MONITORING OF INTAKE AND ENERGETIC EFFICIENCY OF THE GRASS IN A PASTURE ROTATIONALLY GRAZED BY BULLS USING NIRS APPLIED TO THE FAECES

Ph. Lecomte, V. Decruyenaere[1], P. Limbourg, P. Dardenne
CRAGx Station de Haute Belgique B 6800 Libramont
[1]FSAGx UER Zootechnie B 5030 Gembloux

ABSTRACT
The objective of this approach was to characterise variations that one can observe in the course of a pasture season using near infrared spectrometry (NIRS) applied to the analysis of the grass and faeces collected during the season. Available grass and faeces of Belgian Blue White young bulls have been collected 3 times a week since the beginning of May until mid-October. The samples have been predicted in NIRS technique according to a calibration previously developed on the faeces of sheep fed ad libitum in cage with green grass. The NIRS provides a useful tool to provide a relative description and a monitoring of the evolution of the quality and of the daily intake of grass, that could provide useful information to adapt the supplementation according to the changing quality of the grass.

INTRODUCTION
The continuous follow up of the quantity and especially of the quality of the grass collected by ruminant on pasture necessitates in classical studies heavy and expensive implementations (administration of markers, chemical analysis by humid way) that limit the number of measurements. The objective of this approach was to characterise variations that one can observe in the course of a pasture season using near infrared spectrometry (NIRS) applied to the analysis of the grass and faeces collected during the season.

MATERIAL AND METHODS
The faeces of 4 batches of 6 Belgian Blue White crossbred young bulls (initial and final weight 300 kg- 460 kg) grazing in rotation a total of 3 parcels of 0.275 ha for each batch, have been collected 3 times a week (j1, j3, j5) since the beginning May until mid October (n = 63 sampling day). The sample constituted daily with 8 to 10 aliquotes collected in the freshest faeces patches has been dried at 70°C and ground in a hammer mill before being measured in a NIRSYSTEM 6500 monochromator measuring infrared reflectance between 1100 and 2500 nm. Data have been processed with the Infrasoft International Software (Shenk and Westerhaus, 1991) to undertake a prediction a priori of the relative evolution of the digestibility and the quantity of dry matter grazed by the animals according to a calibration previously developed on the faeces of sheep fed ad libitum in cage with green grass (Decruyenaere et al., 1994). Values of predicted sheep ingestion (Qim, g MS/kgP0,75) being brought to bovines ingestion (Qib) by using the equation proposed by Dulphy (1987) Qib = 22,4 + 0,969*Qim. In the same way the grass of each grazed parcel has been collected at the same time by hand plucking. The sample has been treated in the same way and digestibility has been predicted according to classical equation previously developed (Dardenne et al., 1996).

RESULTS AND DISCUSSION
On a spectral point of view the distances measured in terms of H values between the sheep faeces database and the sample studied show that “bovine” faeces spectra’s integrate partially to the sheep basis. 40% of the values have a distance H < to 4 (Hoaglin and Welsh, 1978). Predictions of OM digestibility and ingestion are described in Table 1. Considering the passage between categories of animals the data’s constitute only a referential inside of which one can follow the evolution of the parameters in time. By opposing graphically the values to the time (Figure 1), one observes a continuous decline in the digestibility between May and mid-July and steady from August, of a recovery of these values. This first tendency can be explained by the fact that the grasses enter in reproductive phase from mid-June (heading time), this period corresponding equally here to an episode of marked dryness. Thereafter the return of the rain favours the organic matter mineralisation and the supply of nitrogen to the grasses which stimulates their growth. Over this general tendency the effect of parcel changes are marked by a net increase of digestibility and ingestion values, these values decreasing then according to the staying time in the parcel and the decrease of the availability and the quality of the grass.

This is confirmed by the evolution of the digestibility predicted on the grass which reveals tendencies similar to the ones observed on faeces with for the last a delay of 3 to 4 days in the appearance of the evolution. The VEM and OEB value of the grass (energetic value and balance between ruminal energy and degradable protein in the DUTCH feeding system IVVO 1991) appears (Figure 2) balanced in the beginning of the grazing season, the value becomes then largely excessive in nitrogen in the late season due to high mineralisation and an excess in soluble nitrogen content of the grass.

CONCLUSION
The approach is preliminary, it should have to be completed by the establishment of more bovine faeces spectral references, It shows however the interest of a methodology characterized by its rapidity and its adaptation to the processing of many samples to describe, would not be what in relative value, the temporal evolution of the utilization of the grass at the pasture. In the view of a optimal use of the pasture the technique could provide useful information to adapt the supplementation according to the changing quality of the grass.

REFERENCES
Hoaglin, D.C. and R.E. Welsh. (1978). The hat matrix in regression and ANOVA. *The Amer. Statist.* **32**, 17-22.

Shenk, J.S. and M.O. Westerhaus. (1991). Population definition, sample selection, and calibration procedures for near infrared reflectance spectroscopy. *Crop Sci.* **31**, 469-474.

Dulphy, J.P., Ph. Faverdin, D. Micol and F. Bocquier. (1987). Révision du système des unités encombrement (UE). *Bull. Tech. C.R.Z.V. Theix*, INRA **70**, 35-48.

Dardenne, P., G. Sinnaeve, L. Bollen and R. Agneessens. (1996) NIR-NIT Calibration list, Libramont, Station de Haute Belgique.

Decruyenaere, V., Ph. Lecomte and P. Dardenne. (1994). Prediction de la digestibilité et des quantités ingérées de fourrages verts à partir l’analyse en spectrométrie proche infrarouge (SPIR) de fèces de moutons. 9 Journées herbivores 16-17 mars. *Ann. Zootech.* (suppl.).

IVVO (1991) Eiwit wardering voor herkauwers - Het DVE systeem. CVB reeks **7**. 53p.

Table 1
Parameters of Digestibility and intake predicted by NIRS on the faeces samples (mean of the 4 batches).

Indicative predicted values	dMO %	Intake Kg day $^{-1}$
min.	70.5	6.6
max.	86.3	10.7
moyenne	79.2	7.9
std	4.3	9.6

Figure 1
Description of the evolution of the digestibility and daily intake predicted by NIRS, mean of four 4 batches of young bulls grazing 3 parcels in rotation.

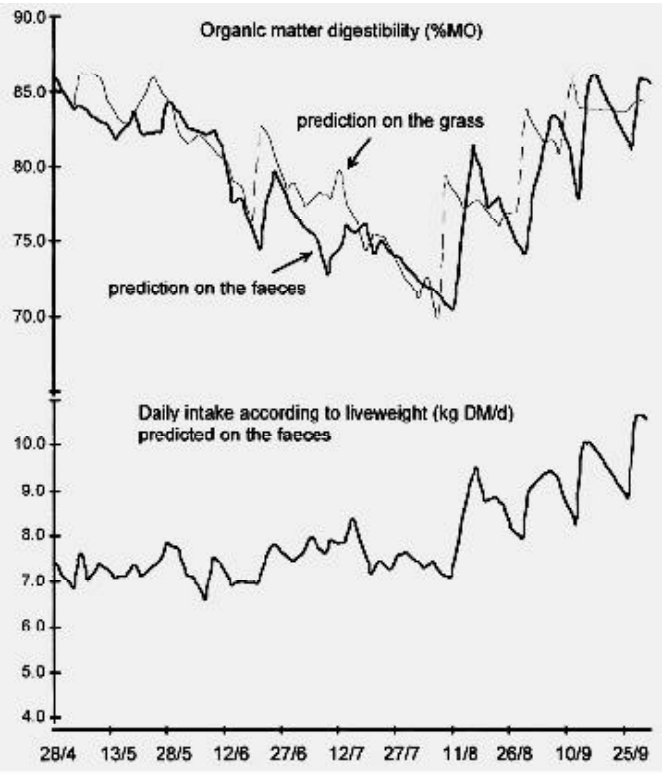

Figure 2
Evolution during the season of the energetic value (VEM, Dutch system) and ruminal nitrogen balance OEB according to NIR prediction on the grass collected in the parcels grazed in rotation by 4 shares of young bulls.