performance.
- Higher demands on breeding conditions, adaptability may decrease.

Worldwide prevalence of breeding highly productive breeds – economic reasons.

Less efficient breeds are becoming endangered.



Present status

- Intensive breeding to ensure high performance while maintaining a good level of functional traits.
- Highly specialized breeds – meet/dairy.



- The estimation of genetic parameters and breeding values prediction (BLUP).
- Selection indexes calculation.
- Genomic selection.
- Methods for shortening generation interval to reach genetic gain in less time.

- Conservation of native breeds with their typical traits.



- The breeding goal is to maintain these breeds as they are.
- The performance is not a priority.
- The monitoring of genetic diversity is the most important task.
- Promotion of „local“ products.
- Support of breeders.



Current numbers of farm animals

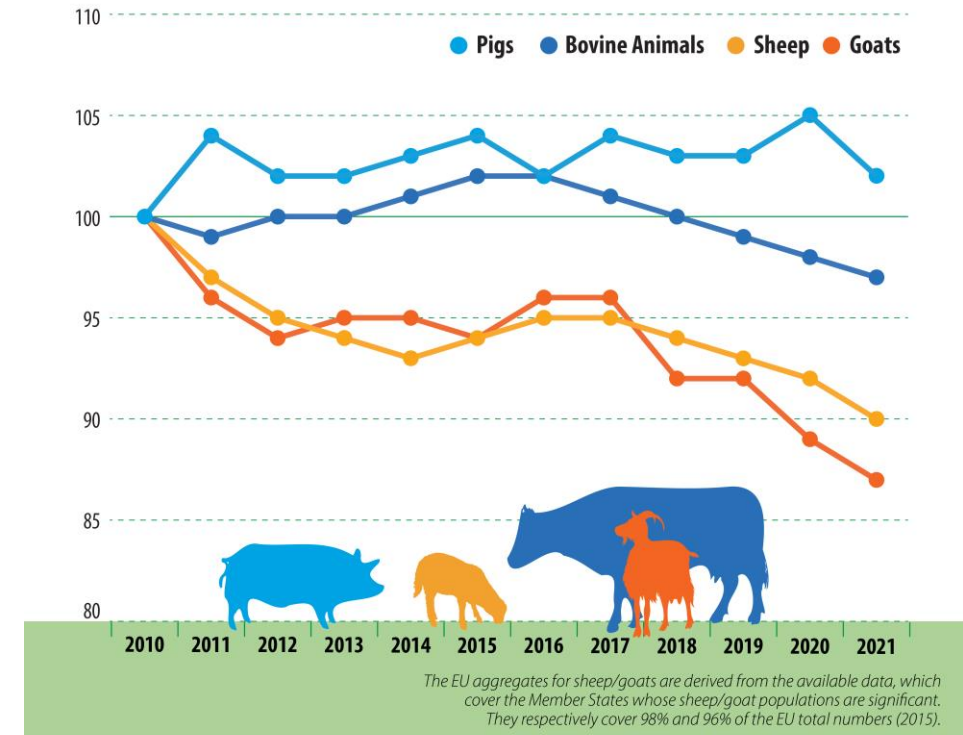
Year 2022	World (mil. pcs)	EU (mil. pcs)	Czech Rep. (thsnd. pcs)
Cattle	940	75	1421
Pigs	784	134	1433
Sheep	1266000	59	174
Goats	1016000	11	25

Sources: FAO, EUROSTAT, ČSÚ

- Decreasing numbers compensated by higher productivity due to intensive breeding.
- Discussion on negative environmental impacts of animal production.

Livestock population in the EU, 2010 – 2021

(index 2010=100, based on head of livestock)



ec.europa.eu/eurostat



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Sources of pictures

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Luboš Vostrý



vostry@af.czu.cz

