Analysis of a pasture as a productive system from a regenerative perspective

Pasture is **a productive system that meets the criteria of the regenerative model if livestock management is controlled**, i.e. the animals graze at the optimal time. This system maintains its productivity when (**1**) there is a high diversity of species, (**2**) the return of materials to the pasture through livestock excrement is maintained, (**3**) livestock management prevents soil compaction and overgrazing, (**4**) a well-managed pasture has the capacity to compensate for the outputs produced by livestock uses, and (**5**) it optimises the use of water and helps the soil have a good capacity for infiltration and water retention.

Figure 1. In spring there are a large number and diversity of plants that provide abundant food for livestock (Santa Pau, Girona). Photo: MJ Broncano

Application of the regenerative system criteria to a pasture

The regenerative production model follows five basic criteria that can be applied to a pastoral system.

(1) The diversity of plants.
In a pasture it **is essential to graze at the optimum point** to obtain the maximum production and the maximum amount of food for the soil trophic web. For this food to be more diverse, it is necessary to have **a high diversity of properly managed plants** (**Figure 1**). This high diversity allows there to be a species, at any time of the year, that **produces the maximum possible at that time** to maintain the functioning of the biological activity of the soil. Thus, in places where **winters** are cold, but still allow pasture production, the fact that there are certain species in the mix that can grow under those conditions will make pasture production significant at that time. The same is true of **dry summers**, there are more drought tolerant species that can grow, even though little water is available. Obviously, all this has a limit, because in certain extremes of cold or drought no species of pasture can grow.

The **greater diversity** of plants at any time **improves the nutritional value**, both for the soil trophic chain and for livestock. A characteristic case is that of **legumes**: sometimes they are not the plants that have the maximum productivity, but i**ncorporating them into the mix of species is essential** because they fix nitrogen which increases soil fertility. In other cases, there are species such as **rye** that **help reduce the presence of adventitious species**, especially at the start of the installation of the pasture, or have other characteristics that improve the general functioning of the system.

(2) The return of plant materials to the soil.
The return of the aerial part occurs mainly **through livestock excrement** (**Figure 2**). The excrement decomposes in the pasture mainly due to the effect of **dung beetles** and other insects. Therefore, **if the excrement contains chemicals** that negatively affect these insects, it will take longer to decompose, the return does not occur properly and **the pasture is degraded**.

(3) Interventions that block the functioning of the biological processes of the soil.
A well-managed pasture is **neither tilled, nor does it require the addition of agrochemicals**, so it does not suffer interventions that block the functioning of the soil. When the animals that graze in the meadow are managed properly,

Figure 2. The return of plant materials occurs mainly through animal excrement. Photo: Marc Gràcia

with high intensities, but very short residence times and long recovery periods, **there is no effect of soil compaction**. Similarly, if we graze at the **optimum resting point, there is no overgrazing** and the plants recover perfectly because they have sufficient reserves in the roots (**Figure 3**).

(4) Soil functioning and the carbon cycle.
If grazing is done at the optimum point, the roots recover all their reserves and this **is the time when there is more carbon in the soil**. On the other hand, if grazing is carried out before the optimum point, it ends up producing a depletion of the roots, which leads to the degradation of the pasture and the loss of carbon from the soil.

The management of animals on the meadow allows some **uses to be obtained** (such as meat, milk or eggs) that **are exports outside the system**. However, **a well-managed pasture** can compensate for these outputs produced by harvesting without reducing the carbon stock and productivity of the system.

When **surplus grass** is produced, at times when the pasture is at peak growth and it cannot be consumed by animals, the grass is cut and saved for when it is needed. In this case, it is necessary to think about **how to return this output to the meadow**, since it can cause a loss of carbon in the soil and productivity of the system. If possible, **these surpluses can be fed to cattle in the same pasture**, which recovers a large part of the carbon with their excrement. If it is not possible, for example, because the climate is very cold or very hot and the animals cannot be in the meadow, **the manure has to be taken back to the meadow**. This is a more expensive process, but it avoids outputs that make the system lose productivity and carbon.

At specific times of the year, and when there is no surplus of the pasture, extra external forage must be added. This has an economic cost, but it also has a **double benefit**: it allows us to **feed livestock** and **increase the amount of carbon in the soil more quickly**. This situation is especially interesting when we start to install a pasture on a degraded soil.

(5) Water as a limiting factor for the productivity of the system.
In a quality pasture, with soil with a high organic matter content, the **infiltration and water retention capacity** is much higher than in a pasture that grows in a much poorer soil. In addition, when grazing is done at the optimum resting point, the **water is used much more efficiently**, since the consumption of water per unit of production is much lower.

Whenever it is possible to **use irrigation** in the pasture at an **economically acceptable cost**, it is profitable to apply it, since it greatly increases production.

Figure 3. Close-up of grass sprouting after being grazed. Photo: MJ Broncano