A bio-economic model to design new selection objectives

Jean Guerrier - Delphine Pinard
Plan

- Why do we need a bio-economic model?
- Updating the economic values for an intensive Holstein system in a new context
- OSIRIS project: a modeling tool to define new breeding goals
Plan

Why do we need a bio-economic model?

Updating the economic values for an intensive Holstein system in a new context

OSIRIS project: a modeling tool to define new breeding goals
How to rank traits?

Farm systems
- culling
- calves
- calvings
- Environment
- income
- expenses
- Vet costs
- Product
- Repro
- A.I.

Breeding objectives
- Maternal traits
- Other
- Milk production

A need for economic studies, based on field data!
Breed process for breeding objectives and TMI

- Description of systems
  - Economic value of traits
    - Integration of genetic parameters
    - Total merit index (TMI)
- Breed orientations
  - Computer herd simulation
  - Computer selection simulation
Why do we need a bio-economic model?

Updating the economic values for an intensive Holstein system in a new context

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OSIRIS project: a modeling tool to define new breeding goals
ISU = production + morphology

We need a bio economic model to take into account new economic challenges
Breed process for breeding objectives and TMI

- Description of systems
- Economic value of traits
  - Herd computer simulation
  - Integration of genetic parameters
  - Total merit index (TMI)
- Breed orientations
- Computer selection simulation
Linking the costs and revenues to traits

Revenues = milk + calves + culls + subsidies
Costs = feed + calving + A.I. + Mastitis + other health costs + fixed costs
Profit = revenues - costs

profit/costs + ”

- Cow fertility
- Heifer fertility
- Birth conditions
- weight
- Calf survival
- Mastitis resistance
- Protein yield
- Milk vector
- Fat yield
- longevit
- Somatic cells concentration
Example with cow fertility: +1%.

- **Culls**
- **Replacement Heifers**
- **Multiparous cows**
- **Primiparous cows**

- **Revenues from calves**
- **Revenues from milk**
- **Difficult calving costs**
- **Heifer feeding costs**
- **Reproduction costs**
- **Interval between calvings**

- **+8.45 €**

- **Calf feeding costs**
- **Cow feeding costs**
- **Revenues from culls**
- **Mastitis costs**

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Relative economic value of traits

- Cow fertility: 17%
- Fat yield: 9%
- Protein yield: 29%
- Somatic cell concentration: 17%
- Functional longevity: 15%
- Weight: 2%
- Functional longevity: 15%
- Heifer fertility: 4%
- Calving conditions: 1%
- Calf survival: 1%
- Milk vector: -3%
- Mastitis resistance: 2%
- Weight: 2%
Breed process for breeding objectives and TMI

- Description of systems
- Herd computer simulation
- Economic value of traits
- Integration of genetic parameters
- Total merit index (TMI)

Breed orientations

Computer selection simulation
Responses to selection of today’s and economic ISU

- 2012 ISU
- Morphology
- Milking speed
- Functional longevity
- Interval between calving and 1st A.I.
- Heifer fertility
- Cow fertility
- Mastitis resistance
- SCS
- Production

Genetic standard deviation

92%
For the Prim'Holstein Breed:
Estimation of the economic values of traits taking into account a new context

BUT:
- It is very time consuming!
- It is a process used only for cattle
- We need more reactivity to update breeding goals or to integrate new traits!

The Prim’Holstein model is the base to develop other models as part of the OSIRIS project
Why do we need a bio-economic model?

Updating the economic values for an intensive Holstein system in a new context

OSIRIS project: a modeling tool to define new breeding goals

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Organization of the OSIRIS project

- Project over 3 years (2012-2014)

- In collaboration with

- Financial support

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OSIRIS goals

Economic weight of traits
- With a bio-economic model
- Based on costs and revenues associated with herd performances

Total Merit Indexes
- Conception
- Update
Four reasons for the OSIRIS Project

- More representative of other production systems like organic farming
- More regularity for updating breeding objectives and Total Merit Indexes
- More homogeneity between ruminant industries TMI
- More reactivity to integrate new trait indexes
## OSIRIS organization

<table>
<thead>
<tr>
<th>6 PILOT SYSTEMS</th>
<th>3 NEW TRAITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REPRESENTATIVITY</strong></td>
<td><strong>REACTIVITY</strong></td>
</tr>
<tr>
<td>- Five breeds (one in each ruminant industry)</td>
<td>- Length of productive life</td>
</tr>
<tr>
<td>- Montbéliard (dairy cow)</td>
<td>- Resistance to parasitism in small ruminants and to paratuberculosis in cattle</td>
</tr>
<tr>
<td>- Mouton Vendéen (meat sheep)</td>
<td>- Milk composition and meat organoleptic quality</td>
</tr>
<tr>
<td>- Aubrac (beef cow)</td>
<td></td>
</tr>
<tr>
<td>- Alpine (goat)</td>
<td></td>
</tr>
<tr>
<td>- Lacaune (dairy sheep)</td>
<td></td>
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<tr>
<td>- One organic farming system in Montbéliard breed</td>
<td></td>
</tr>
</tbody>
</table>
Functioning with programmed modules

- **Common and specific modules when it's necessary**
  - Common modules are configured with parameters (**HOMOGENEITY**)

- **A correction or improvement in a module has an effect on all bio-economic models using it**
  - Breeding goals updated more **FREQUENTLY** and more **REGULARLY**
Conclusion

- All system results are compared with the Czech Software ECOWEIGHT ®
  - To verify our hypothesis and results

- Currently, we have finished:
  - 3 out of 6 systems
  - 1 out of 3 new traits

- The implementation of this program is in 2015
Thank you for your attention