The Carbon Grazing principle

Background:

Humans and cattle are about 18% carbon while plants are about 45% carbon.

The natural world can't function without "carbon flows". This is because carbon is the main building block of all life on the planet and responsible for supplying energy that all life relies on.

The best way to understand what life includes is to think of what dies. Grass dies, cows die, soil microbes die and worms die.

Carbon is always moving. After entering the landscape via photosynthesis, one path of carbon involves moving along the two food chains, one above ground and the other below ground. This involves moving from one living thing to another living thing.

Above ground, when cattle eat grass, carbon is moving from one life form to another life form. Then on to another when we eat meat. Below ground, carbon also keeps moving and maintains soil life that is responsible for keeping the soil well structured and fertile.

When we breathe out carbon dioxide, this is simply some of the carbon that has entered our bodies (via food) moving on.

All rural production sells something that has lived.

A rural producer's day job is managing carbon flows i.e. recycling carbon and in the process turning a portion of the inflows into saleable carbon products, be they meat, fibre, grain, hay or vegetables.

To understand the importance of carbon: energy, nutrients and water all follow the path of carbon.

How successfully pastures are able to introduce carbon into the landscape is determined by animal management. Plants and animals have evolved together and rely on each other. However, if animals dominate plants, then carbon flows are reduced. In the absence of animals, pastures become moribund and again have a lower capacity to introduce carbon.

All else being equal, the grazing paddock that has the most carbon flowing through it will be the most productive and resilient.

Plants rely on carbon inflows to construct themselves. Roots, stems and leaves are about 45% carbon. It is plants that make carbon available to the two food chains that underpin commercial production and positive environmental outcomes.

The two components of paddock resilience are plant resilience and soil resilience.

Allowing carbon to flow into plants increases their resilience in two ways;

- increasing internal energy reserves for them to call on; and
- creating a more extensive root system to give them access to more water and nutrients

Soils with more carbon flowing through them are more resilient because they have improved water infiltration, increased water holding capacity and are more fertile.

Long term soil carbon is very important however it is an outcome of carbon flows.

Without the ongoing flow of carbon and all the compounds it forms as it keeps moving, the landscape would become bare and lifeless. This point reminds us that “carbon flows” and “carbon stocks” are related but **different** debates

Everything discussed to this point makes management of carbon flows the cornerstone of food production, rural profit, reducing the effect of dry times, improved water quality and meeting the expectations of the broader community for better environmental outcomes, including the atmosphere.

Those who take a systems approach, place a high emphasis on carbon, while those who take a reductionist science approach see water as much more important. The reality is that a grazing operation has no control over how much rain arrives, however, there is some control over how effective it is. When we look at the big picture, better management of carbon flows increases water use efficiency.

Removing sheep and cattle for just a short period following rain, achieves a lot more than simply growing more grass for the commercial animals to eat in the short term. **It is an exercise in increasing carbon flows to all sections of the landscape.**

The logic behind the Carbon Grazing principle:

The only way that carbon can move from the atmosphere to the paddock, is via photosynthesis.

Given that it is moisture that promotes photosynthesis, then it is moisture that promotes the introduction of carbon.

Nature has designed the system so that water activates the flow of carbon into the landscape.

Thinking logically, the bulk of the carbon enters the landscape in the short period following rain. This highlights the need to focus management around this point in time.

Letting animals eat plants when they are trying to grow after rain, reduces photosynthesis and in some cases, completely shuts it down.

There are some subtle realities that underpin the Carbon Grazing principle. Because there is no pattern to when rain arrives, in other words, when carbon arrives, the message is that pasture rest is TIMING and not TIME. Basing resting decisions on a certain period of TIME is no guarantee that carbon will arrive.

This is not an attack on cell grazing, where cells may be locked up for 120 days. Cell grazing implements the Carbon Grazing principle, because when rain arrives, the bulk of the cells do not have animals in them.

Stating the obvious, continuous grazing never implements the Carbon Grazing phase of rest after rainfall.

The obvious question is, "How long do pastures need to be rested for, to approach maximum potential carbon inflow i.e. to approach maximum ground cover and resilience?"

Scientists in South Africa suggested that with average pastures, removing animals for 3 - 8 weeks after rain, increased pasture production by 50 - 80%. To relate this to increased carbon arriving above ground, pasture is about 45% carbon when dried. The increase in carbon flows that the increased ground cover represents, provides an insight into the increase in carbon flowing below ground to increase pasture resilience and support soil life.

When people say they can't afford to rest pastures, it begs the question, can you afford not to.

The South African research documented a slowing of flows towards the eight week period. Producers in Australia have made similar observations.

Carbon Grazing is 4 - 6 weeks pasture rest after rain. The period does not commence until the plants actually start growing. Also, it is important to not get caught up on the exact time between four and six weeks, as factors like temperature influence the necessary time. Also, the health/resilience of the pasture, based on past management of carbon flows, influences the period of rest required. One producer in Australia with really healthy pastures is of the opinion that he can achieve full recovery after about four weeks.

The Carbon Grazing principle explains that rest is achieved when enough carbon has flowed into the paddock. This explains why paddocks lacking resilience require a longer rest period.

Carbon Grazing is not "wet season spelling" which involves a much longer time period and places added grazing pressure on the remainder of the property not being rested.

The practical aspect of seeing pasture rest as a short period of time, is that an alternative home for the livestock only has to be found for a short time. The Carbon Grazing book details where the animals can be put without selling them.

The Carbon Grazing principle is about maximising potential inflows. It is the window of opportunity too many people miss. It is important to remember that it is a general principle, and not a new land management system. It is a procedure all successful land management systems incorporate. The more times the better.

We can't change how much rain falls however we can change how much carbon flows into the paddock from what rain does fall. Put simply, it is the management just after rain that sets the level of carbon that becomes available to start its journey through the landscape.

Carbon Grazing is strategic pasture rest. It is actually a **flexible recipe** (see comment below). It is instigated on the basis of **one parameter** and requires only **one action**. This simplifies application. Carbon Grazing always succeeds because it addresses the **most fundamental** thing a producer has to get right.

Discussion:

The Carbon Grazing principle is not new science, it is a new focus.

It is based on the premise that nature does not have a predictable pattern. Stated simply, we must allow nature to transfer carbon from the atmosphere to the landscape according to it's time frame**.**

The Carbon Grazing principle relates to the **first phase** of carbon flows, which is the **introduction phase** i.e. when carbon moves from the atmosphere to the paddock via photosynthesis.

The best way to gauge how well we are managing carbon flows over time, is to observe the outcomes or lack of outcomes after rain. Past management of carbon flows does influence the level of current carbon inflows

Because carbon is always moving, with some returning to the atmosphere on a regular basis, **there is a need to keep bringing in new carbon.**

In the case of new carbon entering the soil, on average 80% will be gone in twelve months. The above ground outcomes can be even more extreme depending on livestock management or fire.

In dry years, the potential for bringing in replacement carbon is much lower. This is the time when applying the Carbon Grazing principle is even more important.

When looking at landscape resilience, the faster moving carbon provides short term resilience, while the slow moving carbon provides long term resilience.

It is while grasses are growing after rain, that they make soluble carbon available to mycorrhizal fungi which are located on the roots. This allows the fungi to extend out into the soil and source extra nutrients for the plants.

For those interested in the trading aspect of soil carbon, the introduction phase of carbon flows only includes short term carbon. This reinforces that long term soil carbon has to start the journey as short term carbon in the first phase of carbon flows.

When it comes to engaging producers, recipes are more likely to engage them, however recipes are prone to fail when circumstances keep changing. Carbon Grazing is not your normal recipe, it is a **flexible recipe.** The instruction (in the rain gauge) to act and remove the animals may be random, however the instructions are always the same and based on the same criteria i.e. rain capable of producing carbon flows. The only variable is that the required rest period shortens as landscape resilience increases with better management of carbon flows.

It is following the path of carbon that provides a better understanding of how landscapes function. Unfortunately this is not the approach that has been taken by rural extension programs in the past, so will take time to gather general acceptance.

One industry extension program in Australia discusses ground cover in terms of not consuming too much (important), but does not discuss land management in terms of increasing carbon flows to provide more ground cover. Level of consumption is the second decision producers need to make, with the first one being management of carbon flows to increase ground cover prior to consumption. Over consuming flows after they have arrived is very different to reducing the flow of carbon in the first place, and is by far the lesser of the two evils. Carbon flows end up above and below ground, while animal consumption only involves what ends up above ground.

Discussing carbon flows is a different way for graziers to look at the landscape and understand how it functions. If extension discusses all the processes carbon becomes involved in as it flows through the landscape, then it quickly becomes clear to producers why the paddock with the highest flows will be the most productive and more resilient.

Producers need to operate with a new paradigm, a different function in their brain. They have to be able to imagine what is happening on a multitude of levels and time frames. At the moment, a lot of producers can see only the outcomes, but don't understand how they occur. They need to be able to visualise the processes they can't see happening.

Timing the harvest of carbon flows:

When graziers let animals harvest carbon flows too early following rain, they interfere with the biophysical conduit (leaves) that are responsible for introducing carbon into the landscape.

In other words, ***graziers should only be letting animals harvest the surplus, not the means by which a usable surplus is generated***. They should harvest what resides above ground after adequate carbon has flowed to all parts of the landscape, including below ground. This approach will ensure future animal production and ongoing resilience of the production base. It will also ensure better environmental outcomes, including better water quality in waterways.

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