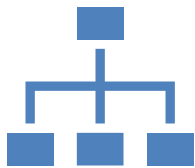


# Optimal Contribution Selection: Theoretical Foundations and Application in Genetic Diversity Conservation

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# Introduction to Animal Breeding Selection



- Definition of selection



- Traditional selection methods



- Objectives: genetic progress vs. diversity conservation

# The Problem of Decreasing Genetic Diversity

- Inbreeding depression
- Loss of adaptive potential
- Example: indigenous breeds? Only?

# What is Optimal Contribution Selection (OCS)?



- DEFINITION OF OCS



- GOAL: BALANCE  
BETWEEN PROGRESS AND  
DIVERSITY



- KEY: EFFECTIVE  
POPULATION SIZE (NE)

# History and Method Development

- James and McBride (1958)

Meuwissen (1997):  
formalization of  
OCS

Wooliams (2015)

- Extensions of the  
method

Applied in dairy  
cattle, conventional  
pig breeding  
programmes

# Basic OCS Concepts

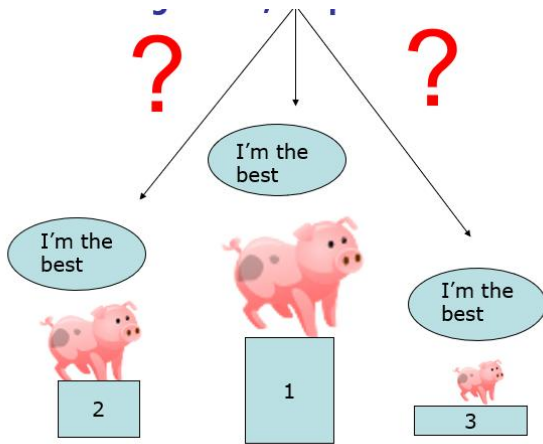


- Genetic contribution of an individual



- Inbreeding limitation through contribution optimization

# Input Data for OCS



- EBV

	1	2	3	4	5	6
1	1,00	0,00	0,50	0,50	0,50	0,25
2	0,00	1,00	0,50	0,00	0,25	0,625
3	0,50	0,50	1,00	0,25	0,625	0,563
4	0,50	0,00	0,25	1,00	0,625	0,313
5	0,50	0,25	0,625	0,625	1,125	0,688
6	0,25	0,625	0,563	0,313	0,688	1,125

relationship matrix (A/G)

# OCS Results

- Selected individuals list
- Their optimal contributions
- Predicted progress and inbreeding



# Comparison with Conventional Selection

Methods based on kinship, (BLUP, i.e.) tend to choose related animals

Genetic gain vs. long-term sustainability

# OCS Application in Breed Conservation

- Population sustainability

- Practical examples

# Flexibility of OCS

- Multiple objectives

- Constraints (e.g. minimum contribution, maximal relatedness)

# Software Support

- Gencont

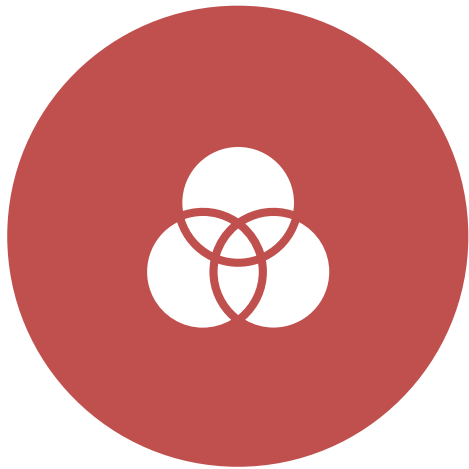
EVA

AlphaMate

MoBPS

OptiSel

# Genomic Data and OCS



- USE OF G-MATRIX



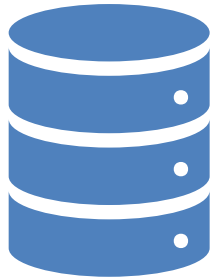
- GREATER PRECISION

# Advantages of OCS

- Inbreeding control

- Sustainable progress

# Limitations and Challenges



- Data requirements



- Practical implementation

# Conclusion

- OCS as a tool for balancing breeding goals

Pedigree based OCS – quality?

Genomic data based OCS



# Discussion Questions



- CAN OCS WORK WITHOUT GENOMIC DATA?



- ROLE OF BREEDERS AND INSTITUTIONS?