Decision Support Systems in Animal Production: A Bayesian Future!?

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Outline
- DSS Framework
- Bayes Intro
- Challenges
- Conclusion

Belief Management
- Expert knowledge
- Simple averages
- Neural networks
- Bayesian methodology
Bayes Intro

State

Evidence/Observation

Specification
- Prior knowledge
- Data Analysis

Consistent Incorporation of Evidence
Bayes formula

Further independent Evidence

Dependency between observations
Dynamic Systems

- Kalman filter
- Dynamic linear models
- Multi State DLM/Hidden Markov models

Hierarchies

Monitoring Systems

Decisions

Censoring
**Example: Litter size**

- Present use in MIS:
  - Monthly/Quarterly average
  - Dynamic Programming Model
- Obvious candidate for monitoring
- Age dependency – differs between herds
- Affected by censoring
- Sparse data,
  (Heavy culling ⇒ few old sows)

**Bayesian methods for Belief Management**

- Wide range of methods available
- Highly Structured Stochastic Systems
  - Hierarchies – population structure
  - Multivariate observations
  - Selection Bias
- Combines expert knowledge and observations

**Expert System**

- Manage
- Risk$_1$, Risk$_2$
- Gain
- Preval
- Learning Estimation
- Farm$_{new}$, VetFind

**Bayesian Network**

- Bayesian methods for Belief Management
  - Static or short time scale expected utility
  - Joint probability of every combination of states conditional on evidence
  - Herd management models, Monte Carlo/Spreadsheet
- Sequential Decisions / longer time scale
A Bayesian future!

- Model based approach
- Expert knowledge may be applied
- ‘Similar’ data sources may be used
- Learning
- Selection bias may be removed
- Consistent.