The 190 kg Nitrogen Cap, responses and economic outcomes on farm.

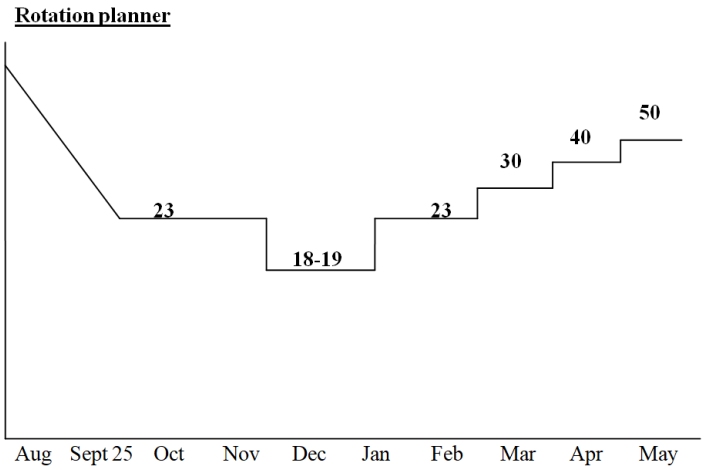
The synthetic N cap is a fact for 20-21 and onwards and it this ceiling may sink in the future.
A "standard" 200 ha dairy farm using say 230 kg N/ha now, reducing down to 190 kg N/ha will remove approx. 80 t DM from the equation, assuming a 1:10 response rate overall.
What are some of the options:

Maximize what's already there:

1. Clover.

   Get the clover to fix as much atmospheric N as possible:
   a. Feed the clover with K (pref. away from the calving period and well before the autumn). K is very mobile and will leach in wet periods. Compare clover content inside vs outside the urine patches.
   b. Check micro-nutrients in clover-only samples and adjust if need be (B, Mo, Cu).
   c. Deal to compacted soils to encourage deep-rooted, healthy plants.
   d. Don't allow high pasture covers to out-shade the clover: rotation planner and silage making.
   e. Over-sow clover in spring if populations are low.

2. Pasture.
   a. Look at using S as well as N in the early and later parts of the season. Spreading N won't do much if S is in fact limiting. Compare colour of younger vs older leaves to diagnose.
   b. Graze to leaf stage as much as possible. Leaf 1 = 20%; leaf 2 = 30% but leaf 3 = 50% of potential plants mass. Over 3 leaves the quality drops off steeply. In Oct/Nov and Jan/Feb, graze to 2.5-3 leaves. During flowering, run a faster round (2-2.5 leaves).



   c. Aim at 1500 residuals throughout the season = best? compromise between quantity and quality.
   d. Harvest true surpluses in order to maximize pasture quality. Several calculators available for this.
   e. ProGibb works, especially in the cooler periods when plants synthesise little of their own giberellic acid.
   f. Place N ahead of grazing, taking account of the high Nitrate period (approx. 3-7 days post spreading, depending time of year).
   g. Dissolved-N application and/or little and often: no benefits re. response rates. Foliar application may have a small advantage.

Most of these are low- or zero cost strategies.

Economic outcomes of some strategies.

The basis of this study is a set of Udder simulations, modelling a 200 ha dairy farm running 739 cows at peak. A number of strategies have been implemented to offset the reduction in synthetic N use from 230 kg N/ha down to 190 kg, but the list of alternatives is literally endless.

In the base model, Pasture Harvest runs at approx. 14.9 t DM/ha; importing 190 t grain, 172 t DM GS (or some other feed), 75 t straw and cutting 122 t DM silage on the platform. Round lengths approx. as per diagram above and 2* 6 ha of grass to grass pasture renewal is embedded. Production level of 300,000 kg MS; 1500 kg/ha and 405 kg/cow.

The feed/milk outcomes ex Udder simulations have then been fed through a series of spreadsheet, calculating the economic performances, expressed as Trading Surplus, i.e. farm revenue minus farm working expenses; items like interest, tax, CapEx etc have been ignored.

Options studied:

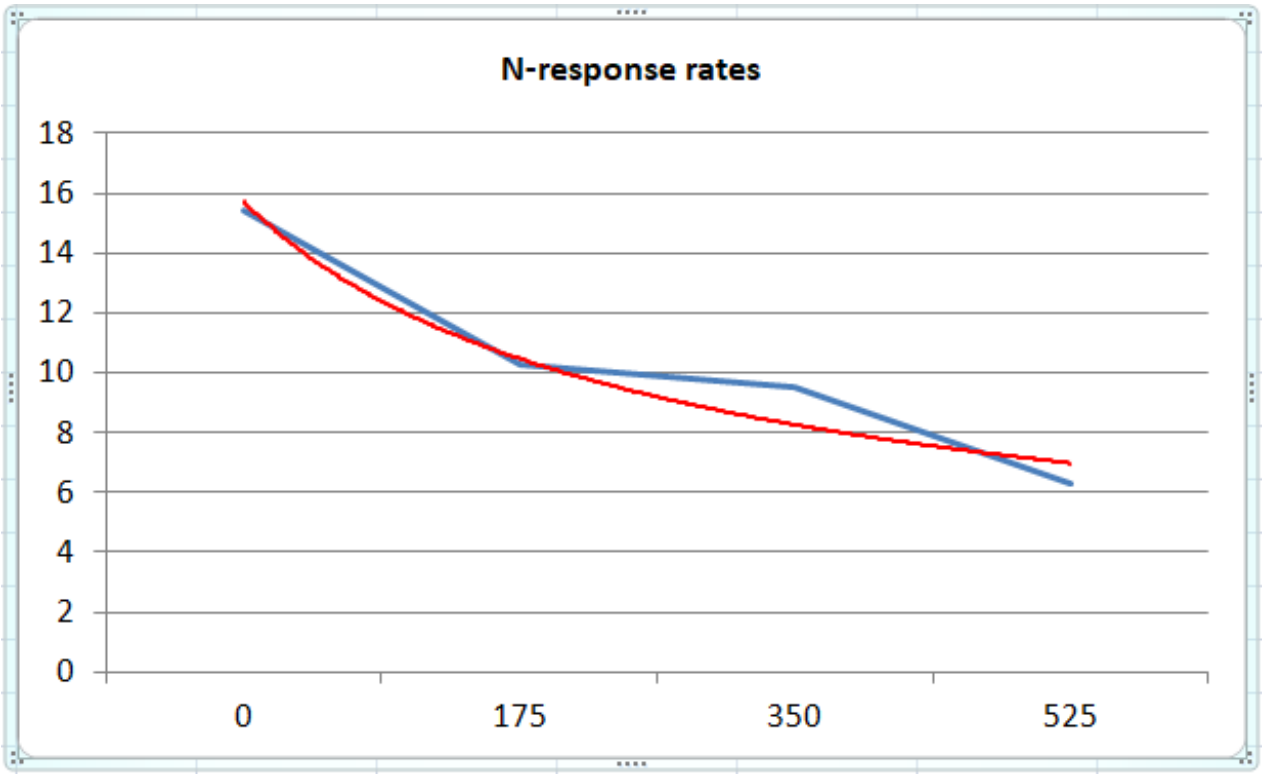
1. No changes
2. Reduced stocking rate
3. Early cull of MT's
4. Imported grass silage
5. Imported PKE
6. Fodder beet crop on farm
7. Lucerne area on farm
8. Early dry-off

NB. With any major system change, an Overseer model needs to be run to ensure N, P losses do not increase.

Table 1, financial results.

	250 kg N	**190 kg N No change**	**190 kg N Reduced SR**	**190 kg N Early cull**	**190 kg N Import GS**	**190 kg N Import PK**	**190 kg N FB crop**	**190 kg N Lucerne**	**190 kg N Early D/O**
Peak milkers	739	739	714	739	739	739	739	739	739
Production	301,846	292,286	292,404	287,997	299,868	311,172	303,532	296,410	286,114
Pasture Harvest	15.0	14.5	14.6	14.5	14.6	14.6	14.9	14.9	14.2
Grain imported	189	189	183	189	189	189	189	189	189
GS imported	172	181	155	137	260	184	34	200	142
GS made	122	113	123	113	122	121	47	120	113
PK imported	-	-	-	-	-	194	-	-	-
t DM FB	-	-	-	-	-	-	300	-	-
t DM Lucerne	-	-	-	-	-	-	-	256	-
TS/ha	**$ 3,090**	**$ 2,831**	**$ 3,050**	**$ 2,756**	**$ 2,923**	**$ 3,133**	**$ 3,342**	**$ 2,774**	**$ 2,655**
Difference		**-$259**	**-$40**	**-$334**	**-$167**	**+$43**	**+$252**	**-$316**	**-$435**

Growth response rates of mixed pasture to applied N reduce with increasing rates of N:



Adapted from Sun, Luo, Longhurst and Luo, 2008