



Carbon Grazing

The Missing Link

Improving plant & landscape resilience

Re-carbonise the soil for profit

De-carbonise the atmosphere

Reduce methane emissions

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Carbon Grazing® is a general principle to maximise the introduction of carbon from the atmosphere into the landscape between the trees. Those who implement Carbon Grazing should enhance their economic return and achieve positive environmental outcomes including methane reduction.

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CHAPTER 1

PUTTING CARBON INTO PERSPECTIVE

A NEW APPROACH

The saying, “nature is not more complicated than we think, but more complicated than we can think”, highlights that science and society are still struggling with the sheer complexity and intricate subtleties of nature. Hence, with so many people measuring, cataloguing and trying to understand everything, we can be overwhelmed with the sheer weight of data and knowledge. Even then, with all the resources available, we often misinterpret and **overlook fundamental principles**.

In modern times Western and Westernised societies have responded by specialising and putting everything in pigeon holes, ie take a minimalist/reductionist approach instead of a big picture approach. A reductionist approach to science generates new knowledge at progressively finer levels. There is nothing wrong with discussing all the current issues separately, provided the big picture is understood, as everything in the landscape is inter-related. Hence, this book looks at the big picture. If we keep the big picture in focus, nature actually becomes less complicated, even as we accumulate more and more knowledge.

In universities, many disciplines are now accepting that they need to complement long-established reductionist approaches with focusing on total systems. There is a need to train more people with an overview of the big picture to better coordinate the specialists.

The current process is for information to be handed out in separate packages to people on the land. The downside of this approach is that rural producers, who are responsible for managing the whole landscape, are then expected to formulate a coordinated action plan. For example, government agencies give rural producers information in different packages and then expect them to put it all together to form the big picture they are dealing with. It is therefore no surprise that parts of the Australian rural landscape have been degraded despite the best efforts of farmers and supposedly the best advice from government.

It is because of this reductionist approach that the importance of carbon is not understood. In taking the reductionist approach, something else is always the main focus. However, it is only when the big picture is discussed, and it is discovered that carbon is a functional component of all the separate systems, that its importance is realised.

The risk for society under a reductionist approach is that legislation can become conflicting, which makes it impossible for rural producers to look after the interests of the other stakeholders in society. In more extreme cases, they may be forced to damage the landscape. At the end of the day, it is rural producers who are the custodians of a large percentage of the land. If they are not given a practical working model for managing the landscape, then the whole of society suffers.

THE POWER OF OBSERVATION

As I relied on nature to earn an income, I felt the need to better understand the processes that controlled my destiny. For scientists it is the opposite; they are taught the science first, then set out to better understand nature in an endeavour to put their knowledge into practice in the real world. Former CSIRO scientist, Dr David Freudenberger, with whom I have worked closely for many years, recently sent me an email with his suggestions on how I should structure this book. He is a scientist who has a good understanding of how I accumulated the information being presented.

“One idea you might wish to consider, is in each chapter start with one of your ‘stories’ or perceptive observations out in the paddock, then weave the science etc from there. You are not a scientist, but a practitioner with a keen perception and deep interest in the science – use that to your strength. Any competent scientist can rabbit on about carbon. Your credibility is as a long-standing practitioner and observer.”

This book is not about science per se, it is about observations determining what particular science needs to be understood. The knowledge which can be gained through combining the two makes you prioritise, so that the true drivers of profit, eg carbon, resilience, are looked after. One natural resource scientist, who often called to see if his theories were consistent with our observations, said he liked to filter science through graziers as a reality check.

The purpose of writing a big-picture book is to encourage people to be more observant and also facilitate a better understanding of the observations they make.

WHY CARBON?

Carbon has always been part of our everyday life without us realising it. In looking at our diet, we have always been aware of carbohydrates. When we go to the service station, we utilise the carbon in petrol to go about our daily lives. Carbon keeps us functioning, our cars rolling, and drives all rural production as you are about to discover.

Most rural producers associate carbon with greenhouse gases and the issue of global warming. Few realise that they are actually managing carbon in their day-to-day operations. It is the exchange of carbon between the atmosphere and a property that is at the heart of a rural producer’s economic future, and the long-term sustainability of the property. In essence, agriculture is really about the recycling of carbon. This is through plants, soil and animals, and in the process produces commodities.

Carbon is a commodity that is always moving, which is why it is easy to run short of it. In managing carbon flows, we have to introduce more carbon into the landscape than is returning to the atmosphere, or at least maintain the carbon pool we have, if the landscape is to remain in a healthy condition. Without sufficient carbon in their landscape, farmers have an inefficient production system.

Plants are responsible for transferring carbon from the atmosphere to the landscape, both above and below ground, through photosynthesis. Livestock and native animals eat plants, so managing them correctly is critical to maximising the flow of carbon into the landscape. The CSIRO talks about total grazing pressure, because kangaroos, where they exist, must not be left out of discussion on the impact of animals on the landscape.

Carbon is the glue that holds everything together. As will be demonstrated throughout this book, **energy**, **nutrients**, and even **water** all follow carbon. As part of this bigger picture, the protein cycle follows carbon and is a reflection of soil fertility.

Although we can not see it, except for diamonds and graphite, carbon is the main building block on earth. All life on earth is carbon based. All living things; plants, animals, insects and soil microbes contain carbon. People are 18% carbon, with the amount of carbon in an average person equal to 900 pencils. When the moisture is removed, trees are 50% carbon and grasses 45%. Soils can range from less than 1% to 10% carbon.

Just as carbon is essential to plants, **it is the master “nutrient” in soils**. Carbon determines soil structure, the ability of soil to hold moisture, how quickly water will penetrate, the resilience of soils to climate extremes, how much nitrogen and other nutrients are available to plants, plant digestibility and a host of other functions. As carbon levels increase in the soil, the soil becomes darker. This is true for both red and black soils.

Land degradation and decreasing agricultural production is all about falling carbon levels in the landscape. As soil carbon levels fall, crop yields or reliability also fall. As a general rule, soils in the same environment with low carbon levels produce less pasture dry matter than soils with higher carbon levels, and the pasture is also of a lower quality.

If we mismanage carbon, then it is reflected in everything around us. When we look at bare soil in a good season, we are looking at the symptom of the problem, not the cause, which is lack of carbon. Most problems the new catchment management approach sets out to address would be greatly reduced, if all participants simply managed carbon better.

Being short of carbon, is another way of saying that the world finds itself in the predicament of being short of plants, animals and soil microbes, ie the very basis of rural production. Many instances of desertification have begun through a lack of carbon.

Carbon is what creates wealth for rural producers, be they farmers or graziers. Carbon stocks need to be seen as part of the capital base of a rural operation. Just as it is important to keep the money account in the black, so the carbon balance on a property must also be in the black. Farmers can borrow and pay back from this carbon account, but borrowing more than you pay back leads to ecological poverty, closely followed by economic poverty.

CARBON GRAZING

The term Carbon Grazing® was coined to promote a better understanding of how the landscape functions and needs to be managed. The term represents the actions that need to be taken. Its purpose is to raise awareness of the importance of carbon management for a grazing business. Carbon Grazing allows responsible graziers to demonstrate that they are making a very valuable contribution to society, and for this they should be recognised.

Carbon Grazing is concerned with:

- The pasture and soil component of the carbon cycle ie the landscape between the trees; and
- How animals have to be managed to allow plants to build up carbon stocks on a rural operation.

Plants remove carbon from atmospheric carbon dioxide and use it to build carbon compounds of leaves, stems and roots. A significant portion of this carbon then moves into the soil through roots and litter. New highly productive topsoil can be made if enough carbon is introduced via green plants.

With respect to Carbon Grazing this book will discuss:

- The true meaning of pasture rest, including when it needs to occur and for how long;
- The different processes that occur in the short period following rainfall; and
- How animals can increase carbon flows by consuming rank grass.

Similar to the term Carbon Grazing, another example of two words opening a debate we had to have, was the term “woody weeds”. In northern Australia there has been a detrimental thickening of non edible shrubs across large areas of the country. This issue was not getting the attention of bureaucracy, so a scientist coined the term “woody weeds”, knowing that using the word “weed” would get the attention of decision makers. It worked, and the debate also had a label. With communication, it is very efficient when two or three words can represent a whole topic, as there is no need to explain the detail. The term “Carbon Grazing” was coined for the same purpose. It represents a debate we need to have, as well as using two words to represent a whole area of knowledge.

Understanding how livestock function and hence the way they select their diet, allows us to predict how they will impact on plants over time, and hence the movement of carbon. Understanding when, why, and in what ratio livestock incorporate the different plant groups into their diet over time leads to higher profits and healthier landscapes.

Too often, the needs of animals are met at the expense of the needs of plants. At the end of the day, it is healthy plants that are the best allies of animals. Healthy plants are capable of producing under marginal conditions. This is part of the resilience theme that the book focuses on.

Given time, all land management practices will be scrutinised for their carbon outcomes. This upcoming debate is not one that rural producers need to fear, because in this debate, things in the interests of society are also completely in their interest. It is not often that we have win/win situations in political processes. This is so because carbon both above and below ground impacts on rural profits, greenhouse gas production, salinity, severity of droughts, soil erosion, weed outbreaks, water quality (including underground water), biodiversity, acid soils, river health and estuary health.

In developing strategies for landholders, it is important to go back to the basics and understand what is really deteriorating in the landscape over time, ie the building blocks (carbon) are being destroyed.

The good operators are replacing the building blocks (carbon) faster than droughts destroy them ie they are allowing plants to reconstruct the landscape whenever the opportunities arise.

As the book progresses, carbon will be related to all the current issues rural producers deal with, like hard capping soils which shed water, lessening the impact of drought, unproductive pastures and erosion. This book takes into account both the realities and constraints land managers face while conducting their operations.

Some rural producers see animals as the source of their income; some see plants, while some see the soil. In reality, these three elements of production cannot perform if there is insufficient carbon introduced and then maintained in the landscape.

How nutrients become available to plants through soil microbes breaking down organic matter (carbon compounds) will be investigated in *Chapter 10: Nutrients follow carbon and what else happens in the soil* beginning on page 36. The ratio of carbon to nitrogen in all living things will be looked at to show how the percentage of nitrogen determines so many processes.

The innovative idea of pasture cropping will be discussed. It overcomes the carbon deficiency issues of traditional cropping. It involves lower risk for producers as well as using less fuel. With pasture cropping there is an ongoing shift from grass production to crop production, then back to grass production. The cropping phase of pasture cropping enhances grass production by some soil disturbance, while the grass phase enhances soil carbon levels.

SIMPLIFYING SCIENCE

This book does not set out to change current science; instead it is presented in a different and simpler perspective. By starting with carbon, the book will put all the current separate issues into perspective, and make it easier to understand how they are connected in the landscape and integral to a rural enterprise. Isolating carbon as the starting point is not saying that current science is flawed. Instead it is a case of trying to find the common denominator between what are currently treated as separate issues.

More importantly, the purpose of isolating carbon as the main issue is to simplify our response to solving problems, and to ensure that we do not create other problems. Presently we often treat the symptoms, not the cause. A good example of one action having dual positive outcomes is that increasing soil carbon reduces the likelihood of salinity, while the same increase in soil carbon in the landscape also reduces the impact of drought. With an increase in soil carbon, there is a reduction in the leakage of water down to the water table, which in turn makes it rise. It is this rising water table that brings the salt to the surface. The ability of carbon compounds to hold water near the soil surface, in the root zone of plants, is what postpones the impact of drought.

Over time the best solutions have always been simple. This is what the engineer looks for in conceiving the perfect solution. But just like seeing the forest for the trees, it takes skill and intuition to think simply. Fortunately I believe this approach can be learned and that is what this book attempts to impart to the landscape manager and rural producer.

UNDERSTANDING THE PRIVATE AND PUBLIC ROLES OF RURAL PRODUCERS

A major focus of this book is the private role of rural producers, which is managing their natural resources for profit and increased long-term production ie managing to increase landscape carbon to keep the bank manager happy. In the process of increasing the carbon levels in the landscape that they manage, they are also fulfilling a public role. This is managing their resources to achieve environmental benefits (such as water quality, reducing greenhouse, salinity etc) for the other stakeholders in society.

Society is changing its attitude towards rural producers and now sees them as accountable custodians of the land. The Native Title legislation highlighted that rural producers own the title, not the land. Their rights and obligations are specified in the title.

AN OPEN MIND

Proposing new ideas is essential for promoting healthy debate. Unfortunately decision makers in government departments and or catchment management personnel are just as likely as rural producers to seek the comfort of what has always been accepted, which is human nature. The world was once considered flat, we now know otherwise. This book sets out to stimulate additional thought on the issues raised, not take a definite final position. I encourage you to read what follows with an open mind. I accept that I shall be challenged over some of what is proposed, and hopefully, the resulting debate will assist in clarification of the issues and our understanding of them.



"I HAVE FINALLY GOT TO RE-READING CARBON GRAZING. HOW DIFFERENT IT IS ON THE SECOND READ. I AM CAPTIVATED AS YOU REVEAL THE "SECRETS" OF GOOD GRAZING MANAGEMENT."

...SHANE JOYCE, GRAZIER, THEODORE, QUEENSLAND, AUSTRALIA.

"ALAN HAS THE GREAT ABILITY TO THINK ACROSS SCALES FROM THE MOLECULES INVOLVED IN CARBON FIXATION, THE GREEN PICK NEEDED FOR SHEEP AND CATTLE DIGESTION, TO THE GLOBAL CHALLENGE OF CLIMATE CHANGE."

...DR DAVID FREUDENBERGER, FORMER CSIRO SCIENTIST, CANBERRA, AUSTRALIA.