Optimisation of strategies of management and sustainable utilisation of AnGR

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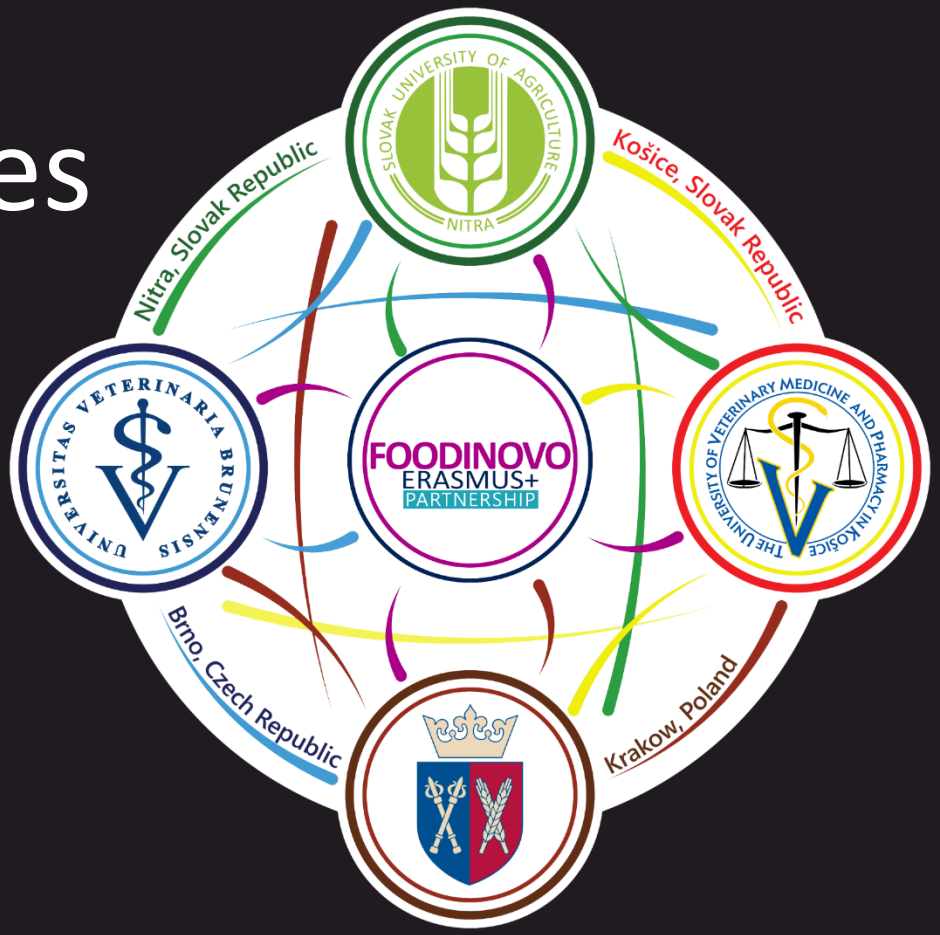

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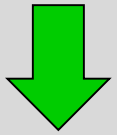
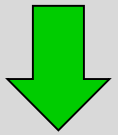
Sustainable development and production environment

- **Conserve natural resources (water, soil, genetic resources) and non-degrade environment**
- **Economicaly viable**
- **Technicaly suitable**
- **Socialy acceptable**

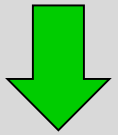
High production



Specialisation



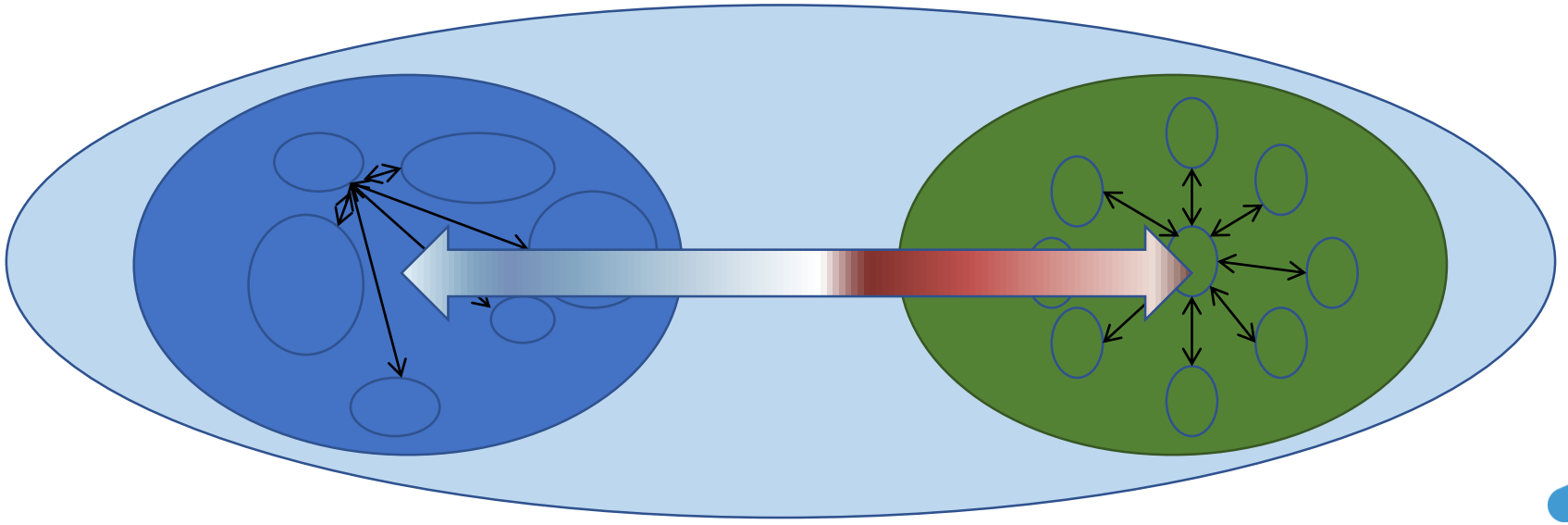
Biodiversity



Sustainable production

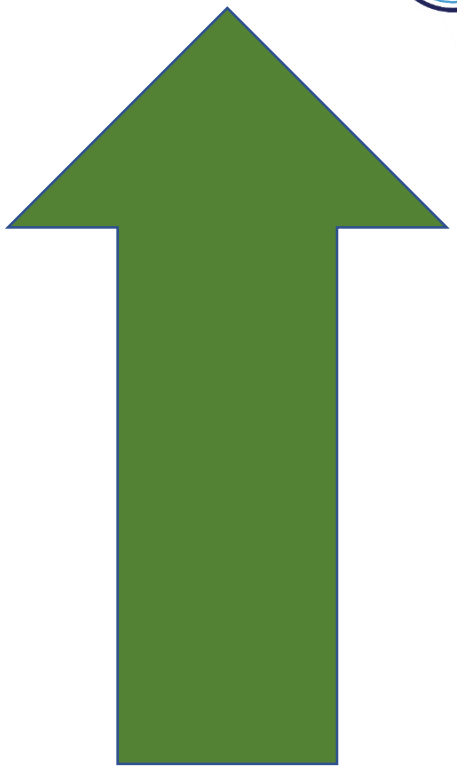
Diversity or variability

- Can be expressed as difference between subpopulations
- Difference is expressed as variabiity - evaluation
  - intrapopultion diversity (sub-species, breeds, lines/ strains and families)
  - Interpopulation diversity (between species/ breeds)



„Consequensces“ of variability

- fitness
- production (performance)
- reproduction – fertility – longevity
- viability – survival
- health – adaptation – resistance



Selection

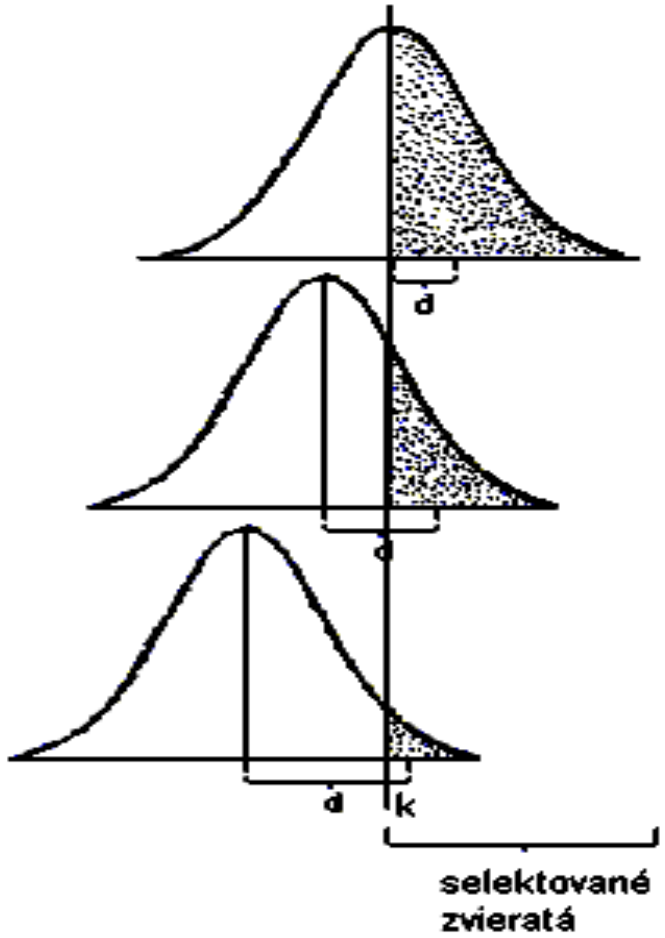
Natural

Artificial

- acts again artificial
- re-establishment of genetic equilibrium
- Stature strength
- increase of reproduction fitness
- increase of adaptation

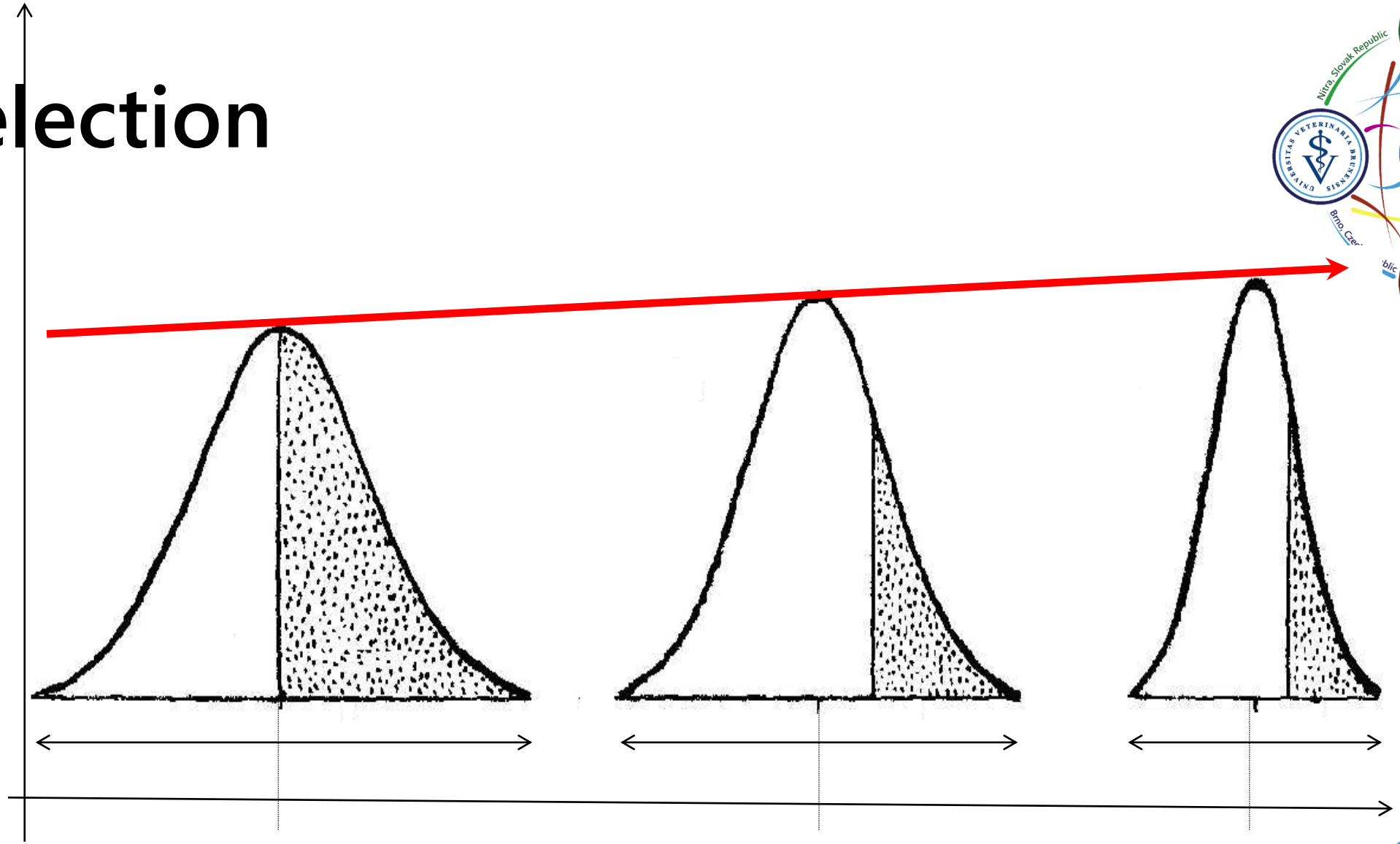
- mainly in the direction of production traits
- decreases ariability
- increases risk of inbreeding
- adaptation as correlated response

Selection



- Selecton of best individuals as parents of next generation
- Need to fulfill breeding goal
- Decision of farmer in reproducion of only selected genotypes (individuals)
- Besides primarily important production traits also economically important reproduction and fitness traits
- Selection shoud be in sound with sustaiability from diversity point of viewand stable population size

Selection

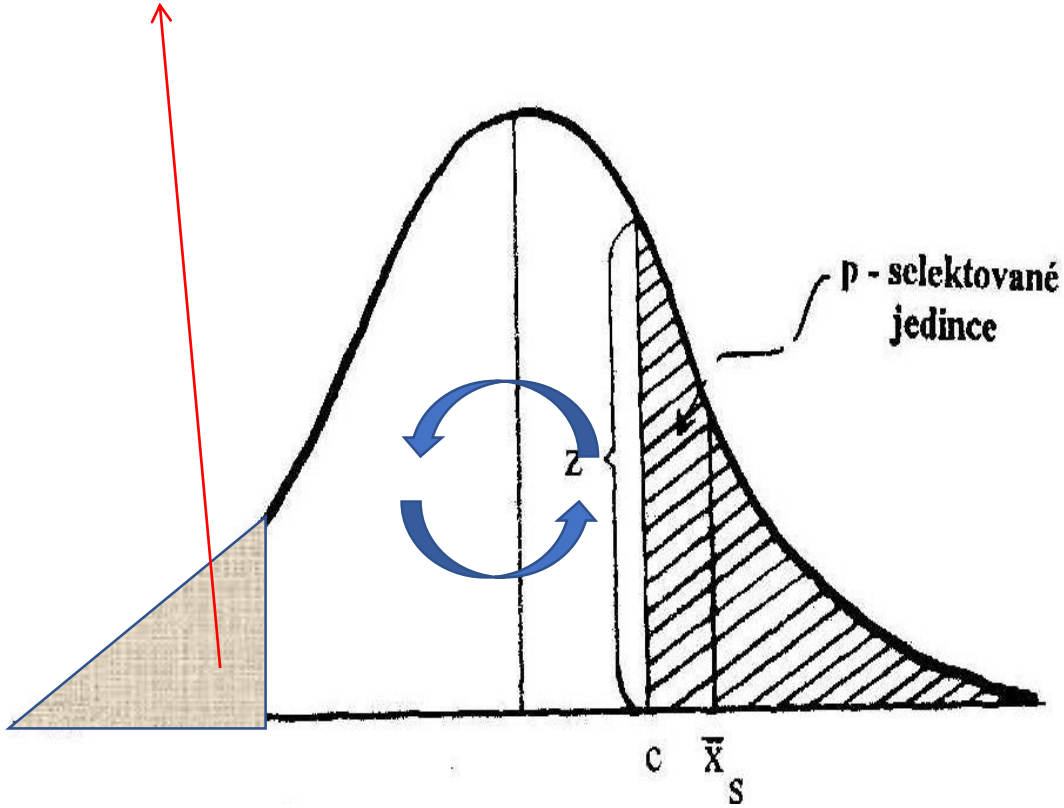


X_0
Parental gen.

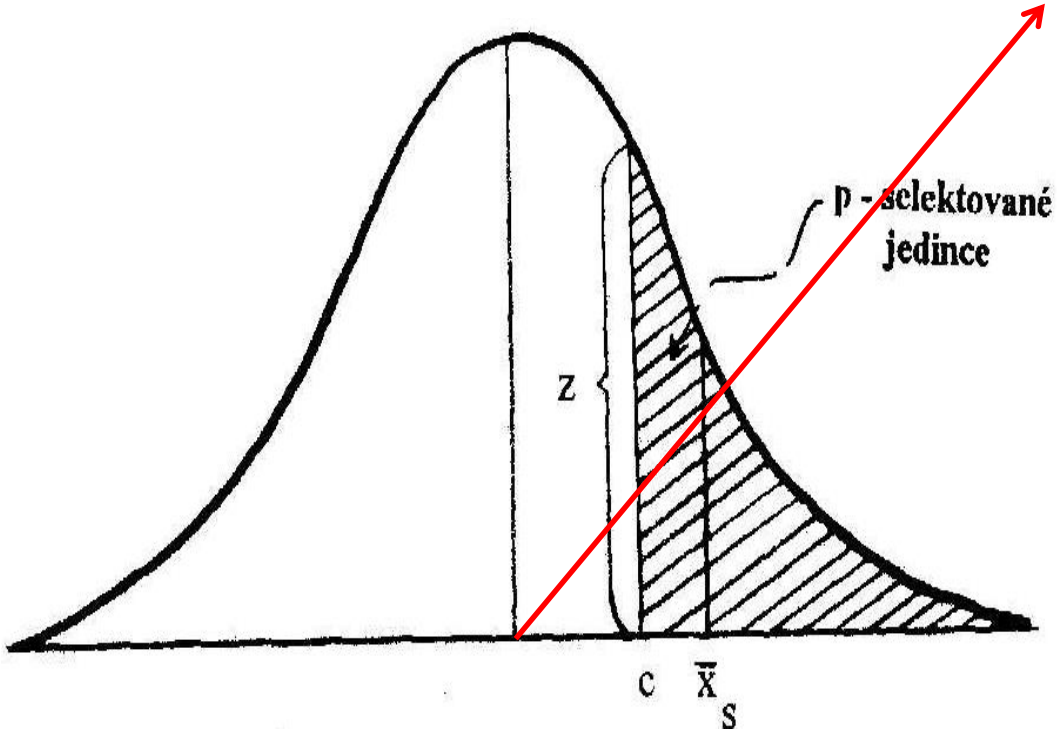
X_1
1. gen. progeny

X_2
2. gen.progeny

Selection
negative vs. positive



Selection
negative vs. positive



Progeny generation is better that parental generation

Bottleneck effect

selection
migration
drift
reproduction
environmental
catastrophe

Real vs. Efective size

- Efective size explain:
  - How many animals can presesent actual variability in population

  i.e,
  - The bigger difference, the bigger risk

  vice versa,
  - The higher value, than higher biodiversity

What about risk connected with relatedness and inbreeding?

It is possible to preserve the state in case when populatino is extremely small?

It is possible to increase diversity of population?

Relationships and inbreeding

- direct relatives
- Siblings
  - Comon ancestors

- *Biologicaly is the relativeness*

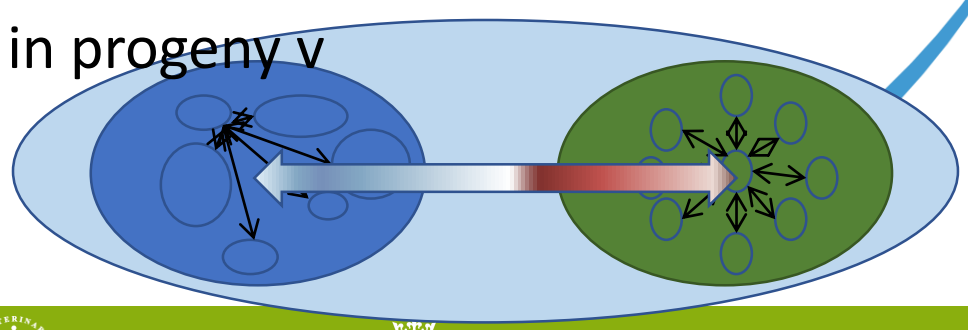
  - degree of genetic similarity of individuals

- Inbreeding – mating of relatives
  - Higher degree of biological similarity
    - *breeds, lines, families*
  - Traits fixation

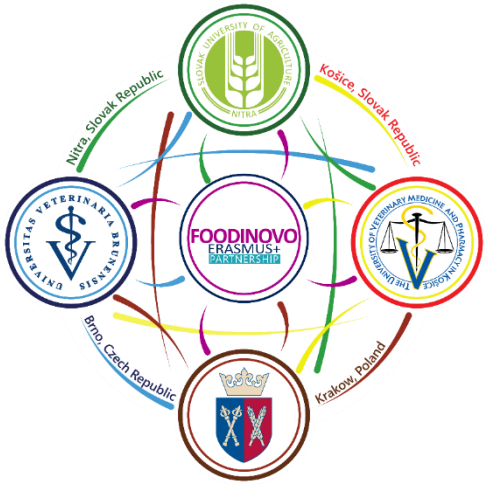
Relationships and inbreeding

Genotype	aa	Aa	AA
Frequence	$q^2 + pqF$	$2\,pq + 2pqF$	$p^2 + pqF$
F = 0	0,25	0,50	0,25
F = 0,5	0,375	0,25	0,375
F = 1	0,5	0	0,5

- Decreases variability in population
- hs potential to decrease and erasure of unfavorable recessive homozygotes in population
- Results in inbreeding depression
- Increases prepotention i.e. ability of individuals produce progeny whose performance is more similar than the average in the population
- Concentration of wished genes of specific ancestor in progeny v
- Opportunity of heterosis effectekt – diversity



Mating programmes – control of inbreeding, *preservation of diversity*



- Random mating

Compensatory mating programmesny

- Mating with restricted mating of full- and half-sibs as well as individuals with common ancestor in first two generations
- **Factorial** mating
- **Asortative** mating
- Maximum avoidance of inbreeding

Factorial mating

		Males							
		1	2	3	4	5	6	7	8
Females	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								

		Plemenníky							
		1	2	3	4	5	6	7	8
Plemennice	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								

		Plemenníky							
		1	2	3	4	5	6	7	8
Plemennice	1								
	2								
	3								
	4								
	5								
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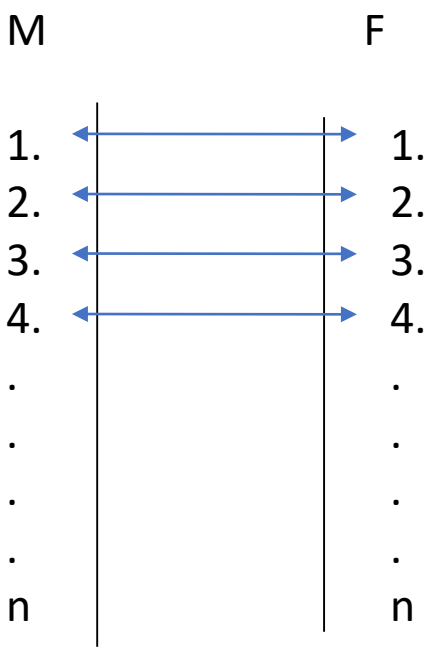
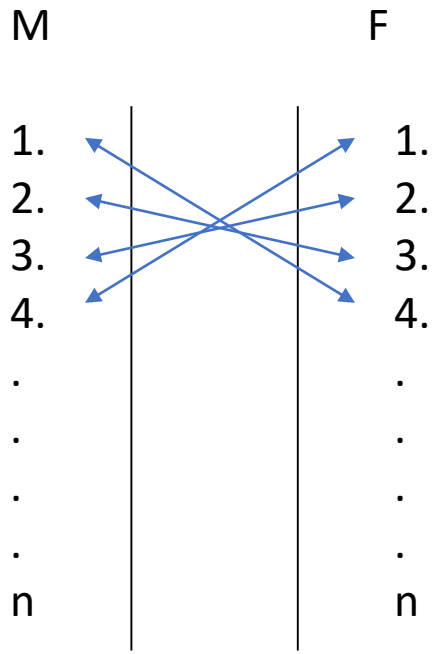
		Plemenníky							
		1	2	3	4	5	6	7	8
Plemennice	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								

Asortative mating – schemae

Possitive



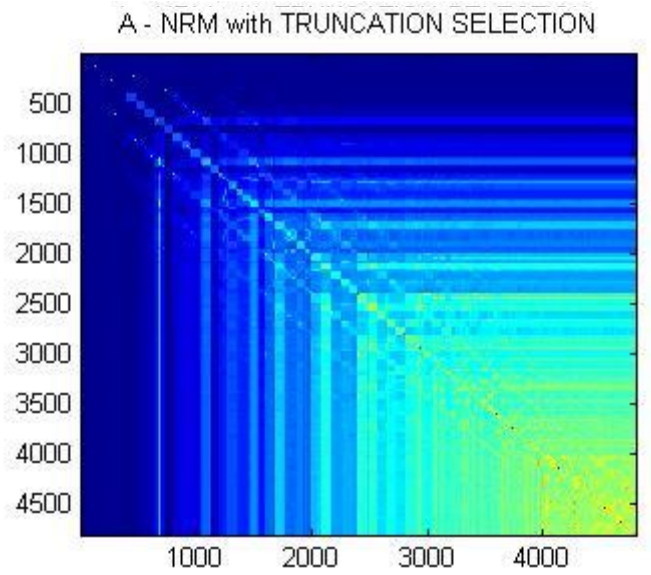
Negative



Simulation of pedigree structure development

$n_0 = 400$
$n_M = 5$
$n_F = 40$

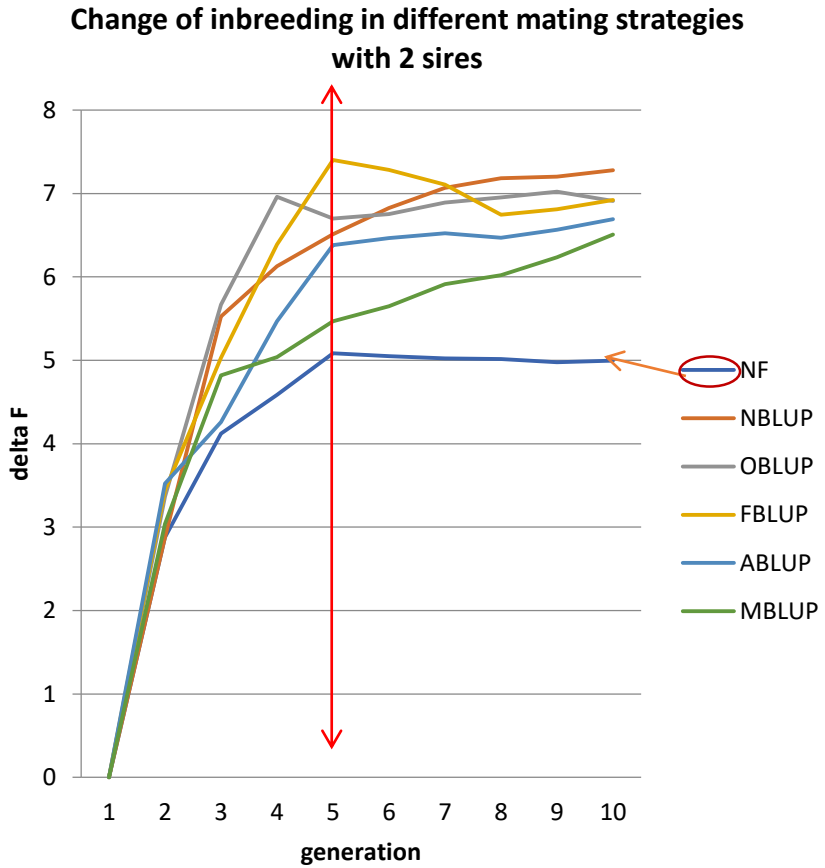
generation
10

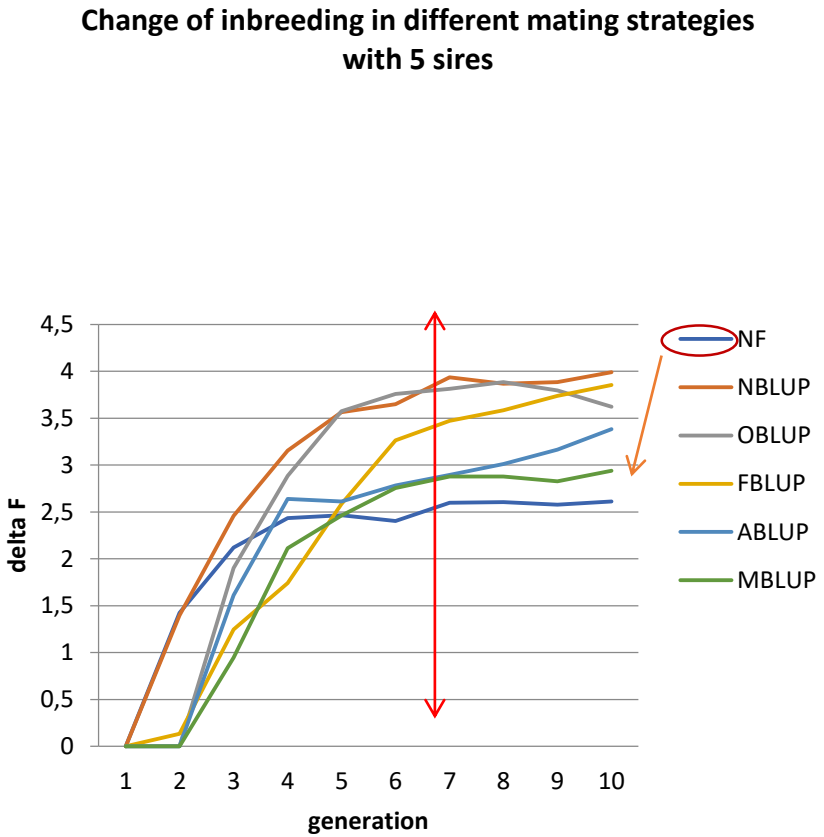


Truncation selection

Kremer, V. D. – Meuwissen, T.H.E. - Woolliams, J.A. 2002. 6S (SixS): Stochastic simulation software for sustainable selection schemes, In: 7th WCGALP, Montpellier
Kremer, V. D. – Meuwissen, T.H.E. - Woolliams, J.A. 2006. 6S (SixS)V2.0: Stochastic simulation software for sustainable selection schemes, In: 8th WCGALP, Belo Horizonte

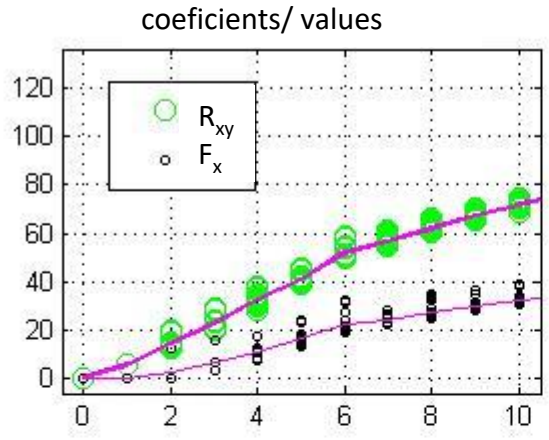
Simulation of increase of inbreeding

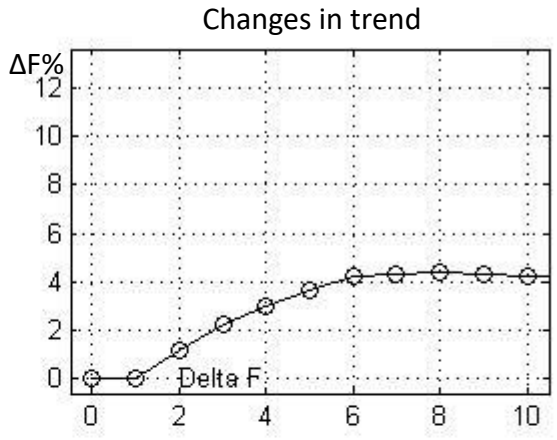


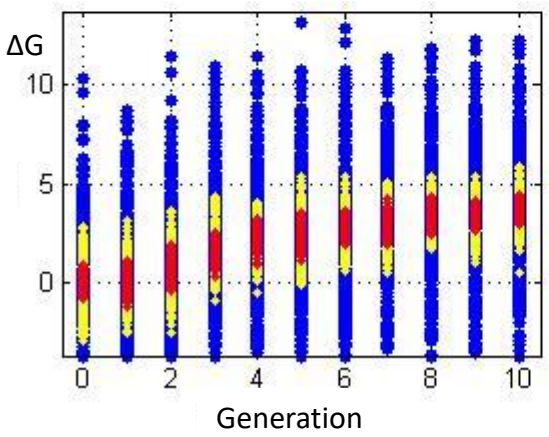


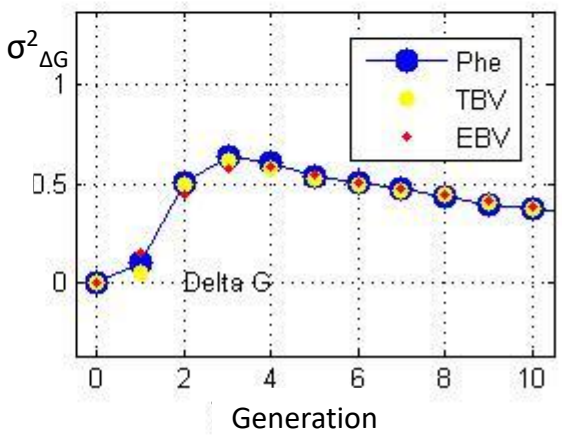
NF – random mating, NBLUP – factorial, , OBLUP – restricted mating of relatives in 1. and 2 degree, ABLUP – asortative, MBLUP – maximum avoidance of inbreeding (BLUP – pedigree information available)

Analysis of mating strategies









KASARDA, R. - KADLEČÍK, O. 2010. Simulácia vplyvu náhodného pripárovania a selekcie podľa odhadnutých BLUP plemenných hodnôt na výšku prírastku inbrídingu v populáciách pinzgauského plemena na Slovensku. AFZ , 13,s 4 - 9

Biodiversity – meaning

- Livestock is of importance for humans, covering cca. 30% of total food consumption

- *Factors affecting genetic diversity of animals*
- *molecular biology a biotechnologies vs. genetic potential of AnGR*
- *Determination of level of genetic diversity in AnGR populations*

AnGR

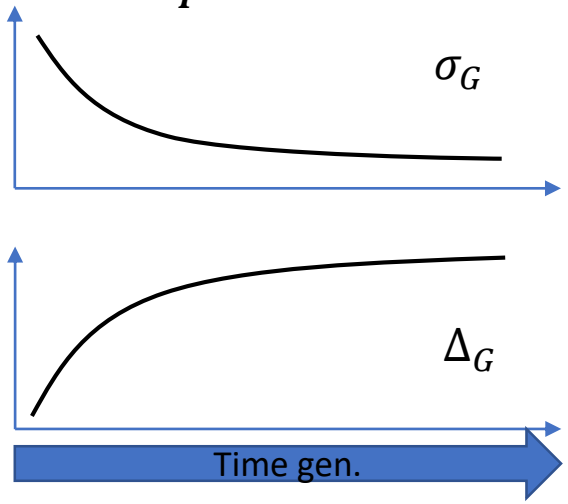
- Diversity in AnGR population is measurable as:
  - *Interpopulation*
  - *intrapopulation*
  - *Relationships between populations*

- Definition of AnGR based on observed morphological traits (phenotype) is used for identification and documentation of differences within and between breeds
- Role of definition on molecular level is evaluation of genetic associations and genetic diversity within breeds

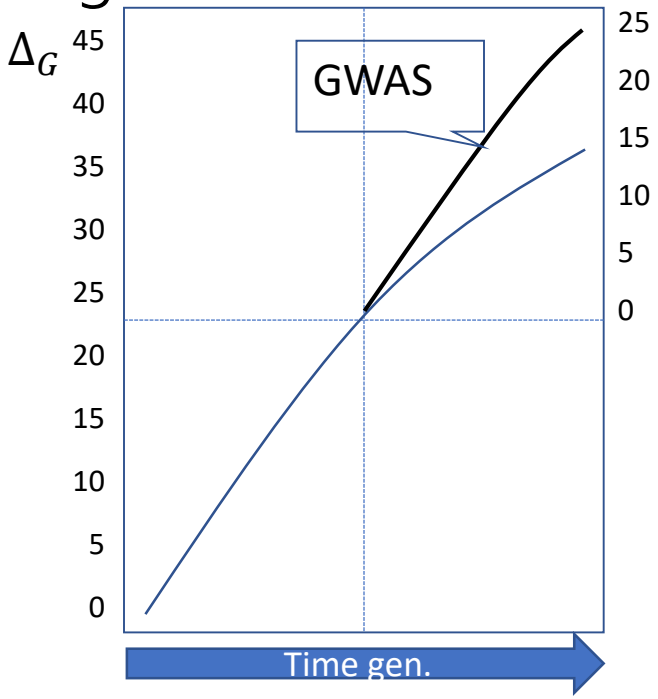
molecular biology and biotechnologies vs. genetic potential

Conventional technologies

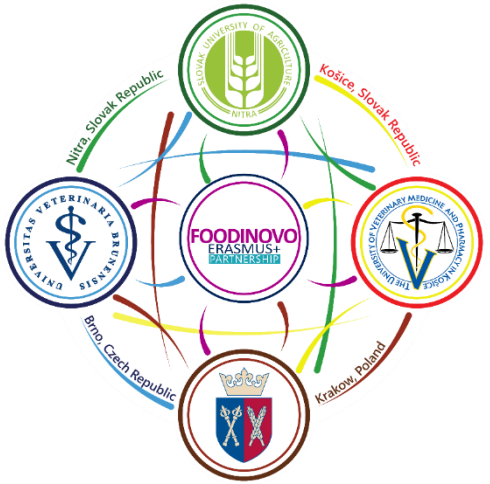
$$\Delta g = \frac{r_{TI}.i.\sigma_G}{I}$$



Mol. gen. and Biotechnologies



Take home message …



- variability is important
  - Mainly for reproduction fitness
- Selection is necesary
  - positive selection significantly changes gene-pool of population
- Increase in inbreeding represents risk for the future of population
  - Role of management of intra and inter –group variability
- Everything is possible to improve by correct mating programme

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