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A simulation model of dairy cows' herd with focus on the information system (SITEL)

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Context and rationale

- Instable economic context
  - prices fluctuation → how to maintain a good marginal efficiency ?
  - development of contractualization → how to predict milk production in the short-, mid- and long terms ?
  - how to anticipate system changes ?

→ Need for tools to predict the consequences of management decisions on herd performances

- Development of tools providing numerous information
  - how does this information influence herd management ?

→ Need for tools to predict the impact of information quality and quantity on herd management

Objectives

- To predict the consequences of management decisions on milk production of dairy herd

  → model of herd (production, reproduction) and its interactions with management decisions

- In practice, management decisions are taken from the information the farmer has about his herd ≠ biological state of the herd

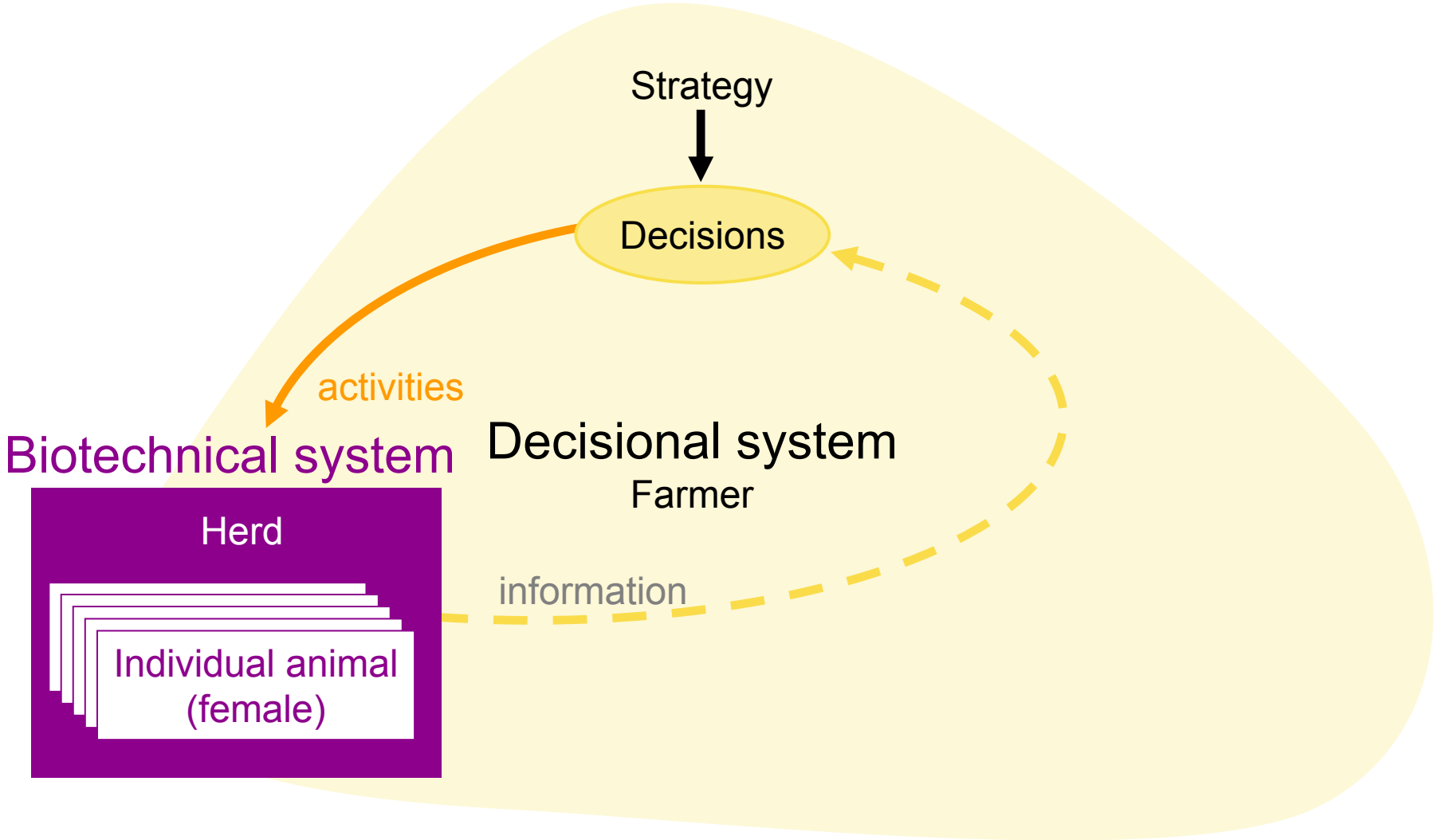
  → explicit representation of the informational system

Model Characteristics

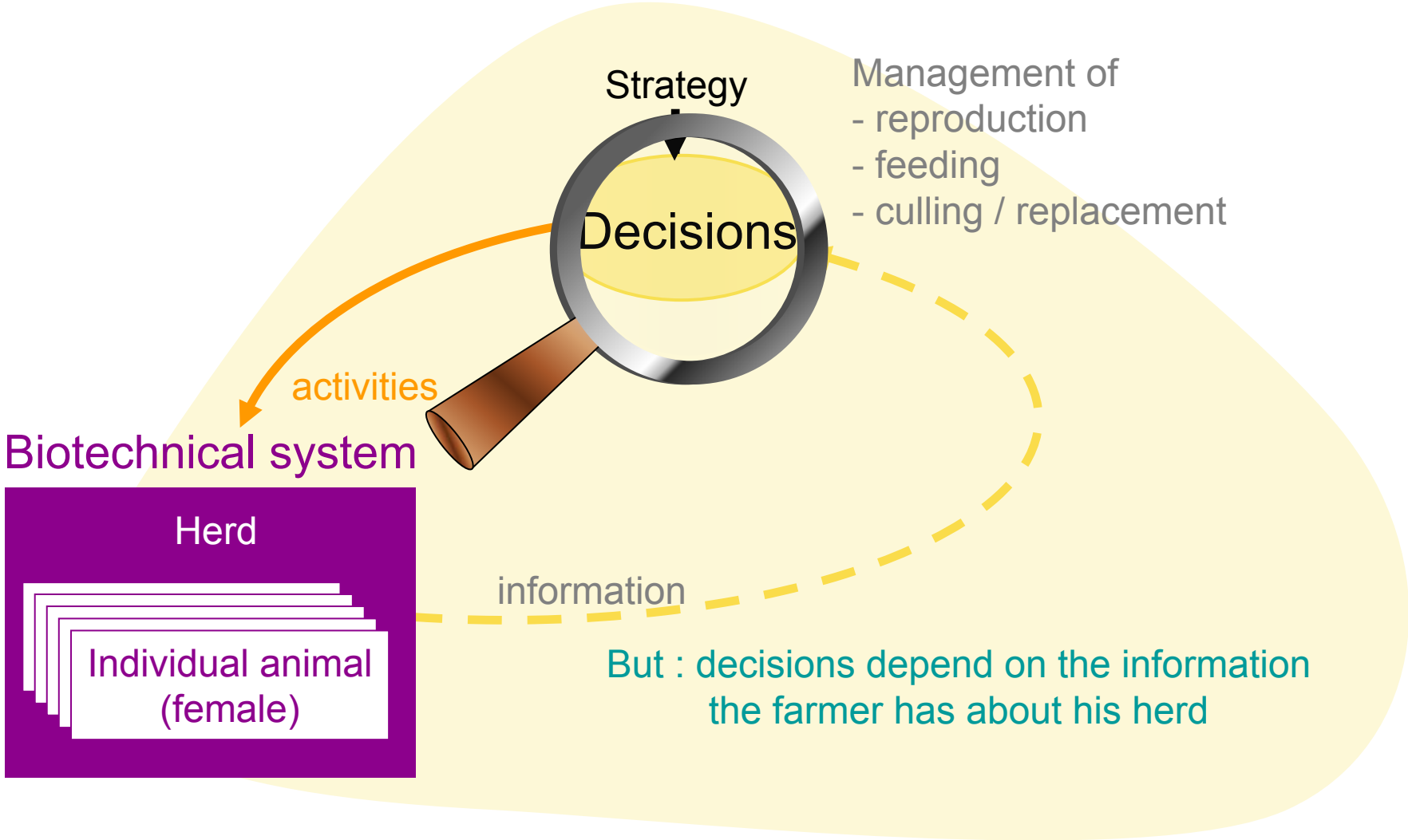
- Herd scale (all females, including heifers)
- Individual based model → Stochastic model
- Dynamic model

  Daily time step, several years/decades
- Based on the ontology of agricultural production systems (Martin-Clouaire and Rellier, 2003) (DIESE software, C++)

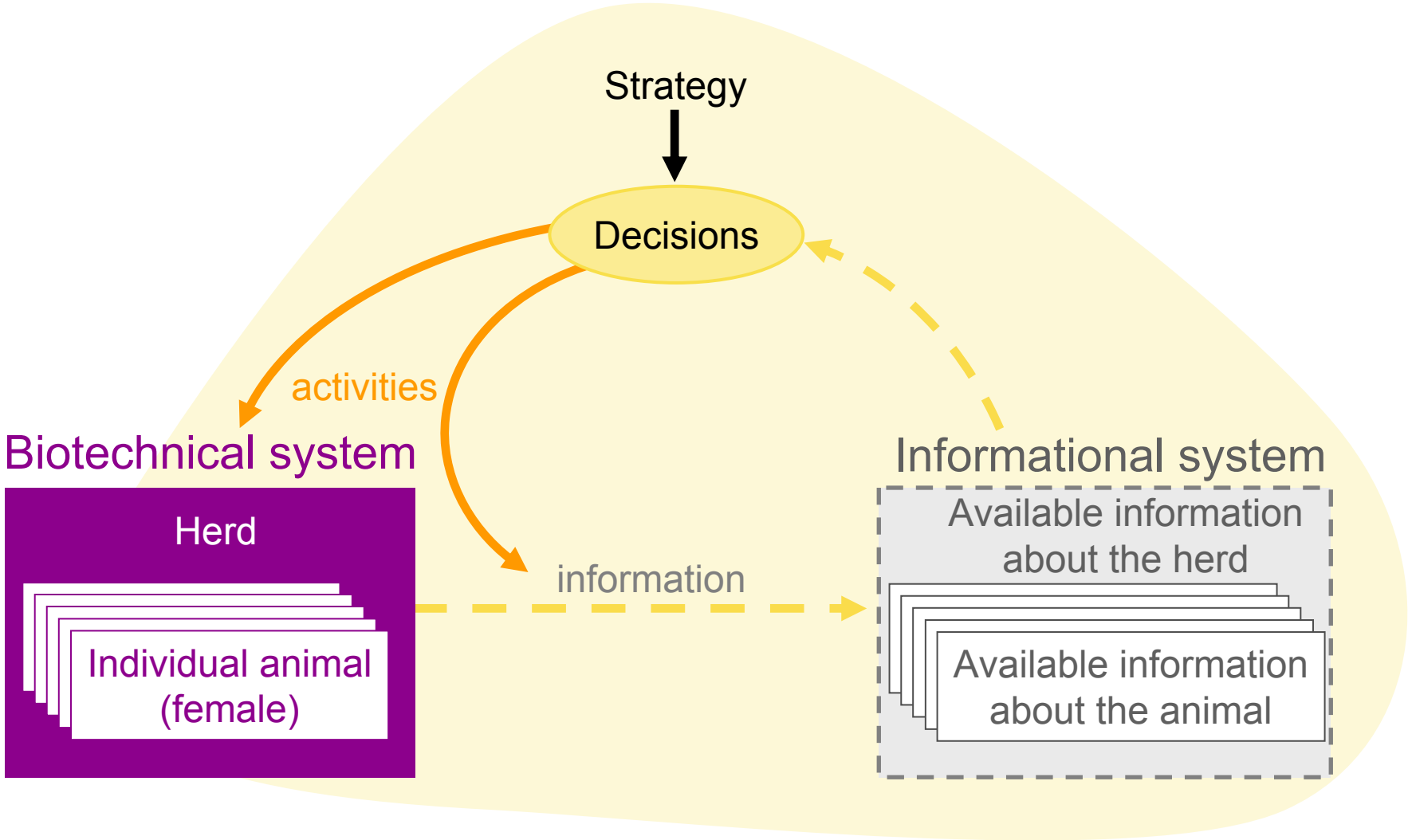
Structure of the model



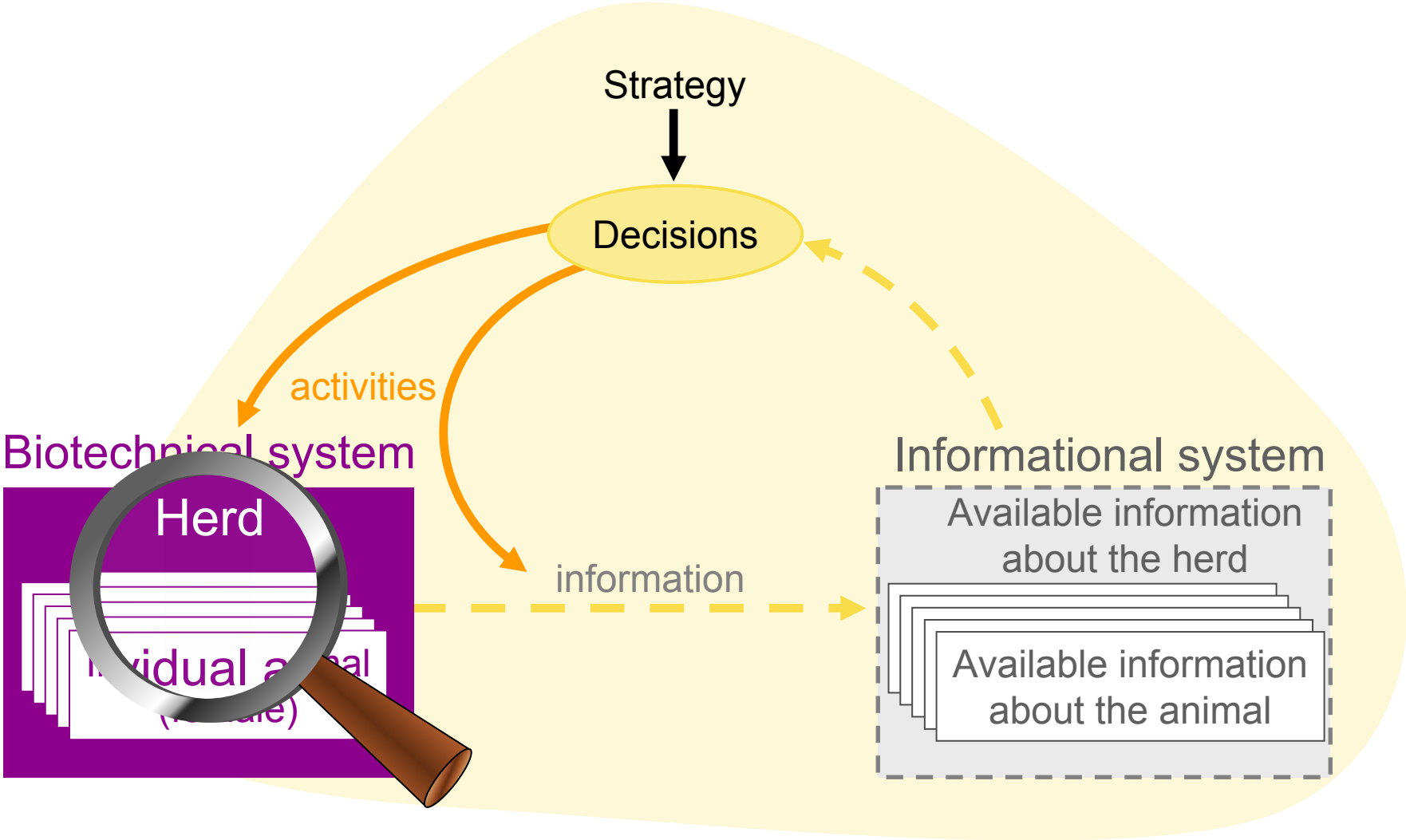
Decisions


Strategy
Decisions
Management of
- reproduction
- feeding
- culling / replacement
activities
Biotechnical system
Herd
Individual animal
(female)
information
But : decisions depend on the information
the farmer has about his herd

Structure of the model

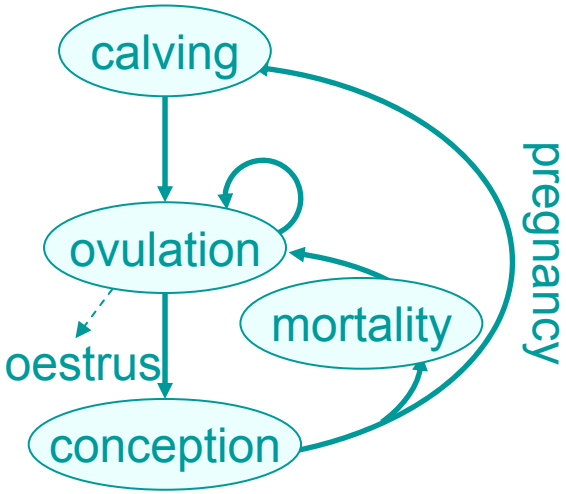


Structure of the model



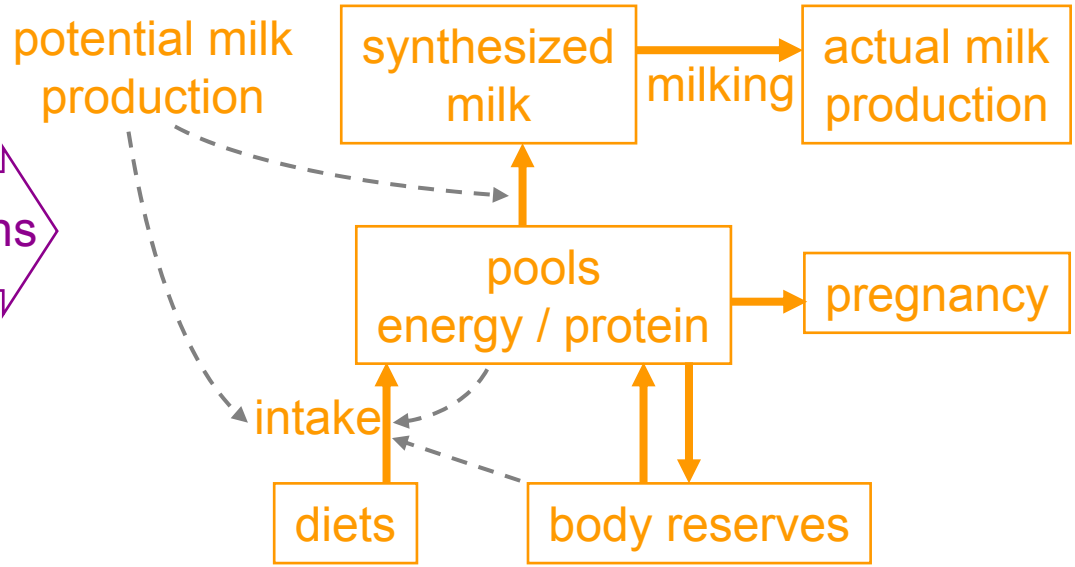
Female model

Reproduction
succession of discrete processes



Interactions

Lactation
intake, milk production and body reserves



Impact of information quality on herd

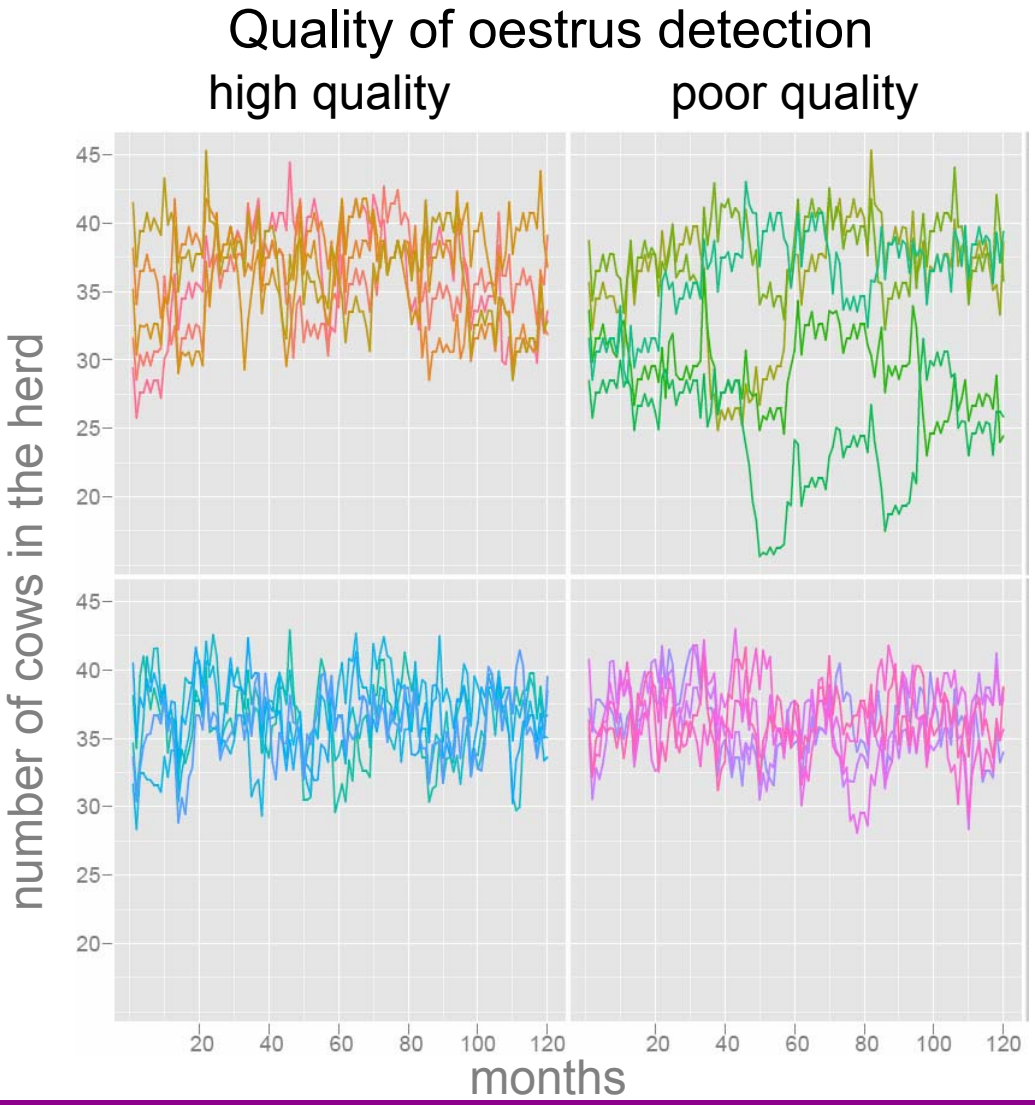
Current development of tools which increase
the number, frequency and precision of available information on cows
→ Which impact on practices and herd performances ?

Example

Which impact of oestrus detection quality on herd performances depending on the spreading of calving over the year ?

2 lengths of reproduction period × 2 levels of oestrus detection qualities
runs of 20 years
5 runs / treatment

Example of output: evolution of the number of cows in the herd



4 months

Reproduction period length

10 months

Conclusion

- This model is one of the first to incorporate at a time genetics, main levers of action on milk production and reproduction and their interactions
- It could become in the short term a tool to predict the consequences of management choices on herd performances
- The representation of the informational system makes possible to study the interest of information quality for herd management

Thank you for your attention