IT IS "CARBON FLOWS" THAT DRIVES LAND RESTORATION

Overview

It is climate change policy that introduced discussion of carbon into rural extension. Herein lies the problem in the way we are currently approaching carbon in extension. The current focus is on carbon stocks and measurement because this is what government funding supports.

We have to think past just carbon stocks. The "management decisions" graziers make relate to the management of "carbon flows".

Discussing carbon flows is the entry point for discussing what profitable and sustainable land management is, not carbon stocks. As important as carbon stocks are, they are simply an outcome of carbon flows.

A grazing paddock is a dynamic system, not a static one.

The dynamic concept of carbon flows highlights the ongoing nature of carbon transfers; whereas the contrary concept of carbon stocks (measured at one point in time) is a static one and says little about what is driving changes in the health of the landscape or the relative significance of past and current management decisions. To understand how a paddock functions, it is important to understand the role of carbon as it flows through different paths after it enters the paddock. Carbon is the organiser because energy, nutrients and water all follow the path of carbon.

Getting back to the basics

If you don't get the basics right, then everything else is not going to fall into place the way it should. Thinking carbon flows is getting back to the basics.

The easiest way to grasp the carbon flows concept is to think of individual carbon atoms entering the paddock from the atmosphere and heading off in all different directions above and below ground before finding their way back to the atmosphere. Some quickly, some slowly.

Follow the path of carbon and what happens in a paddock will be a lot clearer. With carbon flows, once you visualise the flows, you see the dynamics of the whole system and how it functions.

Short-term carbon, which accounts for the bulk of carbon flows, moves through the landscape by ongoing interchange between plants, animals, soil and atmosphere. This exchange powers the health of the paddock generally and pastoral productivity in particular. The volume of flowing carbon in a paddock reflects recent land management decisions.

A producer's day job is recycling carbon. They set out to turn a portion of the carbon that is flowing through the paddock into saleable carbon products, like meat and grain. Cattle are 18% carbon and grass is 45% carbon. The more carbon that flows, the more cattle and grain are produced for sale. Producers are also recycling carbon to maintain the resilience of paddocks, including maintaining or increasing long term soil carbon.

Environmental outcomes are very closely linked to the level of carbon flowing through a paddock. Carbon flowing into plants is the true source of soil organic matter which is about 58% carbon.

What paddock resilience looks like

Paddock resilience is the ability of a paddock to generate carbon flows from rain. Perhaps the best test of resilience is the ability of paddocks to respond to isolated small falls of rain during a dry period.

Immediately after rain

Response on each side of the fence

Think of the soil as a construction site. If plants are not allowed to grow and supply carbon compounds to all the life in the soil, then they die. Soil life is responsible for keeping soil well-structured and fertile.
There are two components of paddock resilience, plant resilience and soil resilience. Both rely on good management of carbon flows.

Plants fail first then the soil fails, i.e. poorly managed plants lose resilience and then do not generate enough carbon flows to keep the soil healthy.

Linking pasture rest to management of carbon flows

When people start thinking carbon flows it becomes obvious that pasture rest after rain is achieved (long enough) when enough carbon has flowed to all of the areas in the landscape, above and below ground, that it needs to. This explains why paddocks lacking resilience require a longer rest period. They take longer to produce the required carbon flows.

Is pasture rest time or timing?

Nature has designed the system so that water activates the flow of carbon into the landscape via photosynthesis. 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.The practical aspect of seeing pasture rest as TIMING, instead of TIME, is that you only need to find an alternative home for animals for a short period of time.

Nature does not have a predictable pattern. Stated simply, we must allow nature to transfer carbon from the atmosphere to the landscape according to its time frame. This is why pasture rest is TIMING.

When should carbon flows be harvested?

Pastures should be rested after rain. In other words, graziers need to be harvesting only the surplus not the means by which a usable surplus is generated.

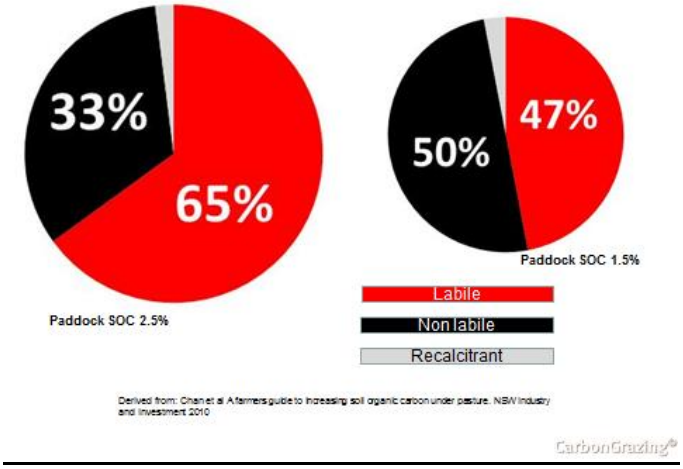
The box is saying that animals should start harvesting what resides above ground after adequate carbon has flowed to all parts of the landscape, including below ground. This approach will ensure future animal production and ongoing resilience of the production base. It will also ensure better environmental outcomes.

The first thing producers ask when they hear this message is, where are we going to put animals to rest pastures after rain? The answer, some of the "increased" ground cover that results from a previous resting exercise can be utilised as somewhere to put animals next time it rains, i.e. the capacity for resting resides in existing pastures.

Short-term carbon is the driver of change

Ground cover, roots and root exudates that feed soil life are all short-term carbon.

Long-term soil carbon is important however its level is slow to change. This is why it is not responsible for short-term changes in paddock health or productivity. Short-term improvements in paddock health and productivity are driven by the short-term carbon introduced in the first phase of carbon flows. Also, the carbon in long-term soil carbon has to start the journey as short-term carbon in the first phase of carbon flows.



When soil organic carbon went from 1.5% to 2.5%, the change was driven by increases in the short-term carbon (called labile carbon) – the red section. Look closely at the actual size (area) of the black section in each circle, which is long-term carbon (non-labile), and there is virtually no change. The percentage of long-term carbon has changed on the left-hand diagram, but this is because the increase in short-term carbon has changed the total.

This diagram sums up what happens in the soil part of your paddock when you change the management of carbon flows. The left-hand circle is larger because changed management has increased the flow of carbon through all of the paddock. Remember only about 2% of flowing carbon involves long term carbon.

Carbon markets can only deal in stocks

Soil carbon and tree carbon has become prominent in public debate because of climate change policy and carbon trading. Payments to landholders in the form of carbon credit schemes for storing carbon apply only to long-term forms of carbon, because short-term carbon flows cannot be secured. However, payments in the form of stewardship incentives can be justified for management changes that increase the flow of carbon and so improve paddock and catchment condition. The two purposes are distinct and different metrics are needed to assess them.

Conclusion

Discussing carbon flows is the entry point to understanding rural profit, landscape health and resilience, protecting water ways and the Great Barrier Reef, and increasing carbon stocks. The greenhouse outcomes of agriculture are a reflection of economic efficiency and it is management of carbon flows that underpins economic efficiency.

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