Great green energy generators

In the second of a three-part series on pasture management, **Christine Page** looks at the grazing requirements of ruminants and the best ways to nurture your precious fields

Grazing at a field of nature's highly efficient solar panels – green, photosynthesising leaves – have you ever wondered just how miraculous these little energy generators are? Through millions of years of evolution capturing sunlight energy, pasture plants are uniquely adapted to being repeatedly grazed through the growing season and then to continually regrow their biomass.

One of the most common smallholder questions I am asked is how many sheep can I keep on my land or have I got room for a house cow? The answer to this question can vary hugely depending not just on the individual pasture but on how you nurture those little energy generators.

HOW MUCH GRASS DOES A SHEEP OR COW EAT?

The best place to start is to work out how much grass a sheep or a cow needs to eat. There is a very good rule of thumb which is that ruminants need to eat approximately 3% of their bodyweight per day in dry matter.

Dry matter is what is left of grass after you remove all the water. Quality of dry matter (DM) is very important to the health of your livestock and which we will consider in next month's article, but for now we will just look at quantity. Take eight sheep weighing 50kg each; that is 400kg of livestock weight. About the same as a Jersey house cow. Daily, your house cow or flock of eight sheep would need to eat 3% of 400kg, which is 12kg of DM.

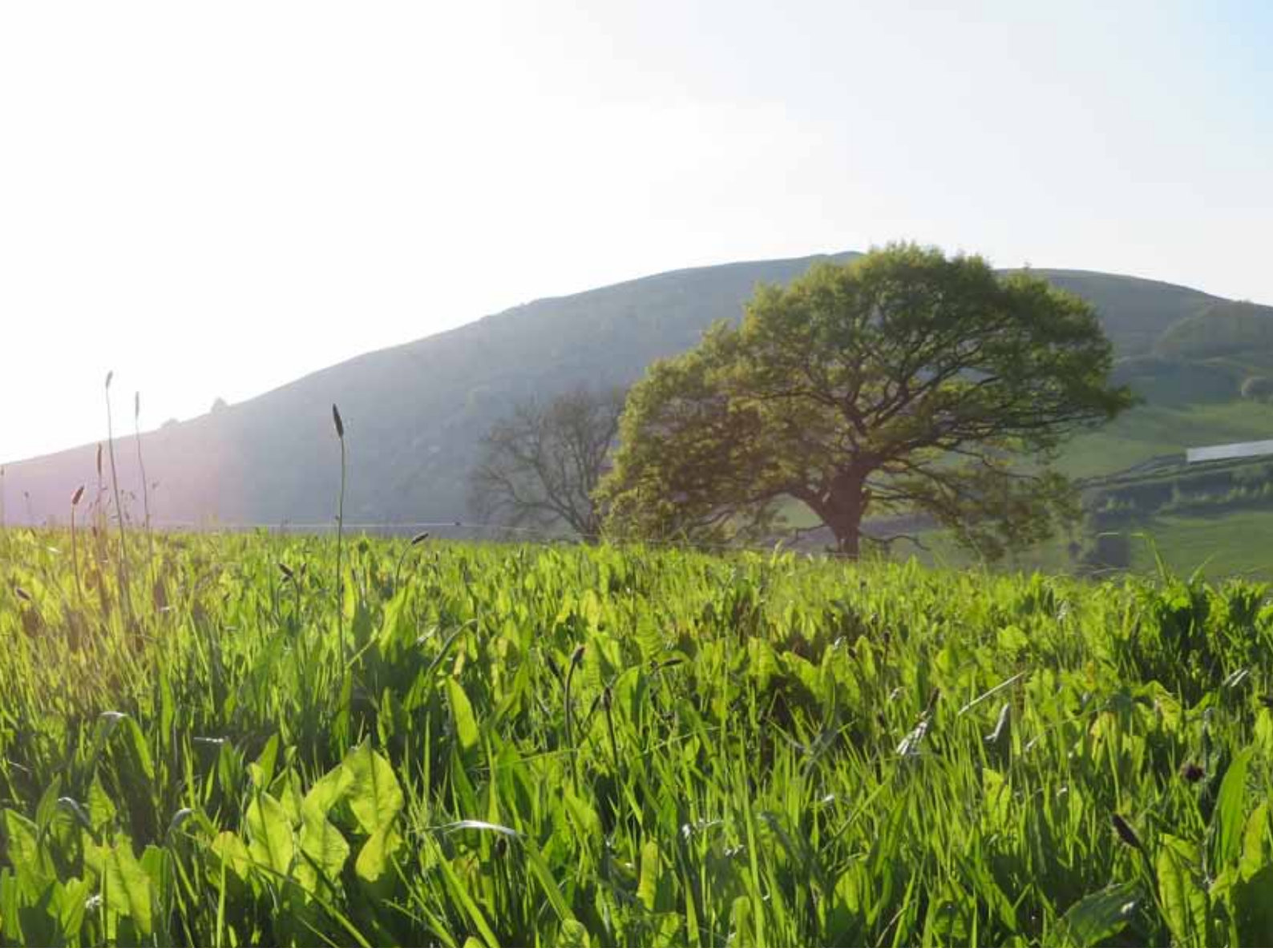
A small bale of hay might weigh 15kg. Hay is around 80% DM, so your house cow would need a bale a day in winter. But during the growing season, as your pasture's little energy generators set to work sucking carbon from the atmosphere via photosynthesis, and combine it with nutrients obtained from the soil to create that dry matter, what does 12kg of it look like in your pasture? This is not as hard to work out as you may think.

HOW MUCH GRASS IS IN MY FIELD?

Equipped with a set of sharp garden shears, four bamboo canes, a tape measure and a lightweight plastic bag, select an area where the grass is about average for the pasture. Place the canes to create a 1m square and cut everything in the square as tight to the ground as you can, putting the cut grass into your plastic bag. Weigh your bag of grass. This is the 'green weight', eg, 1,200g. Then put the grass on a large tray in a warm oven for a few hours. When completely dry, put the grass back into the same plastic bag and weigh it again. This is the 'dry weight', eg, 300g. The percentage DM = 300/1200 *100 = 25%.

The dry weight – 300g – is the amount of DM you have in one square meter of your paddock on that day (tomorrow it will have grown). However, that figure is the total DM in your pasture having scalped the plants right down to the ground, removing all their solar panels (leaves).

BELOW: Fields split into small mob-grazing paddocks



In 'The world beneath our wellingtons' (*Country Smallholding*, April 2019) we looked at how photosynthesising plants use the carbon they have taken from the atmosphere to make and secrete liquid sugar via their roots – called root exudates – to feed symbiotic soil microbes. And how, via the Poop Loop, the plant in return is provided with the nutrients it needs to grow.

When you consider that the leaf area is the plant's solar panel, it is not surprising to learn that reducing the leaf area means less photosynthetic capacity, less energy generated, fewer root exudates and, in return, less dry matter (biomass) grown. It is not a linear scale, however.

Grasses and ruminants co-evolved 50 million years ago. Pasture plants have evolved to be grazed by large herds of herbivores, bunched together for protection from predators and moving constantly to fresh pasture, often not returning for months. Ruminant saliva contains substances that trigger grass growth. When a cow wraps her tongue around a bunch of grass and tears it off, in the same way an elephant wraps their trunk around a branch, she leaves behind growth stimulants on the torn leaf edge that trigger root exudate production and push grasses back into the fast regrowth stage. Without being grazed, pasture plants would soon reach maturity, senesce and wither, the carbon captured in their biomass oxidised back into the atmosphere as they rot down. Without the large herds of herbivores the historic 6ft deep fertile topsoil of the great grassland prairies of the world would never have been created.

ABOVE: Rumiant saliva contains substances that trigger grass growth

TOP: Grazing pastures tall, rather than short, means significantly more grass grown

It is only recently in evolutionary terms that we have enclosed our fields and set-stocked them for weeks or even months on end. Leaving stock on the same pasture for a long time has a significant impact on grass productivity because cows, and especially sheep, can be extremely selective grazers when given the opportunity. They will graze hard the plants they like the best then, as these plants regrow with the sweet liquid sugars produced through photosynthesis, they become even more palatable and your stock will immediately re-graze the sweet regrowth, taking a second bite.

Studies have shown that on average pasture plants have ▸

'Leaving stock on the same pasture for a long time has a significant impact on grass productivity'

evolved to be able to withstand the removal of up to 50% of their leaf area without any impact on their functionality. In fact, as noted above, grasslands have evolved to be grazed: every bite primes the carbon pump, pushing the grasses back into the fast growth phase, sucking carbon from the atmosphere with rapid photosynthesis, making liquid sugar, feeding soil microbes, stimulating the underground life cycles, increasing fertility and ultimately sequestering carbon and building soil.

When a plant is lightly grazed, the leaves removed expose leaves lower down to direct sunlight that were previously in the shade and make up for the lost leaves. But photosynthetic capacity, and thus root exudate production, starts to become impaired when more than 50% of the leaf area is removed. The studies show that on average with 70% of the leaf area gone, half the root capacity stops functioning. With 90% removed, all of the roots go into dormancy for over two weeks as the plant has to go into energy saving mode while it attempts to generate enough energy in the little leaf area remaining to restart the Poop Loop and cycle nutrients in sufficient quantities to start to regrow.

That two-week dormancy if repeated through the year can have implications for how much grass you can grow and, thus, how many sheep or cattle your land will support.

Plants that have their regrowth repeatedly grazed off too soon by livestock taking a second bite will start to shed roots. This not only weakens the plant, but removes the food source for the soil microbes living in the root zone and slows nutrient cycling, reducing soil health and drought tolerance.

Traditional farmers understood this well. An old saying from 100 years ago "never keep the sheep in the same field long enough to hear the church bells ring twice" referred to moving them every week to a new field, which until so many of the hedgerows were ripped out during and after World War II was common practice.

Grazing pastures tall, rather than short, means significantly more grass grown, more carbon sequestered, more fertility built and more livestock can be supported on a given acreage.

This brings us back to our 300g of dry matter in the 1m² of pasture. You now know that you don't want to graze more than half of this, so we can calculate the area of pasture needed to meet daily intake for our house cow, or flock of eight sheep, based on taking just 150g per m². If the daily demand for your sheep is 12kg, or 12,000g, then they would need an area 12,000g/150g = 80m². If you pace out an area 8x10m, marking the corners with a bamboo cane, you can easily see how much they need allocated to them for a day.

To avoid taking a second bite, you would ideally want to move your sheep every five days in the growing season. You can divide up your paddocks simply using some temporary electric fencing into 5x80m2 = 400m2 breaks and move them every five days. When planned well, there should be sufficient rest period for the pasture to fully recover before the next grazing event. This is the basics of mob grazing; a system of holistic grazing that replicates the historic migration of large herds of herbivores that results in growing robust, diverse, productive pastures. ■

Next month: How holistic grazing can help to keep your livestock healthy naturally.

Christine Page runs events on soil health and holistic grazing management. For more information, visit www.smilingtreefarm.com

BELOW: The effect of grazing on pasture plants