

Nutritional Wisdom at Work in a Grazing Enterprise  
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Grazing is a genuinely complex system, involving countless interactions between millions of players, continuously changing and evolving on every imaginable time scale. Soil, microbes, plants, invertebrates, larger animals, humans, weather, climate, supply chains, markets and customers make up a beautiful and challenging tapestry, full of chance encounters and continuous, absolutely unpredictable changes.

Complexity is confounding for most of us who, for science or profit, want to believe that the whole is exactly the sum of the parts. If that were the case, reducing the system to its primary components—those that “explain most of the variance”—could perhaps provide a model of system response that would allow successful prediction. And even though we know, and have known for decades, that landscapes are complex in the mathematical sense of exhibiting emergent, unpredictable behaviour, we still long for the comfort of a simpler model.

As a scientist and a woolgrower, I inherited a double dose of that longing. Ten years of farming has finally convinced me to let it go, and to accept the wonderful gift of complexity.

In this paper, I will talk about my experience of the last 4 years, managing my grazing enterprise as a complex system. I will tell you a bit about what I’ve done differently, a bit about the surprising results of those changes, and a bit about what I think is happening. I need to say up front, that even if it were possible to identify and measure all the variables involved, I mostly didn’t. I kept good farm records and those data are the ones I’ve used to examine the changes, but I did not do any classical scientific studies, and make no apologies for the lack of replication or reductionist rigour.

Much of what I believe is happening to increase the well-being of my animals, and therefore the profitability of my enterprise, results from nutritional wisdom—the ability of animals to learn how to forage successfully in a landscape. The science behind nutritional wisdom concepts is extensive, well-published, and tested in both controlled and uncontrolled environments<sup>2</sup>. I am not claiming to demonstrate any new science with my observations, but rather to document the changes that occurred within my complex, uncontrolled environment when I embraced the challenges and the opportunities of complexity.

What did I do differently? In the first instance, I reduced the stocking rate by 30% to match the forage availability, which was extremely sparse after three years of “lowest on record” rainfall in my area. The idea was to allow the natural plant diversity of my system to recover, providing something for animals to choose to eat other than ryegrass, cocksfoot and clover. I also quit hand feeding.

Second, I stopped weaning, and over time reconfigured my flock into three family groups—each with mothers, daughters, grand-daughters and grandmothers. The idea was to allow older sheep that had learned how to forage successfully to teach their progeny, a process that nutritional wisdom research has shown takes 1-2 years.

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<sup>2</sup> See the publications of Fred Provenza and others at [www.behave.net](http://www.behave.net)

Third, I began resting more of the landscape for longer periods—4 to 6 months rather than a few weeks. I time the rest, as well as I can, to coincide with the peak growth periods of the different types of pasture—native or exotic.

In the first year after these initial changes, the rainfall increased, though not back to average levels. In the subsequent years, rainfall has hovered around average, though with the usual significant variations from season to season.

What happened? First, wool production and fertility both jumped, wool by 40% per sheep and fertility by 27%. Lambing interventions (prolapse, lambs pulled, etc.) decreased dramatically, with no prolapses and only one ewe out of 400-500 requiring attention each year, compared with 10 or more in earlier years. Drenching has not been required by any grown sheep for the entire period, and lambs have been drenched 2 times in 4 years, responding to worm events in summer in two different years. A single drench was sufficient—no follow-up drenches were required. Taken together, these results far outweigh my 30% reduction in stocking rate.

Second, the landscape has recovered. Diversity is up, along with ground cover. Weeds are diminished, partly through animals learning to forage on them, partly through less opportunity to strike. Most areas of the farm have had the chance to go to seed at least one year out of the last 4, providing a nutritious forage that the animals have learned to look for, and also regenerating the soil seed bank. The recovered landscape provides a “bank” of forage to help bridge seasonal deficits in plant growth, for instance the dry autumn of this year.

Third, social dynamics in the flocks have changed in surprising ways. There is a social cohesion that is reminiscent of the Hatfields and the McCoys—a courage that seems to come from having your family at your back. My sheep do not flee from humans or vehicles, even if they are strangers. They mob up, and turn to look, and the look pretty much says, ‘State your business or leave. It’s our place.’ While I’m being a bit tongue-in-cheek, there is no denying that family groups show a higher level of cohesion, predator-deterrence and family-like behaviour. During lambing, ewes do not leave the flock to lamb. A (presumably) nuclear family of 3 or 4 might move a short distance (or the flock as whole may move from them) while one ewe is lambing. I have seen hoggets “baby-sitting” small groups of lambs while the ewes graze nearby.

What do I think is happening in my complex system as a result of these changes? First, just getting the forage level to align with the nutritional requirements of the sheep, is major. Merinos, particularly, seem to be able to manage (but not thrive!) on relatively poor nutrition. Getting the level of macronutrients up to where they need to be undoubtedly was the first big step in improving productivity. I’ve been told (by unsympathetic reviewers) that this is a well-known effect. It may be, but it certainly hasn’t done much to change the way producers manage. Over-grazing and under-nourishing are chronic in our production systems as we try to beat the downward spiral of commodity prices.

Second, by reducing stocking rate enough to provide for the other grazers in the system (native animals, grubs, etc.) and more than enough forage for the sheep, the natural plant diversity in the system has had a chance to breathe. This is absolutely critical for nutritional wisdom to have a chance of working.

Nutritional Wisdom 101: Grazing plant communities have co-evolved with grazers in a silent, intense and beautiful dance of survival. Plants need not to be eaten to death, and grazers need to find the mix of nutrients required to thrive. Plant defences are mostly

chemical—so-called secondary compounds like tannins and alkaloids—that, eaten in sufficient quantity, make the animal mildly nauseous, limiting intake. The animal then has to seek out a different plant, with different secondary compounds, to be able to make up its macronutrient level. But that is not the only role for secondary compounds. They are the pharmacy of the natural world, and animals can learn to use them to self-medicate.

A relevant example of self-medication in my system is that chicory and plaintain both contain compounds that are anthelmintic—work against intestinal parasites. My sheep have learned to seek out chicory and plaintain to worm themselves. I once tried to move a flock of sheep with a known (FEC tested) high worm burden past a section of paddock with a heavy stand of chicory. As one, they moved into it, grazing and calling to each other as they do when there is something tasty on hand, steadfastly refusing to be gathered or moved until they had their fill, a couple of hours later. Not that I didn't try to move them before that, but even my capable working dogs hadn't a chance. It was quite an object lesson for me.

Third, I believe that parasites have a positive role to play in animal health, and that by NOT drenching, but also not allowing worm levels to get out of control, through good nutrition, I am allowing my animals to stay healthier more generally, perhaps through a stronger immune system. While there is growing evidence for this in humans, I have not found any research done with animals.

In conclusion, my creative experiment, embracing complexity and finding ways to make it work for all the elements in my system—plant, animal, human—has provided lovely dividends. The additional profitability is nice, the much-reduced labour for me and my elderly stockman is even nicer, the beauty of the restored landscape refreshes me every day, and watching my sheep come into their own as individuals and family members is tremendously rewarding.