

Functioning of the pasture

The optimal resting point of the pasture is the optimal time for grazing because it combines the needs of plants and the needs of livestock. At this point the plant has already passed the maximum growth phase, has recovered the reserves of roots, has the most efficient water consumption, and its nutritional value is balanced. **If the cattle graze before this point there is a degradation of the pasture, and if it does so after there is a loss of production.**

■ Functioning of the plants of the pasture

Knowing the functioning of the ecophysiology of the resprouting of the plants of the pasture is essential to guarantee good grazing and the associated environmental and economic benefits. Resprouting functioning can be synthesised in the growth curves after grazing the aerial part and the underground part (Figure 1). Three types of changes occur over time:

(a) Growth pattern (quantitative changes). The grass plant (1), after being grazed (2), begins the regrowth of the aerial part using the accumulated reserves in the roots. **The growth of the aerial part is maintained at the expense of the roots (3),** consuming the accumulated reserves. This is maintained until the photosynthetic capacity of the new leaves is enough to generate a surplus that can be stored again as a reserve in the roots (4). From this moment there is a very **rapid growth of the aerial part and a recovery of the accumulated reserves** in the roots. Growth during this period can be more than 10 times higher than growth during the first days of resprouting. Just the plant reaches maturity (5), the reserves of the roots have already recovered, and **the growth of the aerial part decreases rapidly until it stops (6).** This coincides with the appearance of flower buds and the reproduction of the plants.

(b) Variations in the plant's nutritional value (qualitative changes). The pasture at the start of resprouting (2-3) is poor in fibre and rich in soluble nitrogenous compounds, which can cause diarrhoea in cows. **Before reaching its maturity point (5), the composition of the pasture is more balanced,** with a better proportion of fibre and with nitrogen in the form of amino acids, more suitable for animal nutrition. **From this moment on,** the protein content decreases and **the plant begins to lignify, producing a loss of the nutritional value of the plant.** This loss is more pronounced in C4 plants than in C3 plants. From a nutritional point of view, while the plant is in a growth phase (before entering maturity), **there are important differences in nutritional value within the same plant. The upper third of the plant, where growth occurs, is the one with the lowest cell wall content and a high protein content (which is around 14-18% regardless of the species). Therefore, this upper third of the plant has a higher nutritional value** than the rest.

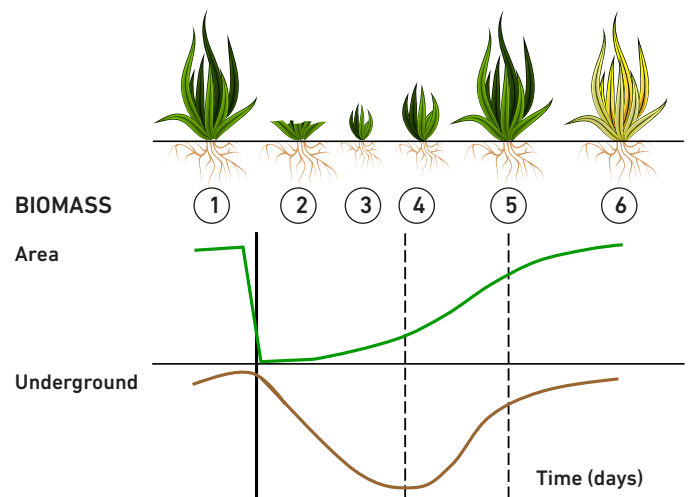


Figure 1. Changes in the organic matter of the aerial and underground parts of a pasture plant after grazing.

(c) Variations in water consumption. From the **start of the maturity of the plant (5)** growth reduces rapidly until reaching zero. However, the water consumption by the plant is maintained, so that the **water consumption per unit of dry matter produced increases greatly.** If the plant is regrazed (or harvested) before this time, the water consumption per unit of production will be much lower. This explains why **pastures grazed at the optimum point can lengthen the growing period when the dry season arrives.**

■ The optimal resting point of the pasture

The optimal resting point is the **optimal time for pasture grazing** combining the needs of the plants and the needs of the livestock (Figure 2). From the above information, it is deduced that the optimum resting point occurs before the plant enters maturity (5). At this time **a series of important aspects are achieved:** (i) **the plant has already passed the maximum growth phase;** (ii) **the plant has recovered the reserves of the roots;** (iii) **the consumption of water per kg of organic matter produced is the most efficient;** and (iv) **the nutritional value of the plant is the most balanced.** If it cannot be grazed at that time, there are different negative effects:

- **Grazing before the optimal resting point.** If the animals graze before the optimum resting point, **production is being lost because the entire exponential growth**

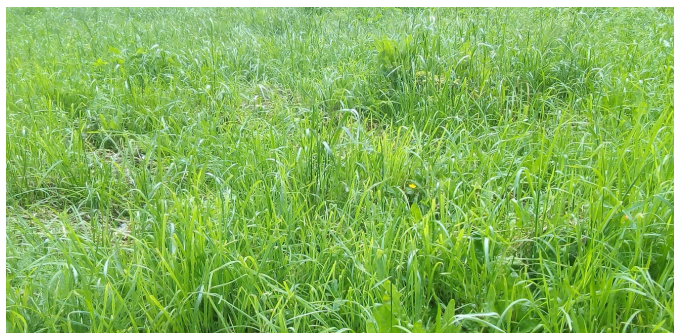


Figure 2. Pasture at the optimum resting point, with grasses about to glean. Photo: Marc Gràcia



Figure 3. Pasture after the optimal resting point, where many grasses are already spiked. Photo: Marc Gràcia

phase (between 4 and 5) is not used, and the pasture does not offer balanced nutritional characteristics. But what is more important, the plants have not been able to recover the reserves of the roots, so **their resprouting capacity is reduced**. If this situation is repeated continuously, the plant loses the ability to resprout, causing degradation and even loss of the pasture. In summary, grazing before the optimal resting point **represents a loss of production and degradation of the pasture**, and if it is repeated over time it can be difficult to recover.

- **Grazing after the optimal resting point.** If the animals graze after the optimal resting point, a quantitative loss of production occurs, since the plant remains in the pasture with a very small production. There is also a qualitative loss because there is a **decrease in the plant's nutritional value**. In addition, the consumption of water per unit of dry matter generated is higher, which also represents reduced production in the dry season. In summary, grazing after the optimal resting point **represents a loss of production for the farmer**.

■ Criteria for determining the optimum point of a pasture

Determining the optimum resting point is critical in pasture management since this is the **precise moment when the animals must enter the pasture**. The time required to reach the **optimal resting point** can be from **18 to 120 days**, depending on the climate, the species, the season, and the moment's climatic conditions. Depending on the type of plant, this optimal point will last a few days or longer in time. It is important to have **criteria that allow us to identify this optimal point**.

- **Grass height.** The height of the pasture, considering the climate, the species and the season, is used as a criterion. Thus, for example, in humid temperate climates the references are 25-30 cm high for the optimum point.

Although each farmer may have references for his/her area, this criterion can lead us to confusion because, **depending on the specific climatic conditions of each year, the plant can modify its phenological cycle** by varying the height at which the optimum point is reached. Thus, in dry years the plant advances maturation and seed production and the optimum point is reached with lower heights.

- **Basal leaves withered or in senescence.** This is a general indication, **valid for any species**. When the first basal leaves wilt or dry out, it is time to put the cattle on the pasture.

- **For grasses**, the optimal point coincides with the **appearance of flower primordia at the base of the stem**. In practice, this is determined when the first individuals of the pasture begin to glean.

- **For legumes**, the pasture is at its optimum resting point when **30-50% of the plants are in bloom**. We have to be careful because in certain areas the plants can flower permanently and this criterion does not work.

In pastures with several species, which is the general and desirable situation, **each species has a specific vegetative cycle** that seldom coincides with the cycle of the other species present in the pasture. Thus, there is no one ideal optimum point for all species simultaneously. In order to decide **the optimal resting time in mixed pastures**, there are two alternatives:

- **In a well-established pasture, an average resting point is calculated**, as close as possible to most species, and preventing important species from being below their optimum point.

- We can also **prioritise a certain species**, either because we want to increase its density or because it shows an obvious level of degradation. In this case, all the pasture is managed (optimal resting time) based on this species that is to be increased or protected, without considering the situation of the others.