

DAIRY MANAGEMENT

COLOPHON:

Veepro Dairy Management is a supplement to the Veepro Magazine. It contains articles, tips and advice aimed at the management of dairy farms worldwide.

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A well-balanced ration is the key to success for any dairy farm. Combined with a cow that has plenty of genetic potential to produce high milk yields, a well-balanced ration produces the best results. The basis is formed by roughage, while concentrates take care of milk production.

HIGH-PRODUCER RATION



The balancing of a ration is part of farm management. Those who want highly productive cows will need to pay a lot of attention to the ration and that is not a simple issue. In addition, the dairy farmer should adjust this ration on a regular basis, especially when a new ingredient is added or when new milk recording data become available.

How should the feed for highly productive cows be balanced? Step by step, this article intends to give you more insight in the matter.

Roughage and concentrates

With the ration of dairy cows, a distinction is made between roughage and concentrates. The roughage part of the ration is responsible for the overall health, it will provide the cow with maintenance energy, and hopefully will also result in a few kilograms of milk. The concentrates part of the ration is mainly used to increase the milk yield. The kind of concentrates that are used is quite important as it will allow the

dairy farmer to properly balance the ration. The following figure illustrates the above:



The hypothesis is clear. For a well-balanced ration the dairy farmer will need to emphasize the **quality** and the **amount** of roughage. This is the first step towards a successful ration. The next step is to determine the amount and kind of concentrates.

Roughage is the basis

Roughage forms the basis of the ration. This basis should be good and solid. The quality of the roughage is more important than the kind of crop. Every crop should be harvested under the best

possible conditions. In many cases roughage is fed fresh only part of the year. During the dry season or winter season, ensiled or dried roughage is fed. Besides the stage of harvesting, fiber content, and palatability, the harvesting method, and the conservation and storage process also play a role of importance.

The quantity of roughage should be such that an unlimited daily supply of roughage is ensured. If there is not enough roughage available, a dairy cow will develop a feeling of hunger, and will not produce enough milk. To remedy this she would start to eat more concentrates. The latter can only be allowed to a limited extent, however, as it reduces the amount of fiber in the ration which in turn will endanger the cow's health (rumen acidosis).

Dry matter intake

Balancing a ration always starts by determining the dry matter intake. A high dry matter intake from roughage is desirable. The exact amount will depend

on the production level of the herd, the average body weight of the cows, and the quality of the roughage. How exactly do we determine the daily dry matter intake of a cow? Depending on the herd's milk yield, and the quality of the roughage, we can determine the dry matter intake from the following table.

require a minimum of 4 feedings throughout the day. Supplying larger quantities at a time, could also result in rumen acidosis.

Kind of concentrates

There is a large variety of concentrates. In a number of cases, the concentrates are pre-mixed at the feed mill. In these feed

cow is fed a certain amount of concentrates, the cow eats a certain amount of roughage less.

If only 1 kg of concentrates is fed, a small amount of roughage is replaced. With every kg of concentrate dry matter that is added, the amount of replaced roughage increases.

When balancing a ration, the following replacement rate is applied:

- The first 6 kg/day: 0.3 → this means that for every kg of concentrates, 0.3 kg of dry matter intake from roughage is replaced.
- From 7 to 12 kg/day: 0.5 → this means that for every kg of concentrates, 0.5 kg of dry matter intake from roughage is replaced.

Table 1. Gross dry matter intake per 100 kg of body weight *)

Kg milk/cow (FCM****)	Conserved or dried roughage					Fresh roughage Grazing **)
	Quality per kg of dry matter (FUM***)					
	700	750	800	850	900	
4000	1.7	1.8	1.9	2.0	2.0	2.4
5000	1.8	1.9	2.0	2.1	2.2	2.5
6000	1.9	2.0	2.1	2.2	2.3	2.6
7000	2.0	2.1	2.2	2.3	2.4	2.7
8000	2.2	2.3	2.4	2.5	2.6	2.8
9000	2.3	2.4	2.5	2.6	2.7	3.0

*) Without concentrates
 **) Zero grazing, intake: -0.2 kg dry matter/100 kg body weight
 ***) FUM is Feed Unit Milk (measure for energy)
 ****) FCM is Fat Corrected Milk = $(0.4 + 0.15 \times \%F) \times M$

We call the dry matter intake we estimate by using the above table the gross dry matter intake. When we start adding concentrates to the ration, gross dry matter intake will drop.

Concentrates

Whereas roughage forms the basis for a dairy ration, concentrates are almost always used to supplement the ration, and particularly, to increase the milk production. Energy has been concentrated in the concentrates and it takes up less space in the stomachs of the cow. By adding concentrates to the ration, dry matter intake from roughage decreases, but the total dry matter intake as well as the energy intake will increase. This will result in a higher milk yield per cow.

Amount of concentrates

For reasons of cow health and farm economics, an excessive amount of concentrates in the ration should be avoided. As a good rule of thumb, usually a maximum of 12 kg of dry concentrates per cow per day is maintained. If a larger amount of concentrates than this maximum are fed, the dry matter intake from roughage will drop too much. This will result in a cow not consuming enough crude fiber which, in turn, will prohibit good digestion and may even lead to rumen acidosis.

In addition, it is important that the feedings of concentrates are spread throughout the day. A quantity of 12 kg of dry concentrates per day would

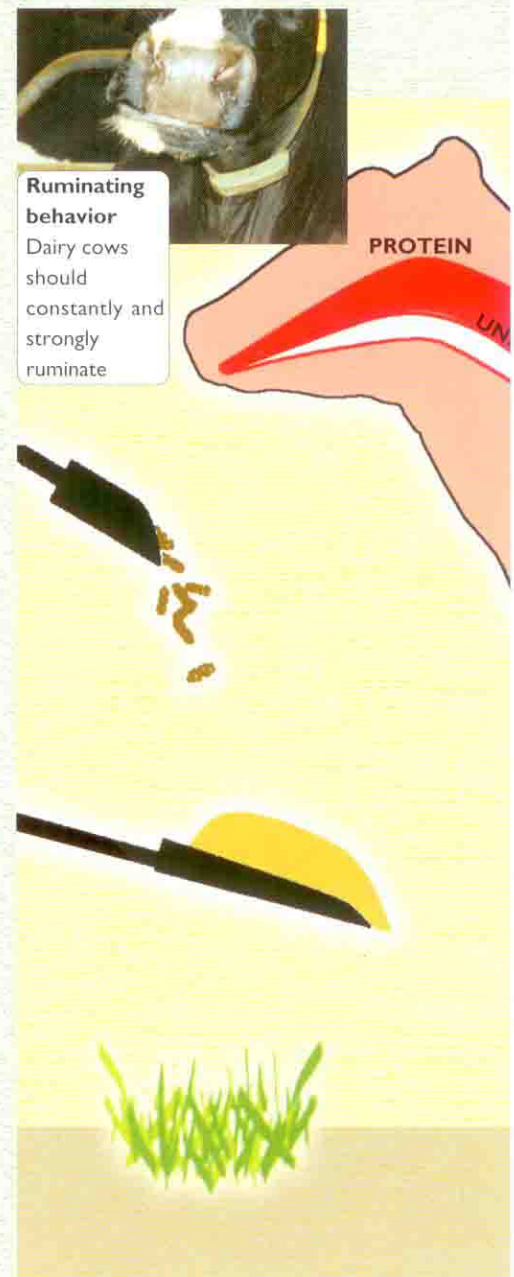
require a number of different mixes are produced as the kind of roughage that is fed can vary from farm to farm. A standard amount of minerals is usually added to these pre-mixes. These pre-mixed concentrates are fed either in the form of pellets or in the form of loose ground meal. However, in many cases concentrates are fed as single ingredients. Since every single ingredient has its own specific effect on the rumen, a number of these single ingredients should be added together in order to balance the ration. A number of commonly fed single ingredients are:

- **Brewers grain:**
A source of high protein with slowly degradable carbohydrates. It guarantees consistent rumen activity.
- **Wheat meal:**
Contains lots of starch, most of which is quickly degradable. It is important to feed this ingredient in small amounts (max. 1 kg per time) to avoid rumen acidosis.
- **Beet pulp:**
High palatability, contains rather a lot of sugar, but slowly degradable.
- **Soybean meal:**
This ingredient is very high on protein and is often used to get enough protein in the total ration.

Replacement effect

When concentrates are added to the roughage ration, the dry matter intake from roughage drops. This is the so-called replacement effect. It means that when a

The degradable part of feed protein and the non-protein nitrogen are converted in the rumen to bacterial protein. The degradable protein passes onto the abomasum and intestines and is converted by enzymes to digestible amino acids. The undigestible part of the ration is excreted.



BALANCING A RATION

Simply balancing a ration for a group of highly productive cows does not finish the job. It is only one part of feeding management. When one starts feeding the ration, it is important to assume a proper approach to feeding practices. Secondly, it is just as important to follow up on the effects of the ration on the cows and the milk yield.

How do we check if the ration is balanced?

Feed in storage

Are the sides and top of the stored feed free from rotting and/or molds?



Feed texture

The roughage should not be harvested too early or too late. When palpating a hand full of roughage, it should tickle in your hand; only then does it contain plenty of fiber.

Evaluate the feed at the feed bunk

The feed should not be too wet and should smell good

Eating behaviour

The cow should readily eat a lot of feed



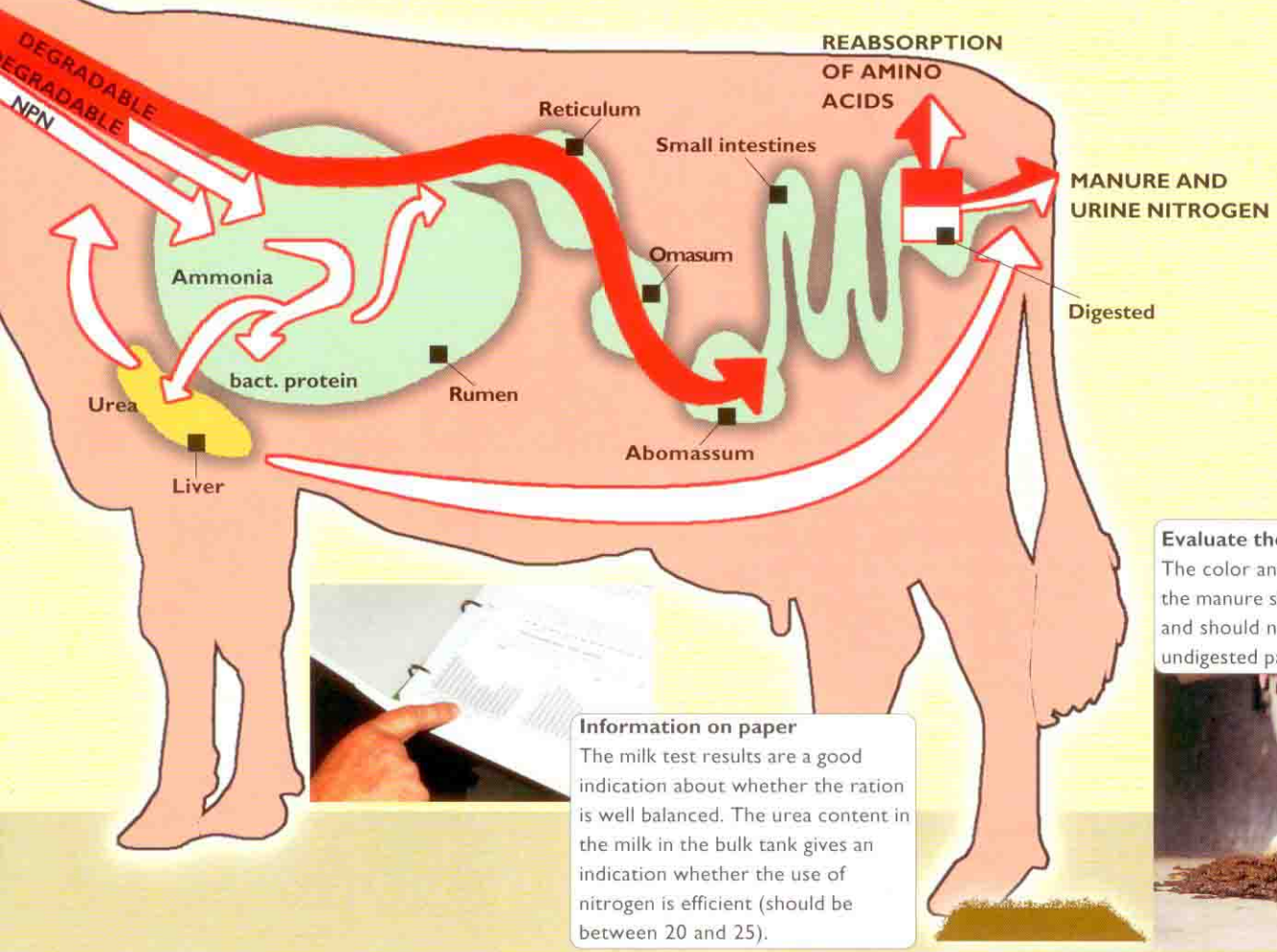
Rumen fill

A full rumen should stick out slightly



Skin/shine

The skin of the cow should be healthy and lustrous



Evaluate the manure

The color and constitution of the manure should be normal and should not contain undigested parts



Information on paper

The milk test results are a good indication about whether the ration is well balanced. The urea content in the milk in the bulk tank gives an indication whether the use of nitrogen is efficient (should be between 20 and 25).



EXAMPLE OF A RATION

When formulating a ration it is, on most dairy farms, impossible to balance a ration for every cow individually. Therefore, a ration is mostly balanced for a complete production group. When balancing a ration for a group of high-producing cows, we balance the ration for the top producers in this group.

The following table shows the ration for high-producing cows with an average daily yield of 36 kg milk/day and 4% fat. The average milk production of this farm amounts to 8,000 kg per cow per year, the cows having an average body weight of 650 kg. The average feeding value of the roughage is 900 FUM.

Table 2. Feeding value of the roughages and concentrates fed in this ration.

Ingredient	%DM	FUM	gdcp	gcp	FOS	Sugar	fiber	Starch	Ca	P	Mg	Na	K
Corn silage ¹	30	977	37	78	518	12	186	343	1.4	1.6	1.3	0.5	12.3
Grass silage ¹	40	870	85	132	560	72	250	-	4	4.0	2	3.5	27.4
Brewers grain ¹	22	958	202	256	326	3	156	38	3.3	5.5	1.8	0.3	0.6
Wheat meal ²	90	1064	94	111	618	22	24	585	0.7	3.2	1	0.1	4.2
(Sugar)beet pulp ²	90	927	60	89	670	120	160	1	8.2	1	2.7	1.2	7.3
Soybean meal ²	90	990	386	424	550	75	60	51	3.5	7	2.6	0.2	20.4

¹ Relative feeding value of wet ingredients such as corn silage, grass silage, and brewers grain is per kg of dry matter

² Relative feeding value of dry ingredients such as wheat meal, beet pulp, and soybean meal is per kg of product

The roughage for this ration consists of corn silage and grass silage. The corn silage was well dented at harvest and has an outstanding feeding value. The grass silage was harvested at the right stage and has sufficient fiber but is rather low on protein.

Table 3. The ration for a dairy cow producing 38 kg of milk per day with 4% fat.

Ingredient	kg	kg DM	FUM	gdcp	gcp	FOS	Sugar	Fiber	Starch	Ca	P	Mg	Na	K
Corn silage	10	3	2931	111	234	1554	36	558	1029	4	5	4	2	37
Grass silage	26	10.4	9048	884	1373	5824	749	2600	-	41	42	21	36	284
Brewers grain	10	2.2	2108	444	563	717	7	356	84	7	12	4	1	1
Wheat meal	2	1.8	2128	188	222	1236	44	48	1170	1	6	2	0	8
(Sugar)beet pulp	4	3.6	3708	240	356	2680	480	640	4	33	4	11	5	29
Soybean meal	2	1.8	1880	772	828	1100	150	120	102	7	14	5	0	41
Chalk	0.1									30				
Total intake		22.8	21826	2639	3567	13111	1466	4322	2389	123	83	47	44	400
Per kg of dry matter					157	575	64	190	105					
Total required			21800	2660						107	80	46	25	91
Per kg of dry matter					160	575	60-70	190	150					

In the above ration, the four concentrate ingredients mentioned in this article are being used. These concentrates are fed as single ingredients and they can be mixed according to the ration, as indicated.

With the above-mentioned amounts of concentrates, the ration is well balanced. It contains enough energy and protein for 36 kg of milk with 4% fat. In addition, the ration contains the optimum amount of crude protein, sugar, and crude fiber. Extra starch could be added to this ration.

This ration also contains enough minerals, with the exception of Ca. That is why 0.1 kg of chalk has been added to the ration to provide for the shortage of Ca.

After calculating the replacement effect, the high producers still take up $(2.6 \times 6.5) - ((6 \times 0.3) + (3.4 \times 0.5)) = 13.4$ kg of dry matter from roughage.

For milking cows in this group that produce less than 36 kg of milk, the amount of concentrates needs to be lowered. For cows producing over 36 kg of milk, there is room to slightly increase the amount of concentrate.

