Evaluation of feeding value for variety registration

Eucarpia Section Fodder Crops and Amenity Grasses

Ghent, Tuesday 15th September 2015
Evaluation of feeding value for variety registration

- History and motivation in France,
- criteria, results, variation,
- comparison between countries, some examples,
- future developments.
History and motivation

**Lucerne:** From the discussion among CTPS experts in 2003, it was agreed that Acid Detergent Fiber (ADF) and Protein Content (PC) was included to evaluation of Luzerne varieties. This change occurred for the varieties applied since 2004.

**Grasses:** After a 3 years study CTPS experts decided to integrate ADF, PC and Water Soluble Carbohydrate (WSC) to VCUS of Cocksfoot, Tall Fescue, Meadow Fescue, Italian, Hybrid and Perennial Ryegrass varieties. This change occurred for the varieties applied since 2010.
All evaluations are done with NIRS technique on the basis of INRA equations.

Early Tall fescue

Late Tall Fescue

Intermediate Diploid Perennial Ryegrass

Very late Diploid Perennial Ryegrass
Conclusions of the Study done in FR

- NIRS gives a good prediction of ADF, PC and WSC
- Strong effect of drying conditions, especially on WSC
- Several locations is needed
- High correlation between years of harvests
- Strong differences between varieties
- To avoid influence of the effect of the earliness => evaluation of 3 cuts in spring for grasses + separation of PRG and TF in several trials depending on the earliness.
- WSC not correlated to ADF. To be used to predict ensilability?
Correlation between Year 2 and Year 2 + 3 for ADF of Tall Fescue
Correlation between ADF and WSC

Very Late Tall Fescue

\[ y = -0.5532x + 26.29 \]

\[ R^2 = 0.2433 \]
French VCU Protocol for feeding value evaluation

- Feeding value measured for:
  - 4 locations (only 3 in Meadow Fescue),
  - 3 cuts in spring and 3 replications per cut,
  - only 2nd year,
- Optimisation of sampling conditions (harvest stages, short time before drying)
- Stove at 60°C (80°C max. in wet conditions) during 48 hours as a minimum,
Statistical validation of criteria

For each cut and each nutritional criterion (PC, ADF, WSC):

- Coefficient of Variation lower than 10%
- Minimum 2 locations validated

For each location:

- 2 minimum nutritional criteria validated
- Minimum 2 cuts validated

Possibility to estimate missing value
Criteria, results, variation: Earliness/Acid Detergent Fiber

(youngness after 1st January / %DM)

Earliness

2014 PRG very late 2n PRE/ADF

y = -2.3587x + 210.39

R² = 0.2067

Arcoal

Tryskal

Carillon

Mezo
Criteria, results, variation: Earliness/Acid Detergent Fiber

(days after 1st January / %DM)

2014 Cocksfoot PRE/ADF
$y = 1.8357x + 70.665$
$R^2 = 0.0302$

2014 Tall Fescue PRE/ADF
$y = -2.831x + 202.92$
$R^2 = 0.2438$

2014 PRG very late 2n PRE/ADF
$y = -2.3587x + 210.39$
$R^2 = 0.2067$

2013 Cocksfoot PRE/ADF
$y = 1.5883x + 85.511$
$R^2 = 0.0352$

2013 Tall Fescue PRE/ADF
$y = -3.2234x + 220.9$
$R^2 = 0.4411$

2013 PRG very late 2n PRE/ADF
$y = -4.4832x + 250.63$
$R^2 = 0.6424$

2012 Cocksfoot PRE/ADF
$y = 4.9699x - 5.0853$
$R^2 = 0.1519$

2012 Tall Fescue PRE/ADF
$y = -1.9278x + 176.29$
$R^2 = 0.2612$

2012 PRG very late PRE/ADF
$y = -2.657x + 204.9$
$R^2 = 0.3133$
Criteria, results, variation: Earliness/Protein Content

(days after 1^{st} January / \%DM)

2014 Cocksfoot PRE/PC
\[ y = -13.789x + 318.67 \]
\[ R^2 = 0.2787 \]

2014 Tall Fescue PRE/PC
\[ y = 13.811x - 46.74 \]
\[ R^2 = 0.733 \]

2014 PRG very late 2n PRE/PC
\[ y = 6.1584x + 86.302 \]
\[ R^2 = 0.5089 \]

2013 Cocksfoot PRE/PC
\[ y = -2.3265x + 165.53 \]
\[ R^2 = 0.0756 \]

2013 Tall Fescue PRE/PC
\[ y = 1.0243x + 118.16 \]
\[ R^2 = 0.0086 \]

2013 PRG very late 2n PRE/PC
\[ y = 5.5411x + 79.629 \]
\[ R^2 = 0.5031 \]

2012 Cocksfoot PRE/PC
\[ y = 12.592x - 55.966 \]
\[ R^2 = 0.5349 \]

2012 Tall Fescue PRE/PC
\[ y = -2.5566x + 161.45 \]
\[ R^2 = 0.0821 \]

2012 PRG very late PRE/PC
\[ y = 4.3205x + 93.191 \]
\[ R^2 = 0.3926 \]
Criteria, results, variation: Earliness/Water Soluble Carbohydrate (days after 1st January / %DM)

2014 Cocksfoot intermédiaire
WSC/DEE
\[ y = -3.8635x + 162.48 \]
\[ R^2 = 0.6249 \]

2014 Tall Fescue PRE/WSC
\[ y = 0.5794x + 118.75 \]
\[ R^2 = 0.0215 \]

2014 PRG very late 2n PRE/WSC
\[ y = -0.1231x + 158.51 \]
\[ R^2 = 0.0023 \]

2013 Cocksfoot PRE/WSC
\[ y = 1.3183x + 121.98 \]
\[ R^2 = 0.1006 \]

2013 Tall Fescue PRE/WSC
\[ y = 2.2521x + 108.94 \]
\[ R^2 = 0.4838 \]

2013 PRG very late 2n PRE/WSC
\[ y = 1.1628x + 130.32 \]
\[ R^2 = 0.3616 \]

2012 Tall Fescue PRE/WSC
\[ y = 3.3546x + 82.336 \]
\[ R^2 = 0.5096 \]

2012 PRG very late PRE/WSC
\[ y = -0.0034x + 148.55 \]
\[ R^2 = 8E-06 \]

2012 Cocksfoot not validated for WSC
**comparison between countries (Legumes)**

<table>
<thead>
<tr>
<th>Country</th>
<th>BG</th>
<th>DE</th>
<th>FR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Answer from:</td>
<td>Bistra Pavlovka &amp; Ivan Vasilev</td>
<td>Uta Schnock</td>
<td>Denis Leclercq &amp; Vincent Gensollen</td>
</tr>
<tr>
<td>Species</td>
<td>Legume</td>
<td>Clover, Lucerne and Onobrychis viciifolia</td>
<td>Lucerne</td>
</tr>
<tr>
<td>Criteria</td>
<td>Protein</td>
<td>Protein</td>
<td>Protein, Digestibility</td>
</tr>
<tr>
<td>Technique</td>
<td>NIRS</td>
<td>Kjeldahl</td>
<td>NIRS</td>
</tr>
<tr>
<td>Number of years</td>
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<td>2</td>
<td>2</td>
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<tr>
<td>Number of locations</td>
<td>4</td>
<td>5</td>
<td>4</td>
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<tr>
<td>Number of cuts / year</td>
<td>All (2 - 5)</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Number of replications</td>
<td>4</td>
<td>4</td>
<td>4</td>
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</table>
## Comparison between countries (Grasses)

<table>
<thead>
<tr>
<th>Country</th>
<th>BG</th>
<th>CZ</th>
<th>UK</th>
<th>BE</th>
<th>FR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Answer from:</strong></td>
<td>Bistra Pavlovka &amp; Ivan Vasilev</td>
<td>Marek Povolny</td>
<td>Trevor Gilliland</td>
<td>Joke Pannecouque</td>
<td>Denis Leclercq &amp; Vincent Gensollen</td>
</tr>
<tr>
<td><strong>Species</strong></td>
<td>Perennial grasses</td>
<td>X Festulolium, Festuca arundinacea, Dactylis glomerata</td>
<td>Main grasses</td>
<td>Tall fescue</td>
<td>Main Grasses</td>
</tr>
<tr>
<td><strong>Criteria</strong></td>
<td>Crude Fiber, Protéin</td>
<td>Crude Fiber, Protéin, PDIE, Digestibility of OM, ME, NEL, NEV</td>
<td>Digestibility</td>
<td>Digestibility</td>
<td>Digestibility Protein Water Soluble Carbohydrate</td>
</tr>
<tr>
<td><strong>Technique</strong></td>
<td>NIRS</td>
<td>NIRS</td>
<td>NIRS</td>
<td>NIRS</td>
<td>NIRS</td>
</tr>
<tr>
<td><strong>Number of years</strong></td>
<td>3</td>
<td>2</td>
<td>1 (2)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Number of locations</strong></td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td><strong>Number of cuts/year</strong></td>
<td>2</td>
<td>Pasture: 2, Meadow use: 1</td>
<td>3 (2)</td>
<td>All (normally 5)</td>
<td>3</td>
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<tr>
<td><strong>Number of replications</strong></td>
<td>4</td>
<td>all (usually 3)</td>
<td></td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>
Rules for VCU admission

- **Index** with yield, agronomic characters, disease resistance and feeding value. Candidate varieties compare **check varieties**.
  
  ADF: $0.9 \times$ difference in % between the candidate and the check varieties.
  
  PC: $0.4 \times$ difference in % between the candidate and the check varieties.
  
  WSC: $0.3 \times$ difference in % between the candidate and the check varieties.
  
  For example: Candidate = 18% of ADF, Check varieties = 20%, then candidate has 10% less ADF than the checks. Bonus = $0.9 \times 10\% = 9$ points.

- Used as **individual characters alongside**. The candidate variety must normally shown a statistical clear improvement relative to the mean of the existing National List varieties in one of the 8 characters and have an overall positive balance across all characters.

- Just additional information.
NIRS technique on combine harvesters. Up to now the results are not consolidated enough to be applied in VCU testing.

Criteria closer to the animal needs for VCU admission and publications (http://www.inration.fr):

- Net energy value
- Metabolisable protein value
- Fill value = ingestibility value (voluntary intake value).

Criteria closer to the farmer needs:

- Net Energy Value / surface unit?
Thank you for your attention