

NIRS Consortium Product Equation Packages

Variant:

I = Basic/ DM, ADF, NDF, CP, minerals, RFV

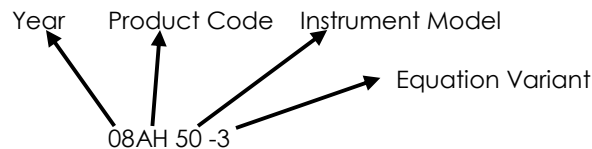
II = Basic + dNDF, RFQ, ash

III = Basic + II + RUP

Package	Description	Variants Available		
		I	II	III
<u>Mixed Hay</u>	legume & grass hays	X	X	X
<u>Mixed Haylage</u>	legume & grass haylages	X	X	X
<u>Alfalfa Hay</u>	alfalfa hay only	X	X	X
<u>Grass Hay</u>	warm & cool season grasses	X	X	
<u>Corn Silage Fermented</u>	fermented corn silage	X	X no RFQ	
<u>Alfalfa Breeders</u>	fresh cut alfalfa: research			X
<u>Roasted Soybeans</u>	roasted soybeans	other		
<u>Scissors Clip</u>	fresh clip alfalfa	other		
<u>Corn Silage Unfermented</u>	unfermented corn silage	other		

Equation versions current June, 2007. Information revised February, 2009.

NAMING SYSTEM



Product codes: AH= Legume hay; CS= corn Silage; GH= Grass hay; MH= Mixed hay; HG= Mixed Haylage.

Instrument Model: 45=Foss 4500; 50=Foss 5000+6500.

Equation level: 1=Basic; 2=Basic + dNDF+RFQ+Ash; 3= 2 + RUP; 4=sugar.

Mixed Hay

Mixed Hay Equation

Filename: 07MH50-(1,2,or 3).eqa

Constituent	N	Mean	SD	SEC	RSQ	SECV	1-VR	source
DM	106	93.87	1.50	0.24	0.98	0.31	0.96	06mh50.eqa
PROTEIN	1139	17.70	5.43	0.76	0.98	0.80	0.98	NEW
ADF	1021	34.19	6.60	1.63	0.94	1.67	0.94	NEW
NDF	1274	46.60	12.36	2.01	0.97	2.07	0.97	NEW

dNDF48	365	22.64	7.02	2.01	0.92	2.20	0.90	NEW
CA	774	1.07	0.54	0.16	0.91	0.17	0.90	NEW
P	764	0.27	0.08	0.04	0.72	0.04	0.70	NEW
K	687	2.25	0.77	0.29	0.86	0.31	0.84	NEW
MG	684	0.26	0.09	0.04	0.78	0.05	0.76	NEW
ASH	676	8.61	3.07	0.94	0.91	1.02	0.89	NEW
FAT	188	1.99	0.76	0.19	0.94	0.22	0.92	06mh50.eqa
Lignin	127	6.91	2.15	1.24	0.67	1.36	0.60	NEW
RUP	102	25.37	6.78	1.40	0.96	2.35	0.88	06mh50.eqa

There were only 12 samples added with generally very few changes. The only notable change involves lignin. We had data from donor labs that were added to the calibration. This addition seems to have decreased performance. However, this is an old lignin equation and its accuracy may be lower than the SECV may show.

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Mixed Haylage

Mixed Haylage Equation

Filename: 07HG50(1,2,or 3).eqa

Constituent	N	Mean	SD	SEC	RSQ	SECV	1-VR	source
DM	793	94.70	2.34	0.65	0.92	0.69	0.91	06hg50-3.eqa
PROTEIN	499	17.66	4.69	0.87	0.97	0.96	0.96	NEW
ADF	497	37.82	6.44	1.87	0.92	1.98	0.91	NEW
NDF	882	47.34	10.89	2.25	0.96	2.35	0.95	NEW
dNDF48	400	20.46	4.53	1.84	0.83	1.99	0.81	NEW
ASH	563	10.07	3.72	1.10	0.91	1.19	0.90	NEW
CA	487	1.11	0.47	0.16	0.89	0.17	0.87	NEW
P	498	0.31	0.08	0.05	0.63	0.05	0.55	NEW
K	473	2.50	0.81	0.31	0.85	0.36	0.81	NEW
MG	478	0.29	0.10	0.06	0.71	0.06	0.67	NEW
Lignin	142	8.07	2.75	1.07	0.85	1.23	0.80	NEW
FAT	116	2.65	0.77	0.31	0.84	0.35	0.79	NEW
ADP	126	2.04	1.46	0.53	0.87	0.65	0.80	06hg50-3.eqa
RUP	116	21.92	4.14	1.24	0.91	1.42	0.88	06hg50-3.eqa

This calibration received the largest number of samples for updates (#26). From the donor labs we had information on FAT and Lignin that were included.

Compared to the previous year changes in performances were small. Relatively speaking, the largest changes were on Fat and Lignin showing increases in number of samples (over 10%) with an increase in error (SECV) for lignin, but a decrease for FAT. We think these two parameters would greatly benefit from chemistry coming from donor labs.

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Alfalfa Hay

Alfalfa Hay Equation

Filename: 07AHY50(1,2,or 3).eqa

Constituent	N	Mean	SD	SEC	RSQ	SECV	1-VR	source	Bias
DM	106	93.87	1.50	0.24	0.98	0.31	0.96	06AH50-3.eqa	-1
PROTEIN	615	20.73	2.97	0.59	0.96	0.64	0.95	NEW	
ADF	737	32.38	5.81	1.75	0.91	1.80	0.90	NEW	
NDF	901	40.92	7.80	1.69	0.95	1.75	0.95	NEW	
dNDF48	287	20.48	5.67	1.91	0.89	2.10	0.86	NEW	
CA	395	1.47	0.32	0.16	0.74	0.18	0.69	NEW	
P	391	0.26	0.06	0.03	0.72	0.04	0.67	NEW	
K	343	2.49	0.61	0.24	0.85	0.27	0.80	NEW	
MG	339	0.32	0.09	0.05	0.75	0.05	0.70	NEW	
ASH	529	8.43	3.02	0.80	0.93	0.87	0.92	06AH50-3.eqa	
Lignin	101	7.50	1.97	0.75	0.85	1.03	0.73	06AH50-3.eqa	
FAT	188	1.99	0.76	0.19	0.94	0.22	0.92	06AH50-3.eqa	
RUP	102	25.37	6.78	1.40	0.96	2.35	0.88	06AH50-3.eqa	

The legume equation received minimal updates with only 13 samples received from three different labs. Also this year the potential update for DM didn't fit well. The process we have in place with scanning on the master and the analysis run in a different lab, imposes a time delay with changes in moisture that are not compatible with updates. However, the DM calibration has responded quite well. I've noticed a bias compared to historical NFTA samples that was applied this year to the equation. In general the small addition of sample hasn't changed the equation performance much.

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Grass Hay

Grass Hay Equation

Filename: 07GH50(1, 2,4).eqa

This is the same as 06GHY

Constituent	N	Mean	SD	SEC	RSQ	SECV	1-VR	Source
DM	878	94.44	2.45	0.64	0.93	0.69	0.92	New
PROTEIN	799	12.61	6.51	0.71	0.99	0.73	0.99	New
ADF	470	40.74	7.15	1.48	0.96	1.61	0.95	New
dNDF48	250	25.39	7.40	2.62	0.87	2.96	0.84	New
NDF	531	59.60	13.13	2.32	0.97	2.57	0.96	New
CA	562	0.50	0.22	0.08	0.86	0.09	0.84	New
P	567	0.18	0.07	0.03	0.80	0.03	0.77	New
K	484	1.53	0.71	0.21	0.91	0.23	0.89	New
MG	483	0.22	0.11	0.04	0.88	0.04	0.85	New
ASH	164	8.26	2.97	0.87	0.91	1.09	0.89	New

As with the other equations above, this grass hay equation had a significant addition (over 100 samples) of dNDF48 data. As with AHY the data set has been restricted to grass hay samples, which include both warm and cool season grasses.

This equation does not contain a FAT prediction. This is due to the fact that we had very few samples analyzed for fat. NFC and TDN for NRC is calculated with a constant of 2.5 for FAT. Future updates should provide a prediction for fat, as soon as we receive enough sample data.

A test was run using NFTA and labs' spectra and data. A bias for NDF of -1.7 was calculated and applied it to the current equation. Please report to Paolo if there are any problems using this correction.

Grass Hay Equation

Filename: 07GH50-4.eqa

Constituent	N	Mean	SD	SEC	RSQ	SECV	1-VR
Sugars	67	5.14	2.36	0.97	0.83	1.02	0.81
Fructan	67	1.43	0.80	0.43	0.71	0.48	0.63
WSC	68	6.72	3.02	1.11	0.87	1.24	0.83

In October of 2008 we released an addition to the Grass Equation for sugar. During late 2007, samples from FFR and CALWEST were selected for developing this sugar equation. Samples included timothy, orchard grass, perennial ryegrass, Teff and sudangrass collected over different cuttings, and 2 different growing seasons. Samples were all oven dried (less than 60 °C) and ground through a 1mm screen. Determination of sugars was limited to 70 samples and were analyzed at the Forage and Range Research Lab in Logan, UT.

Because of the limited number of samples, the equation was developed with few principal components to avoid over fitting. Nevertheless, total sugars and water soluble carbohydrates (WSC) have respectable performances. Fructans are limited in concentration which makes the calibration complicated, but we've kept this parameter in the calibration for future expansion.

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Corn Silage Fermented

Fermented Corn Silage Equation

Filename: 07CS50(1 or 2).eqa

Constituent	N	Mean	SD	SEC	RSQ	SECV	1-VR	source	Bias
DM	421	96.24	3.60	1.42	0.85	1.53	0.82	cslg50-2.eqa	2.00
PROTEIN	702	9.26	1.86	0.53	0.92	0.56	0.91	NEW	
ADF	633	27.52	4.66	1.53	0.89	1.61	0.88	NEW	-1.50
NDF	1056	46.29	7.36	2.03	0.92	2.08	0.92	NEW	
dNDF48	535	27.67	4.95	1.63	0.89	1.72	0.88	NEW	
IVTDMD	534	82.19	3.14	1.37	0.81	1.47	0.78	NEW	
FAT	192	2.43	0.42	0.17	0.83	0.19	0.79	NEW	
ASH	286	6.00	3.22	0.64	0.96	0.79	0.94	cslg50-2.eqa	
Lignin	307	3.80	1.11	0.48	0.81	0.55	0.75	cslg50-2.eqa	
P	263	0.22	0.04	0.03	0.51	0.03	0.41	cslg50-	

								2.eqa	
								cslg50-	
CA	262	0.27	0.10	0.06	0.63	0.08	0.48	2.eqa	
K	300	1.20	0.47	0.26	0.69	0.28	0.64	NEW	0.30
MG	293	0.21	0.07	0.04	0.66	0.04	0.61	NEW	

This fermented corn silage calibration had the addition of only 8 samples. Biases were applied to moisture, ADF and K to better fit NFTA data.

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Alfalfa Breeders

A research equation for fresh clipped alfalfa was originated in 1998 and is updated annually by the seed breeders research group within the NIRS Consortium. Output includes ADF, NDF, CP, ADL, RUP, and dNDF.

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Roasted Soybeans

File Name: roastsb2.eqa
 File ID: ROASTED SOYBEAN EQA FOR APPROX.
 BYPASS PROTEIN, 5/95, (4500)

Constituent	N	Mean	SD	SEC	RSQ	SECV	1-VR
DM	63	90.87	4.17	0.35	0.99	0.45	0.99
PROTEIN	113	41.52	2.11	0.42	0.96	0.47	0.95
APBYPROT	114	56.77	6.62	2.86	0.81	3.43	0.73

This equation was developed from data supplied by Dr. Glen Broderick, University of Wisconsin in the 1990's. Spectra were trimmed to 4500. The equation predicts Protein, and Approximate Bypass Protein (APBYPROT) as a percent of total protein.

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Scissors Clip

File Name: asc01.eqa
 File ID: 1994 alf scissors cut samples trmd to
 4500.std w/um500494.std.cent.

Constituent	N	Mean	SD	SEC	RSQ	SECV	1-VR
CP	133	21.86	4.49	0.51	0.99	0.90	0.96
ADF	138	31.05	6.67	0.97	0.98	1.31	0.96
NDF	138	38.10	8.09	1.00	0.98	1.53	0.96
DM	526	92.88	1.96	0.37	0.97	0.40	0.96

This equation was developed in 1995 from hand harvested alfalfa, primarily first harvest, and was updated in 2001 from NIRS Consortium member samples. This equation is only in the 4500 spectral range, but will work with 4500, 5000, and 6500 instruments.

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Unfermented Corn Silage

Fermented Corn Silage Equation

Filename: 06UNCS50.eqa

Constituent	N	Mean	SD	SEC	RSQ	SECV	1-VR
DM	158	93.12	0.75	0.45	0.64	0.51	0.53
CP	161	7.49	1.59	0.65	0.83	0.73	0.79
ADF	162	28.47	5.61	0.91	0.97	1.10	0.96
NDF	160	48.82	8.06	1.33	0.97	1.50	0.97
Starch	156	22.56	10.01	1.16	0.99	1.30	0.98
IVDMD48	163	80.67	4.73	1.78	0.86	2.08	0.81
dNDF48	160	29.81	5.13	1.76	0.88	2.11	0.83
NDFD48	163	60.81	6.39	3.79	0.65	4.37	0.54

Participants in the NIRS Consortium developed this equation in 2006. The first release was made in March of 2006 and an update released in September of 2006. Samples were received from several locations across the US and submitted from 5 participating members. This equation is modeled similar to the Alfalfa Breeders in that participants cost share in the equation update, compared to a set annual fee.

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