The use of the French system for the evaluation of horse feedstuffs in Italy

Nicoletta Miraglia\textsuperscript{1} and Domenico Bergero\textsuperscript{2}

\textsuperscript{1} Molise University - Campobasso
\textsuperscript{2}Torino University
Italy
EVOLUTION OF THE FRENCH SYSTEM IN ITALY FROM 1987 ON

1987
Presentation of the French system in National Congresses
  Italian Soc. of Equine Practitioners (SIDI)
  Italian Soc. Veterinary Sciences (SISVet)

1989
First experimental results
  In vivo trials (meadow hays, ceral mixtures)
  EAAP, Dublin, 1989

1990
Estimating and expressing the energy and nitrogen value of feedstuffs in Southern Europe
  Plenary Session on Estimating and Expressing the energy and Nitrogen value of feedstuffs in Europe
  EAAP, Toulouse, 1990
## Chemical composition

<table>
<thead>
<tr>
<th>Forages</th>
<th>DM</th>
<th>OM</th>
<th>Ashes</th>
<th>CP</th>
<th>CF</th>
<th>NDF</th>
<th>ADF</th>
<th>ADL</th>
<th>HFU</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Natural Meadow hay</td>
<td>91,60</td>
<td>92,38</td>
<td>7,62</td>
<td>8,39</td>
<td>34,21</td>
<td>69,8</td>
<td>38,1</td>
<td>4,58</td>
<td>0,50</td>
</tr>
<tr>
<td>2. Natural Meadow hay</td>
<td>93,43</td>
<td>92,65</td>
<td>7,35</td>
<td>9,09</td>
<td>30,15</td>
<td>60,1</td>
<td>31,3</td>
<td>4,21</td>
<td>0,55</td>
</tr>
<tr>
<td>3. Natural Meadow hay</td>
<td>96,43</td>
<td>93,16</td>
<td>6,84</td>
<td>7,01</td>
<td>34,01</td>
<td>66,2</td>
<td>37,2</td>
<td>5,86</td>
<td>0,49</td>
</tr>
<tr>
<td>4. Natural Meadow hay</td>
<td>96,41</td>
<td>91,66</td>
<td>8,34</td>
<td>8,46</td>
<td>34,03</td>
<td>64,7</td>
<td>37,5</td>
<td>5,16</td>
<td>0,50</td>
</tr>
<tr>
<td>5. Alfalfa hay-1st cut</td>
<td>91,70</td>
<td>91,29</td>
<td>8,71</td>
<td>9,24</td>
<td>32,77</td>
<td>63,6</td>
<td>36,2</td>
<td>6,18</td>
<td>0,52</td>
</tr>
<tr>
<td>6. Alfalfa hay-2nd cut</td>
<td>92,96</td>
<td>91,38</td>
<td>8,62</td>
<td>16,68</td>
<td>27,42</td>
<td>42,0</td>
<td>26,7</td>
<td>6,95</td>
<td>0,62</td>
</tr>
<tr>
<td>7. Sweetvetch hay</td>
<td>91,95</td>
<td>87,60</td>
<td>12,40</td>
<td>10,08</td>
<td>32,50</td>
<td>53,9</td>
<td>38,4</td>
<td>8,92</td>
<td>0,53</td>
</tr>
<tr>
<td>8. Squarroso clover hay</td>
<td>93,85</td>
<td>88,40</td>
<td>11,60</td>
<td>13,17</td>
<td>32,01</td>
<td>54,6</td>
<td>36,4</td>
<td>6,95</td>
<td>0,55</td>
</tr>
<tr>
<td>9. Sainfoin hay-1st cut</td>
<td>94,44</td>
<td>91,14</td>
<td>8,86</td>
<td>10,14</td>
<td>28,38</td>
<td>54,1</td>
<td>32,5</td>
<td>7,51</td>
<td>0,57</td>
</tr>
<tr>
<td>10. Sainfoin hay-2nd cut</td>
<td>94,87</td>
<td>90,47</td>
<td>9,53</td>
<td>11,64</td>
<td>28,91</td>
<td>50,5</td>
<td>28,5</td>
<td>7,96</td>
<td>0,58</td>
</tr>
</tbody>
</table>
### EXPERIMENTATIONS

**MEDITERRANEAN FORAGES**

*EAAP Prague, 1995 – Lillehammer, 1996*

### Digestibility coefficients

<table>
<thead>
<tr>
<th>Forages</th>
<th>Dry Matter</th>
<th>Organic Matter</th>
<th>Crude Protein</th>
<th>Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Natural meadow hay</td>
<td>42.3 +/- 4.2</td>
<td>42.9 +/- 4.3</td>
<td>47.0 +/- 6.4</td>
<td>41.2 +/- 1.3</td>
</tr>
<tr>
<td>2. Natural meadow hay</td>
<td>56.4 +/- 1.0</td>
<td>56.8 +/- 1.0</td>
<td>57.0 +/- 0.9</td>
<td>54.2 +/- 0.6</td>
</tr>
<tr>
<td>3. Natural meadow hay</td>
<td>46.7 +/- 2.5</td>
<td>47.2 +/- 2.5</td>
<td>47.2 +/- 2.6</td>
<td>42.8 +/- 2.4</td>
</tr>
<tr>
<td>4. Natural meadow hay</td>
<td>50.5 +/- 2.0</td>
<td>53.1 +/- 1.3</td>
<td>51.7 +/- 4.1</td>
<td>48.7 +/- 1.6</td>
</tr>
<tr>
<td>5. Alfalfa hay 1st cut</td>
<td>47.2 +/- 0.5</td>
<td>49.0 +/- 0.8</td>
<td>52.5 +/- 1.6</td>
<td>44.5 +/- 1.0</td>
</tr>
<tr>
<td>6. Alfalfa hay 2nd cut</td>
<td>58.2 +/- 4.7</td>
<td>58.2 +/- 4.8</td>
<td>77.5 +/- 1.5</td>
<td>57.3 +/- 3.5</td>
</tr>
<tr>
<td>7. Sweetvetch hay</td>
<td>41.0 +/- 5.3</td>
<td>40.1 +/- 6.7</td>
<td>53.0 +/- 4.5</td>
<td>-</td>
</tr>
<tr>
<td>8. Squarroso clover hay</td>
<td>51.1 +/- 5.7</td>
<td>50.5 +/- 5.4</td>
<td>56.8 +/- 6.3</td>
<td>46.8 +/- 6.1</td>
</tr>
<tr>
<td>9. Sainfoin hay 1st cut</td>
<td>57.2 +/- 2.2</td>
<td>58.0 +/- 2.1</td>
<td>52.7 +/- 2.3</td>
<td>53.4 +/- 1.5</td>
</tr>
<tr>
<td>10. Sainfoin hay 2nd cut</td>
<td>57.0 +/- 1.8</td>
<td>57.7 +/- 1.9</td>
<td>63.6 +/- 2.4</td>
<td>54.5 +/- 2.0</td>
</tr>
</tbody>
</table>
Figure 3. Comparison between the predicted UFC values INRA 1994 and the analytical determination

$$UFC = -0.124 + 0.0003 \text{ CG} + 0.0013 \text{ DOM}$$

Figure 4. Comparison between the predicted UFC values INRA 1994 and the analytical determination

$$UFC = -0.0557 + 0.0006 \text{ CC} + 0.2589 \text{ DE}$$
The French Horse Net Energy System (UFC) showed a satisfactory validity when applied to these forages.

It was confirmed the overestimation of the energy in the De system vs. the UFC system.

The UFC value of the Mediterranean forages can be predicted using the French relationship especially with the equations involving DOM and DE.

Satisfactory results came from the use of the predicted OMD values as expected by Martin-Rosset (1996).
Data of forages used in Italy

- From different areas
- Presented previously in different occasions
- Generally, mild to low quality
- Used both for breeding and athlete horses
<table>
<thead>
<tr>
<th>N = 29</th>
<th>UFC stepwise calculation (/kg DM)</th>
<th>UFC equation 1 (/kg DM)</th>
<th>UFC equation 3 (/kg DM)</th>
<th>MADC (g/kg DM)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.61±0.01</td>
<td>0.50±0.01</td>
<td>0.73±0.01</td>
<td>39.02±1.69</td>
</tr>
</tbody>
</table>
Relations between data, same sample

- UFC stepwise vs. UFC calculated (equation 1): R square 0.332; SEE 0.030
- UFC stepwise vs. UFC calculated (equation 3): R square 0.942; SEE 0.009

- Eq. 1: \( \text{UFC} = 0.852 - 1.090 \text{ CF} + 0.555 \text{ CP} \)
- Eq 3: \( \text{UFC} = -0.124 + 0.254 \text{ CC} + 1.330 \text{ DOM} \)
Green Forages from marginal areas

Natural pastures with high fibre content very different if compared with French green forages

To evaluate with new equations including NDF - ADF

Concentrated feeds

Few samples concerning simples concentrates

Industrial feeds characterized by high amount of fibre by-products

High fibre content = New equations including NDF and ADF
System Evolution

New trials

In vivo trials

Impact of new processing on concentrates feeds

- Chemical analyses
- Enzymatic procedure
- Biophysic method (NIRS)
- Use of markers

Modelling

New Prevision Equations
ADVANCES IN IN VIVO DIGESTIBILITY EXPERIMENTAL PROCEDURES
Faeces + Urines collection
CONCLUSIONS AND FUTURE PERSPECTIVES

VALIDATION OF THE FRENCH SYSTEM

The French System has been successfully used when applied to forages. The problems concerning the validation of some equations are mainly linked to the differences between Mediterranean and Central Europe forages. The development of the system has to be directed towards its adaptation to the quality and amount of fibre both in forages and in the new industrial concentrated feeds.

PRACTICAL USE IN FIELD CONDITIONS

The French System is the most diffused system employed in Italy in practical feeding and rationing.