Nordic Feed Evaluation System NorFor®

2021-10-27

News in NorFor 27th of October 2021

From the 27th of October at 8:00 there will be new version of NorFor's Feedstuff Table (FST), Feed Rations Calculator (FRC) and One-day Feeding Control (OFC). In the NFRO ration calculator you will find FST revision 2.07, FRC revision 2.06 and OFC revision 1.37 (click on Help and About.)

Changes will result in small diets changes

Feed ration for a 2. Lactation Holstein cows producing 40 kg of ECM. The ration is optimized with grain, Rapeseed expeller/cake and soya bean meal. The roughage is a mix of grass silage (50%) and maize silage (50%).

	FRC 2.04	FRC 2.06
Concentrate, kg DM	12,1	11,6
Roughage, kg DM	13,5	14,0

What are the changes in the new FRC version?

1. A linear passage rate for forage NDF (r_kpNDFf)
2. New degradation rate for rest fraction of 60% per hour for concentrate and forage with few exceptions
3. More crude protein is digested due to less endogenous and microbial nitrogen in faeces
4. New climate values

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1. Forage NDF passes linearly through rumen

According to the NorFor book (2011) forage NDF passage rate in the rumen is curvilinear, but hereafter it will be linear.

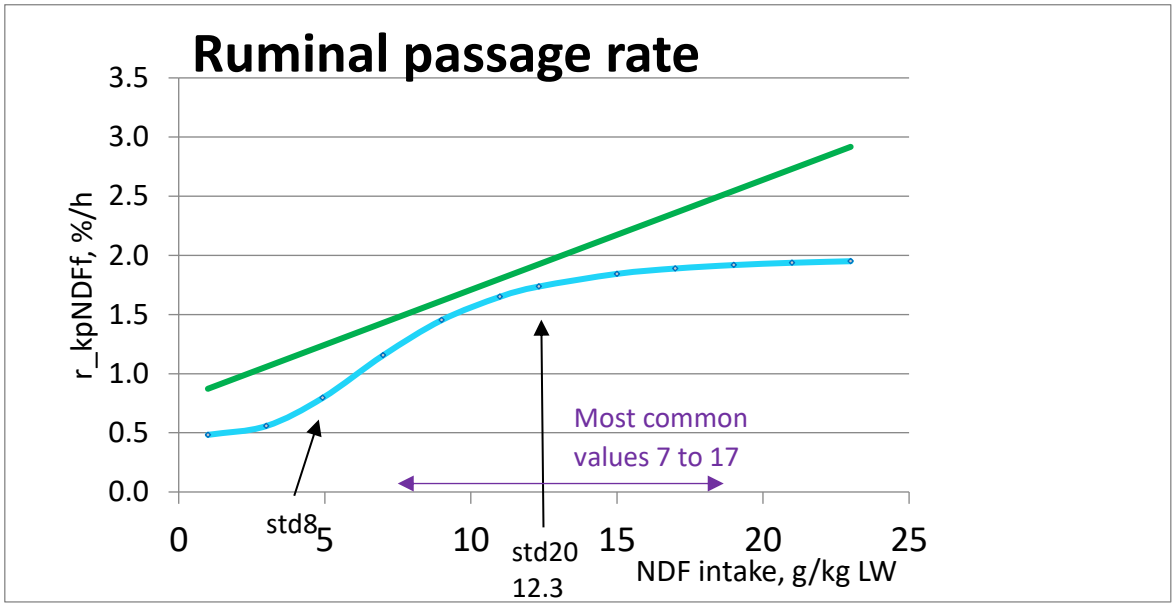

Diagram 1. Passage rate for NDF in forage (r_kpNDFf) will be linear (green line) in new FRC (FRC version 2.06) and it is slightly higher than used earlier (FRC 2.04 and earlier versions, turquoise) .The standard feed values at 20 kg DMI (std20) is based on 12.3 g NDF intake per kg live weight

- ➔ In FRC version 2.06 the passage rate for forage NDF is slightly higher. That lead to rumen degraded NDF is slightly lower. That results in slightly less energy, and slightly less rumen microbial synthesis.
- ➔ More simple equation. Numerical better prediction of apparent NDF digestibility.
- ➔ In scientifical feeding experiments NDF intake varied between 3.6 and 20.6 g NDF per kg live weight (average 12.1, ±2 standard deviations correspond to 7 and 17).

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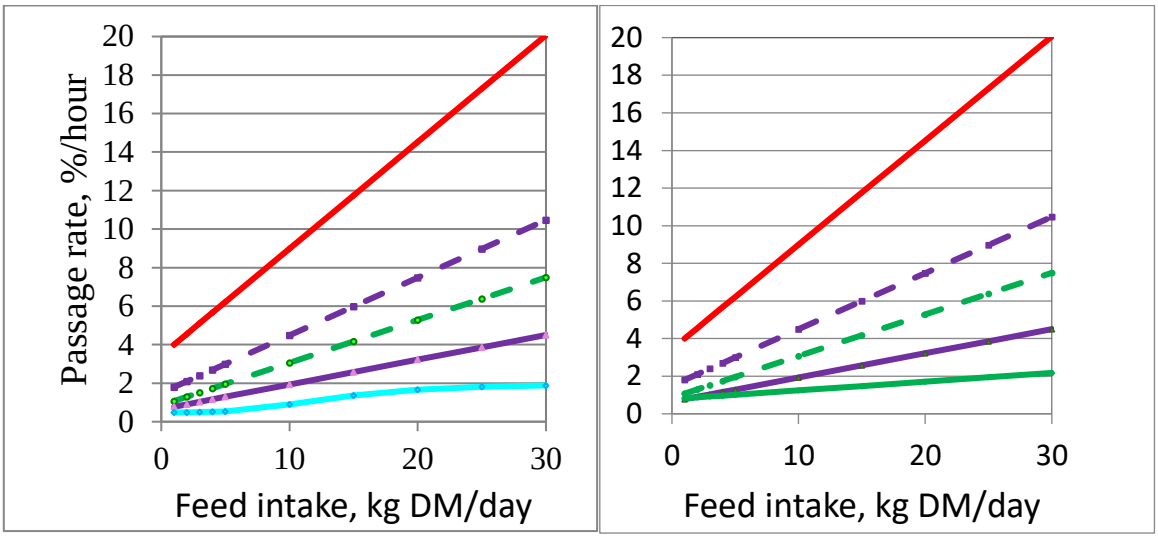

Diagram 2. Compilation over all passage rates used in the NorFor model. Figure to the left shows the previous versions (FRC version 2.04 and earlier) and the figure to the right shows the new (FRC version 2.06). Red line is passage rate for rumen liquid and soluble fractions, purple dashed line is for potentially degradable CP and starch in concentrate, green dashed line is for potentially degradable CP and starch in forage, purple solid line is for NDF in concentrate and turquoise/green solid line and forage NDF.

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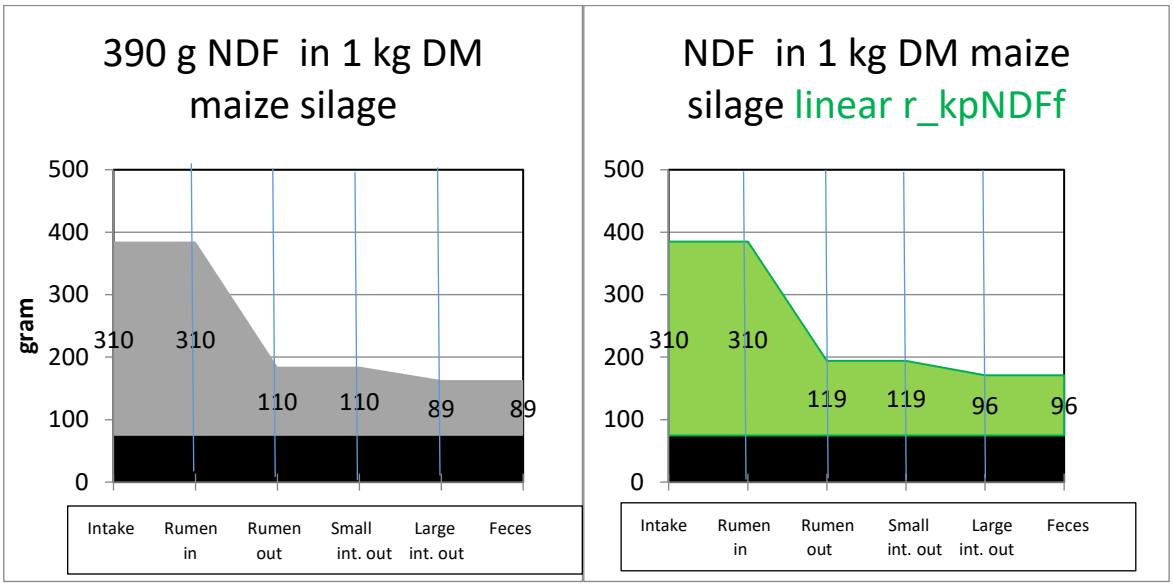

Diagram 3. The figures show NDF degradation in 1 kg DM maize silage and how much NDF passes through rumen and gastro-intestinal tract according to the NorFor model. The figure to the left shows the previous NorFor versions (FRC 2.04 and earlier) and the figure to the right the new (FRC 2.06). The new passage rate for forage NDF leads to slightly more NDF passes out of rumen and out in faeces, slightly less digested NDF, and hence slightly less rumen microbial synthesis and energy. Black is indigestible NDF (iNDF) and grey/green is potentially degradable NDF.

2. Rest fraction gets another degradation rate

The new Norfor model (FRC version 2.06) will use 60 % per hour for the degradation rate of rest fraction and it will be the same for both concentrate and forage. Sugars (WSC) in forage will not affect the degradation rate of rest fraction.

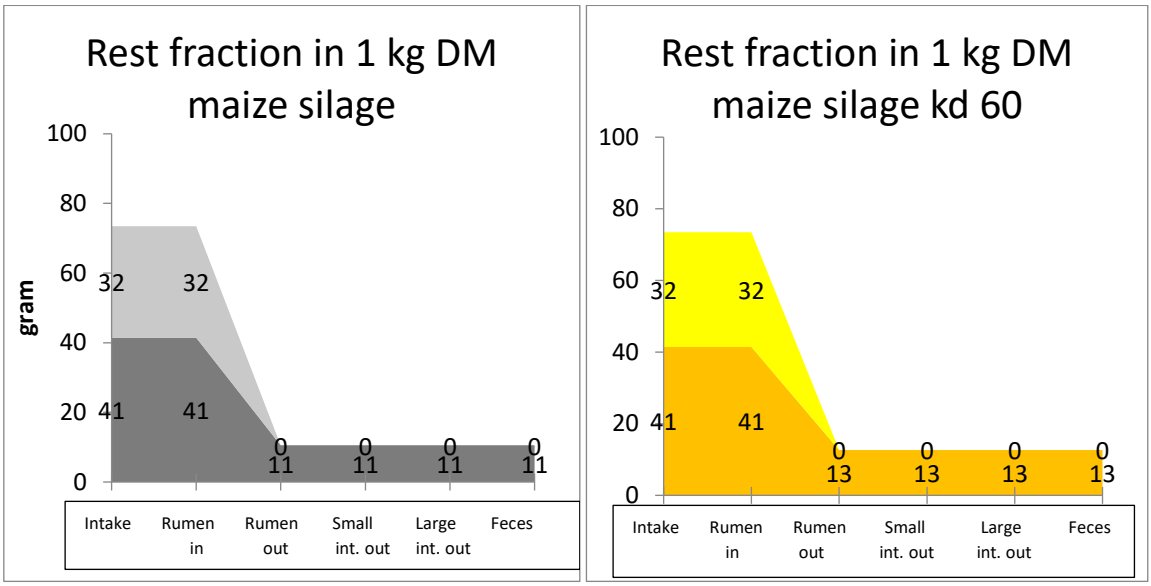

Diagram 4. The figures show how much rest fraction of 1kg DM maize silage degrades in the rumen and passes through the gastrointestinal tract to faeces. Figure to the left shows the previous FRC versions (FRC 2.04 and earlier) and figure to the right the new version (FRC 2.06). The new degradation rate (kd) of rest fraction leads to changed rumen degradation. That will affect estimated rumen microbial synthesis and energy. Light grey/yellow is sugars (WSC) and dark grey/orange is sugar-free rest fraction

3. More digested crude protein due to less endogenous and and microbial N in feces

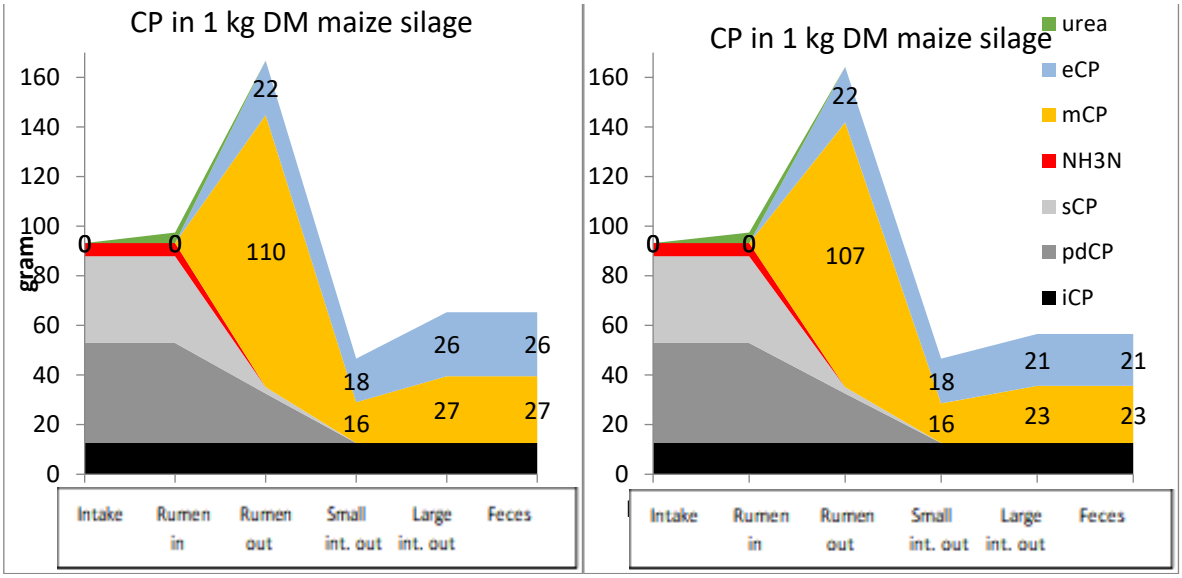

Diagram 5. The figures show how much CP from 1 kg DM maize silage (black, dark grey, light grey and red), endogenous CP (light blue), microbial CP (orange), urea from saliva (green) is degraded, synthesised, digested and passes through the digestive track. Figure to the left shows the former versions of FRC (FRC 2.04 and earlier) and figure to the right shows the new (FRC 2.06). The new version leads to lower endogenous and microbial N in faeces, and hence more apparent digested crude protein and higher energy. On the other hand, there will be less rumen microbial CP and metabolizable protein (AAT) due to less rumen degraded forage NDF and rest fraction.

Why are these changes introduced in the NorFor model?

The NorFor digestion model was evaluated against feeding trials with cows. The evaluation of NorFor's prediction of apparent NDF digestibility was presented at the Nordic Feed Science Conference[1]. The conclusion of that presentation was that the model could be simplified via a linear equation for ruminal passage rate of forage NDF instead of curvilinear. During the same evaluation, possibilities to improve prediction of apparent CP digestibility were found. In connection with these prediction changes, also a simplified degradation rate of rest fraction could be introduced without changes of prediction of production responses.

In the conference's proceedings[1] it was reported a mean prediction error of 6.3 % for the prediction of apparent NDF digestibility with a curve linear passage rate and 6.1 % of a linear based on 29 scientific studies and 212 treatments.

An evaluation of NorFor's prediction of apparent crude protein digestibility (not published) was based om 214 treatments from 33 scientifical studies and resulted in a change. The mean prediction error of crude protein digestibility was 12% before the change and 5.6% after, which corresponds to 237 and 137 grams apparent digested crude protein per day, respectively.

[1]M. Åkerlind & N.I. Nielsen, 2019. Evaluation of NorFor's prediction of neutral detergent fibre digestibility in dairy cows. Proceedings of the 10th Nordic Feed Science Conference. SLU, Uppsala, Sweden.

4. Climate values

A climate value for manure when cows are on pasture can be chosen as a ration parameter to formulate rations. Cow manure from pasture generates other climate impact than manure in barns (slatted floor or deep litter), storage and spreading. For dairy cows you can choose the climate value for grazing 8 hours per day where one third of the manure estimates remain outdoor, while young cattle and dry cows you can choose a climate value for 24 hours.

There will be a negative climate value for avoided fertilizer which also can be chosen as a new ration parameter.

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Changes in NorFor feedstuff table (FST)

kdRest 60%/h

Degradation rate for rest fraction will be 60% per hour for both forage and concentrate. The degradation rate will change for concentrate from 150 to 60 %/h. Rest fraction in forage and roughage with particle size larger than 6 mm will degrade 60%/h and will not be affected by the content if sugars. There will be few exceptions: unmolassed dried beet pulp, molassed dried beet pulp, molasses, propylene glycol and glycerol will keep the degradation rate of 150% per hour.

NOTE: kdRest to 60% per hour will be automatically changed in all systems, i.e. NorFor feed table, herd feed table and feed analysis system. The kdRest of 150% per hour for the exceptions will only be kept in the NorFor feed table. **Users must manually change kdRest from 60 to 150 %/h** in the herd feed tables for dried beet pulp, molasses, propylene glycol and glycerol. Mixtures and compound feeds including these feeds will variate in kdRest. Another option could be to re-import these feeds from the NorFor feedstuff table after the update.

Degradation rate of rest fraction (kdRest) of forage have been sensitive to its sugar content (see table), and hence the standard feed values. The fixed kdRest will make forage standard feed values more stable.

Table. Example of a forage[1] with different sugar content and its effect on kdRestCHO and standard feed values (NEL20, AAT20, PBV20) before and after the release of FST 2.07

	Before				After			
Sugar, g/kg DM	**kdRest** %/h	**NEL20,** MJ/kg DM	**AAT20,** g/kg DM	**PBV20** g/kg DM	**Fixed kdRest**	**NEL20,** MJ/kg DM	**AAT20,** g/kg DM	**PBV20** g/kg DM
0	10	5.57	76	41	60	6.26	82	31
12	21	5.86	80	36	60	6.26	82	31
57	60	6.19	84	29	60	6.24	82	31
159	150	6.30	85	26	60	6.19	82	31

[1]Analysed values of OMD in vivo 74.4 % of OM, ash 74, CP 159, CFat 43, NDF 457, FPF 98 g/kg DM.

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Changes in One-day Feeding Control (OFC)

There are several parameters added that have previously existed in FRC and some are new

1. Parameters, minimum and maximum limit

New parameter: AAT/NEL intake. The total amount of AAT (metabolizable protein) divided the total amount of net energy in the diet. There is also a minimum limit coupled to this parameter.

Minimum limit of starch for dry cows in close-up and a maximum limit for dry cows in far-off period

Fatty acid content in diets can be chosen as parameters: C16:0, C18:0, C18:1, C18:2 and C18:3, and the unit is gram per kg DM.

2. N, P and K excretion

There are new parameters showing

Excreted amount of N for a group of animals

Excreted amount of P for a group of animals

Excreted amount of K for a group of animals

3. Climate values

There are new parameters estimating climate impact

Climate values for grazing animals can be chosen

Negative climate value for avoided commercial fertilizer

Climate values for groups of animals

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