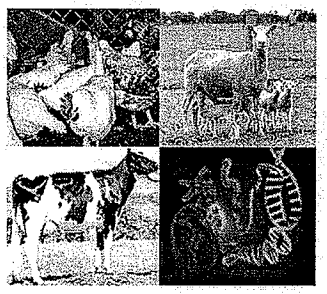
Aspects of breeding program design



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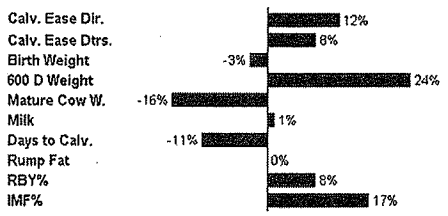
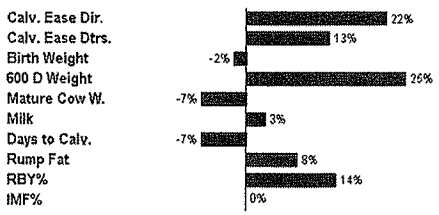
Examples of breeding objectives

Percentage emphasis on each EBV in the Japanese B3 Index.



Percentage emphasis on each EBV in the Supermarket Index.



Breeding program design

Considerations

- Is the best available population being utilized for the breeding objective?
  - If not, can genes from the best population be imported?
- Is there genetic variation within the chosen population, and what is the importance of heterosis?
  - Highly heritable traits respond well to within line selection
  - If heterosis is important, crossing systems (i.e. cross breeding) should be considered

Considerations

- Should reproductive technologies be utilized
  - AI, MOET, JIVET
  - Sperm and embryo sexing
- Is the breeding program structure optimal
  - Closed versus open nucleus
- Optimising selection
  - Use of a selection index
  - Unfavourable trait correlations → separate sire and dam lines may be required

Optimising selection

- Measurement strategy
  - Which traits to measure
  - Which animals to measure
  - Use of repeated measures
  - Level of pedigree recording
- Method of evaluation
  - Phenotypic selection
  - BLUP
  - QTL-BLUP
- How to select and mate the selected animals
  - Balance of selection intensity and generation interval
  - Balance of selection intensity and inbreeding

Conservation genetics

Special issues apply to conservation programs

- Level of genetic variance to conserve
  - Which populations
  - How many individuals from each population
  - Should selection result in a directional change
- Breeding strategies
  - Level of intervention e.g. introduction of outside animals
- Method of conservation
  - Live animals (in-situ, ex-situ), reproductive material, genetic material

Animal breeding

Application of genetic principles to modify animal performance

- Identify worthwhile changes
  - formalise a breeding objective
- Identify genetically superior animals
  - usually via a selection index

Technologies

Established technologies can and have resulted in significant gain. In developed countries these include

- Breed selection, development of composites breeds, crossing systems, separated sire and dam lines
- Use of reproductive technologies
- National genetic evaluation systems using BLUP
- Breeding structures allowing the exchange of genetic material

The genomics revolution has resulted in the introduction of new technologies (e.g. GAS), the impact of which is still largely unknown.