SPIKE AND PANICLE EMERGENCE DETERMINES THE FORAGE QUALITY

How do I choose the perfect cutting time for my forage grass and what influences it? Luuk Maas, product manager for forage quality at DSV, describes how grassland management can be optimised and what influence spike and panicle emergence has on forage quality.

Dairy farms are familiar with the spike and panicle emergence of forage grasses during vegetation: the flower sprouts from the stem of the plant at the end of the growth phase. If cutting is delayed until this time, the lignin content of the plant increases. At the same time, the digestibility of the organic matter decreases and the proportion of cell contents also decreases the longer you wait to cut. However, the time of cutting should not be chosen too early either, because this results in yield losses since the optimum yield has not yet been reached. This raises the question of when is the "perfect" cutting time, or does it exist at all?

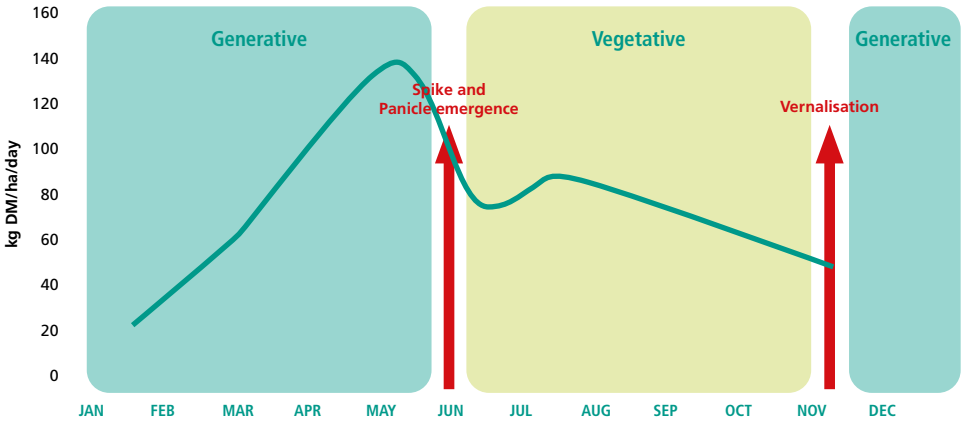
Generative and vegetative phase

Grass growth can be divided into two phases during the year, which are shown in Figure 1. In spring (March to May), grass grows very fast, as the plants aim to sprout and push ears and panicles during this time. This is the generative phase. On average, more than 50 % of the total annual yield is achieved during this period. However, especially towards the end of the generative phase, the ratio of cell content and cell walls shifts steadily. The proportion of cell walls increases, causing the proportion of cell contents to decrease. This in turn leads to a lower forage quality of the growth.

The generative phase is followed by the vegetative phase with a lower growth increase. This can be clearly seen in Figure 1 by the growth dip in June.

In the vegetative phase, it should be noted that the grass can no longer shoot, as the growth cone, the so-called apex, was removed in the generative phase by the timely cutting. In this phase, particular care must be taken not to cut too deeply, as the grasses grow back more slowly in the vegetative phase. Only after the plants have received a cold stimulus (vernalisation) over a sufficient period of time does the generative phase begin again with rising temperatures. From

FIG. 1: GRASS GROWTH OVER THE COURSE OF THE YEAR



Other factors influencing annual grass growth:

- Temperature
- Humidity
- Light
- Spike emergence

this moment on, the grass plant grows faster and can shoot again. This means that only when the generative phase begins again, new culms are formed and spike and panicle emergence can occur again.

The growth cone (apex): Important for the timing of cutting

In practice, the aim is to use the grass growth in spring up to the time of cutting in such a way that the ingredients are optimal for feeding and the growth produces yield. Therefore, the following applies to every grass cut: do not cut too early, but also not too late!

An important criterion for deciding when to cut is the "apex". This is the vegetation cone of each plant, which sits in the tip of a shoot and comprises the apical meristem, a group of divisible cells. From there, the plant grows and forms new leaves. Among other things, hormones are produced in the apex that prevent the growth of side shoots. If the shoot tip and thus the apex is removed by a cut, the stem no longer grows further in length. Instead, side shoots sprout from the leaf nodes further down (see figure 2, plant 2, stage 3). Here the nutrients are stored more safely and no lignification takes place.

Influence of the apex on forage quality

Optimal is the first cut shortly before spike and panicle emergence, then the apex is still low and will not be damaged during cutting (see figure 2; plant 1). In addition, yield and forage quality are at a high level at this time. The grass plant can grow again in length and produce yield due to the still existing vegetation cone.

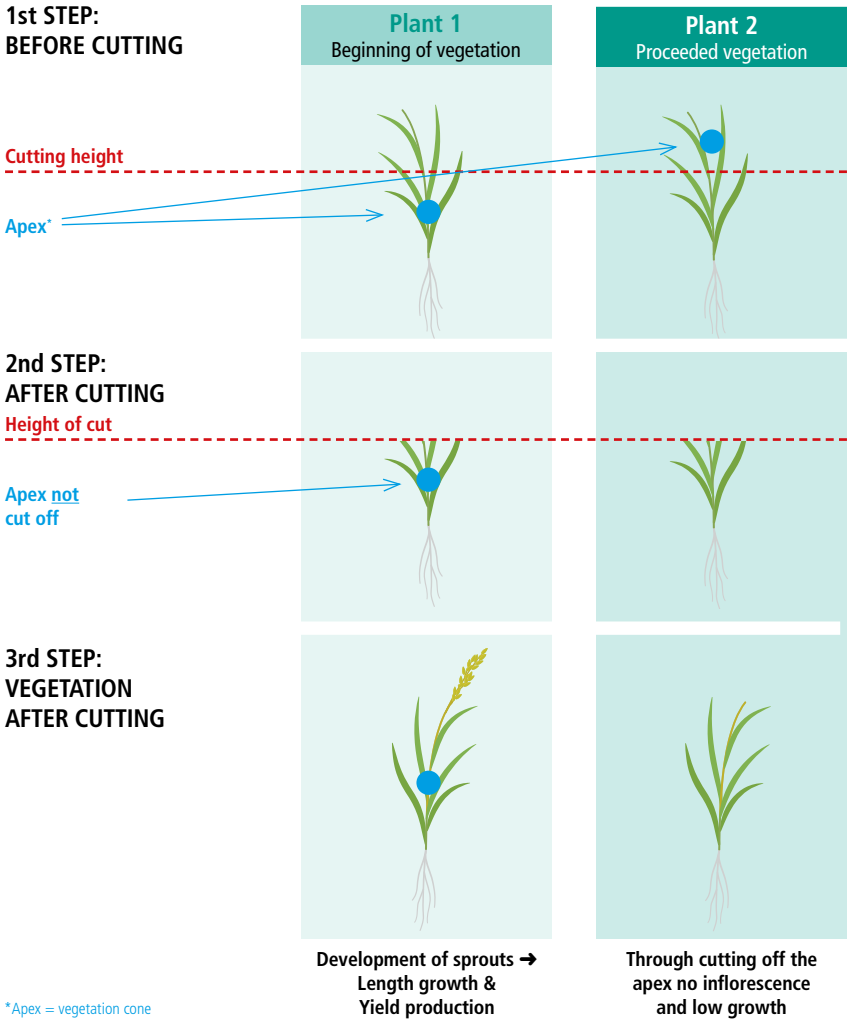
In the course of further growth during vegetation, however, this cone grows upwards. The more suitable the first cutting time is, i.e. close to the beginning of spike emergence, the easier it is to choose subsequent cuts. In order to fulfil this condition, the following recommendation applies: There should be **at least 4 weeks** between the grass cuts to ensure a sufficient yield and an optimal conversion and utilisation of nitrogen into protein.

IS TO BE CONSIDERED:

With the increasing dry summers, one sees more and more grass plants shooting. This phenomenon is related to drought stress and not to the factors mentioned in this article (apex, generative or vegetative growth).

Due to this, the 1st cut should be made one month before spike emergence (beginning of June). This usually corresponds to the first week in May, but also varies from region to region. At the beginning of May, the apex is still below the cutting height, which should be > 7 cm. This allows for rapid resprouting and generative growth of the grasses for the 2nd cut. With an early 2nd cut at the beginning of June at the start of spike and shoot growth, the higher-lying apex can be harvested. This means that the plant enters the vegetative phase and can no longer shoot, which has a positive effect on the forage quality of

FIG. 2: GRAPHICAL COMPARISON BETWEEN PLANT 1, WHERE THE APEX IS NOT CUT OFF VS. PLANT 2, WHERE THE APEX IS REMOVED THROUGH THE CUT



*Apex = vegetation cone

Summary

Too early 1st cut:	Too late 1st cut:
– Lower yield (not yet profitable to mow)	+ High yield
+ High digestibility of organic matter	– Lower digestibility of organic matter
+ High protein content	– Less protein
+ Grass wants to shoot further, as apex is not "topped" ➞ Fast regrowth	– Grass already shot

Optimal: Carry out the 1st cut one month before spike emergence – then keep a four-week interval between cuts. In this way, you can benefit from the high growth rate of the generative phase even longer before the vegetative phase follows.

the subsequent growth. Due to weather conditions, however, the plants may shoot, especially in dry conditions. In such stress situations, the plants shoot in order to reproduce.

Practical tip: The aim is to mow above the apex of the grass at the first cut so that the grass can still shoot at the second cut and benefit from the high mass growth of the generative phase.

Dilemma of cutting time - wait or cut?

A frequently occurring problem in practice is insufficient plant growth at the 1st "optimal" cutting date. There is too little growth on the field, so that harvesting is not yet worthwhile. In this case, a decision has to be made whether to wait another 1½ weeks before cutting in order to obtain a higher yield.
However, waiting also has consequences that need to be taken into account:

1. the apex of the forage grasses pushes up further and may have outgrown the cutting height after 1½ weeks. If the 1st cut is delayed, the high growth rate is lost for the following cut. In addition, the stand already reaches the vegetative phase and no longer shoots. This is more suitable for grazing.

2. the apex is still below the cutting height and the spike of the grass plant is not "decapitated", the fast growth rate is maintained because the plant remains in the generative phase. However, the problem occurs with a delay: The time of the actually "optimal" cutting date is reached about 2½ weeks later and the farmer has to decide "to mow or not", although the 4 weeks to the last cut have not been reached. However, spike and panicle emergence is not delayed and remains at the beginning of June. At this time the yield is still low. Waiting again with the cutting date then has the consequence that the forage quality drops significantly, as the lignin content increases. However, in this scenario the 1st cut is more productive and the forage quality is higher. A balance must be struck here. The starting point for the optimal first cut is the time of spike and panicle emergence at the beginning of June.

Grazing: Observe apex here too

When it comes to grazing, it is often said: "Mowing as a service to the pasture". This saying is based on the transition from the generative to the vegetative phase. In spring, the cows like to eat the fast-growing grass. However, there comes a time when the grass shoots and the ruminants avoid it. In this case, when overhanging material is then taken away, the plant enters the vegetative phase and hardly any spikes and panicles are formed.

In practice, it is often seen that the area is mulched immediately after grazing. Here, care must be taken that the working height is set low enough so that the apex is cut off. If in this case the cutting is too high, only foliage is harvested, the apex remains standing and the vegetative phase is not reached. After a short time, this causes the growth of spikes that are not eagerly eaten.

In practice, a balance must always be struck between the longest possible use of the plants with generative growth and the unavoidable shooting of the plants.

Conclusion

There is no clear-cut statement as to when is the right time to cut. For orientation, it is important to wait for the beginning of spike and shoot emergence in order to achieve an optimum yield and forage quality. If you wait too long with the first cut, the forage quality will decrease and the vegetative phase of the emergence will start too early. The aim should be to leave the growth in the generative phase until the 2nd cut and to "harvest" the apex with the 2nd cut. Then the crop enters the vegetative phase and it becomes easier to find the optimal time for cutting, as the plants no longer shoot.

Maren Timmermann
Lippstadt
Fon +49 2941 296 227

Luuk Maas
Ven Zelderheide
(DSV Zaden NL)
Fon +31 611592234
Mail: luuk.maas@dsv-zaden.nl