Managing weeds through effective grazing.

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Introduction

Weeds have been impacting on civilisation for thousands of years, in some ways detrimentally, in others beneficially. For example hops, a vital ingredient of the beer we drink today was considered by the Egyptians, three thousand years ago, to be a weed, emphasising the fact that a weed is merely a plant out of place.

Utilising sunlight energy, impact from grazing animals and a screwdriver; we are able to capitalise on simple, environmentally sound and effective weed management tools.

The need to change

The property

Margot and I run a crossbred weaner vealer breeding enterprise on our property 'yerra binda', 70 km north-east of Armidale on the eastern fall of the Northern Tablelands at an altitude of 1350 m. The property is 880 hectares, soil types are predominantly red basalt and sedimentary trap rock with a rainfall of about 820 mm.

We have always been aware of the need to live in balance with the land around us and to that end our aim has been for total ground cover, zero siltation runoff and pastures as weed free as possible.

For many years we were concerned about problem plants which were increasing and becoming established in much of our pasture. It appeared to us these weed species could only be controlled by either mechanical or chemical means. Not only were weeds an issue, but we were managing towards increasing bare ground and soil degradation caused by animal tracking and overgrazing. These in turn were leading to soil loss and declining water quality in streams and dams.

So when the effects of rising input costs and diminishing returns first began to impact, it was plain to see we were grazing our way towards an unsustainable and unproductive future, not only environmentally, but economically and socially as well. A change in our thinking or more importantly, as we learned later, a change in our decision making process was urgently required if we were to sustainably manage and care for this land now and for future generations. To paraphrase Albert Einstein: "If you always do what you have always done then you will always get what you have always got". This could not have been more true in our case.

The process of change

Early in the 1990s we became fascinated by a grazing philosophy which revolves around the planned migration of the great herds of Africa, whose survival, not only from predators, depends on the sheer concentration of numbers. The massing of these animals requires that the grazing intensity over a short period of time is both dense and relatively even and that as soon as the available forage is grazed to certain level, the animals move on and do not return until plant recovery is complete. Not only is the available forage evenly grazed, but excrement spread is contained within the graze area, ensuring the proliferation and continuing regeneration of soil micro fauna, thus perpetuating microorganic activity and the subsequent improvement in soil health. The great majority of the pioneering work in extrapolating the way in which these great herds move in the wild, to domestic livestock on a rangeland situation, has been researched and documented by Allan Savory and presented in his book *Holistic Management*.

Empowered with this new knowledge, it seemed logical to revisit our grazing practices. The animals we derive our livelihood from, have now become the most potent tools we possess, in order to achieve our goal of healthy weed free pastures. Where once our livestock were of prime importance, now the soil health is paramount, a change from the often used title of "grazier" to one of "constant gardener", from mining the soil to building healthy biomass.

A change from our past ways of grazing management, ie semi-set stocking where animals spent a relatively long graze period in any one paddock and the rest period is sometimes negligible, to planned grazing where the graze period is short but intense with a long rest. One which involves a complete change in the decision making process, where the prime importance is the health of the LAND not the animals. This change from what is perceived to be the norm requires a complete paradigm change.

By using our herd of angus/hereford/shorthorn cows at high stock density, sometimes up to 3000 DSE/ha and with frequent use of a screwdriver to test the ground for its water infiltration capability, we are now making significant biological improvement and gradually reducing the weed problem on 'yerra binda'. Perennial grasses, both introduced and native are regenerating, as are many native legumes not seen for generations. These are now overtaking the weeds of yesterday in many areas.

The weed issues prior to the implementation of planned grazing

Plants need to be survivors to exist at 1000 m above sea level and as result, those plants that become a problem are therefore, difficult to control. One which has proven most difficult for us to live in balance with as grass farmers, is a native tussock called matrush (*Lomandra* spp.).

Lomandra is indigenous to the Northern Tablelands. A largely unpalatable plant for livestock, which in its native environment and when in balance with the plants around it, only grows in a three or four leaf form. However, in a pasture situation, surrounded by highly palatable perennial plants, fertilised regularly and particularly if livestock are set stocked and no consequent grazing pressure is applied, it can develop to enormous proportions (total weight including root ball, around 60–70 kg). The impact on the grazing industry in north-east New England caused by the encroachment of this giant tussock, has been substantial over the past 50 years, with up to 75% of some pasture areas having been totally dominated by this vigorous plant. With the benefit of hindsight, we now realise that the immense problems caused by this plant in our district, lay in inappropriate grazing management (through poor decision making), which created the conditions for lomandra to proliferate.

Such was the impact of this plant on the grazing enterprises of our district, that methods of control became the basis for the formation of the local Landcare group. Many trials were set up by Department of Agriculture and others to look at different ploughing techniques and chemicals to impact on the problem. Some of these chemicals were so toxic, that bare ground still exists on a few of the old trial sites. We have found that technological solutions are short term at best and do not address the root cause of the problem as well exacerbating the problem in the long term.

Other 'so called' weeds which were an issue prior to our change of grazing management and which we consider to definitely be susceptible to planned grazing and the subsequent competition which follows are, sliver grass or rat tail fescue (*Vulpia* spp.), horehound (*Marrubium vulgare*), nodding thistle (*Carduus nutans*), bracken fern (*Pteridium* spp.) and black thistle (*Cirsium vulgare*).

Successful changes

It is now twelve years since we made our first tentative steps towards a significant change in our grazing management, utilizing short graze periods with high stock densities and long recovery periods; as a consequence the plant dominance of lomandra is diminishing dramatically.

The resultant regeneration, through long recovery of perennial species, both introduced and native, on top of and around the tussocks is causing the attrition of the plants through sheer competition. This is occurring to such an extent that we no longer consider lomandra to be a weed problem which cannot be controlled on 'yerra binda'.

The success of this method of weed management would certainly indicate to us that the control of many existing problem weeds in other regions of the country such as Salvation Jane, Capeweed and similar soft annuals would be relatively easy and cost effective. (The only tools required are sunlight, planned movement of a mob of cows and a screwdriver for monitoring).

Incidentally, as confirmation of this, in 2004 we took part in a weed survey conducted by Mark Trotter a PhD student from the University of New England, in which a number of properties in the district were studied in order to identify the weed content of various pasture paddocks. Of the eight farms in the study the site on 'yerra binda' recorded the lowest number of growing weed plants and bare ground and the highest legume percentage (Table 1). Interestingly, the number of un-germinated weed seeds was observed to be quite high, indicating that the density of the pasture sward promoted by planned grazing

Table 1 Pasture composition (%) by point quadrat of eight properties on the New England Tablelands of NSW ('yerra binda' is property 892).

Property number	Pasture grasses	Pasture legumes	Broad leaf	*Vulpia* spp.	Bare ground	Other
892	79.8	9.2	8.2	0.0	2.8	0.0
12	63.7	1.8	20.0	8.0	4.2	2.3
19	80.0	3.8	11.5	0.0	3.8	1.0
666	84.2	0.5	7.8	1.0	5.0	1.5
688	29.2	2.5	12.8	40.8	13.0	1.8
820	76.0	0.0	12.2	0.0	4.8	7.0
85	84.2	0.0	6.5	2.5	3.8	3.0
86	82.8	0.5	3.3	9.3	3.3	1.0

Source: Trotter (2006).

and the low level of bare ground was preventing the germination of further weeds.

The principles of controlling weeds through planned grazing

Planned grazing, pulse grazing, time control grazing and cell grazing are all terms which describe the movement of livestock from one pasture to another on a regularised basis. In our opinion, none defines the process better than "planned grazing", as the key to its success depends on an effective grazing planning chart, regular pasture monitoring and most importantly, adequate plant recovery time. Bearing in mind that without planning, monitoring and recovery, livestock movements can become a system, and a system often eventually fails.

As mentioned before, planned grazing as such is based on the massed migrations of predominantly wildebeest and zebra on the great plains of Africa. Its effectiveness as a tool where time and planning of recovery periods is the key to success, and the rate of change is more influenced by stock density i.e. the higher the stock density the more flexibility in management and greater control over time. A short, intense grazing time followed by long recovery is also critical to ensure plants are not repeatedly grazed and have time to fully regrow during the recovery period.

Basically, the outcome which seems to maximise both the production and the health of the soil on which we grow our pasture, is one where our cows eat 30%, trample 30% and leave 30% approximately of the available forage in each paddock they visit.

30% (approximately) eaten

Because an element of competition has been introduced into the normal grazing routine of each cow, the approximately 30% they eat is made up of both palatable and non palatable species and because of the time constraints on the graze period, they don't have the opportunity to overgraze the more desirable species. By and large, those desirable species tend to be perennials whose ability to recover is far greater than that of annuals, as a consequence of which we find that we are managing towards perennial grass dominant sward.

30% (approximately) trampled

Trampling is beneficial in many ways, as much of the forage material which is trampled becomes compost and litter, two vital ingredients in the formation of new soil. While it is decomposing it increases the level of organic material in the topsoil layer, providing food and habitat for soil micro-organisms, so vital for soil health. At the same time we know that the presence of litter dramatically reduces runoff and it has been shown that a combination of litter and healthy forage to a height of approximately 100 mm insulates the soil against extremes of temperature from between 8–10°C. The added benefit of laying some forage on the ground and trampling it with cloven hooves encourages the seeding regeneration of perennial species whilst inhibiting the growth of annuals.

Finally, and perhaps most significantly, the effect of trampling on many perennial species can be beneficial in that it strips away old decaying plant material thus promoting new growth and additional root tillering. However the same trampling effect on most annual plants can prove disastrous.

30% (approximately) remaining forage

The un-trampled or uneaten plants at the end of the graze period provide the critical basis for plant recovery, and protection for emerging perennial seedlings. Not only determining dramatically the rate and ability of plant recovery but greater moisture retention. Therefore the more you leave behind, the faster the rate of recovery.

Additional benefits from planned grazing for pasture weed control

From our perspective, there are many additional benefits which flow from the transition to planned grazing, other than one purely of weed management, vital though it is.

Even nutrient spread

By planning stocking density in each paddock, controlling the grazing process and the TIME on the grazed area, we achieve the benefit of even nutrient distribution and control the amount of forage removed in any graze event. As a consequence of this, excrement is spread uniformly and because there are no stock camps, tracking is eliminated and there is no transfer of nutrients from one area to another.

A significant improvement in the four ecosystem processes

All of the four ecosystems processes, water cycle, mineral cycle, biodiversity and energy flow (the capture of sunlight) are enhanced by any change in grazing management. Increased groundcover is the first step which in turn leads to an increase in the function of the four processes.

An increase in the level of available soil carbon

Changes to groundcover management can have highly significant effects on levels of soil organic carbon, influencing soil surface condition, soil structure, porosity, aeration, bulk density, infiltration rates, water storage capacity and the amount of plant

available water. An improvement in any of these factors increases the effectiveness of the rain that falls, enhancing productivity as well as reducing rates of erosion, dispersion water logging and dry land salinity (Jones 2004).

Achieving significant biological change

Planning grazing has resulted in an increase in plant biodiversity within the pasture sward; a diverse pasture is a healthy pasture. We have seen a significant increase in species diversity over the past ten years; native legumes have increased particularly *Hardenbergea* spp. and *Glycine* spp., as well as the introduced legume, red clover. This is largely due the fact that these desirable plant species are not being overgrazed. With the critical point in mind that overgrazing is not the number of animals on a given area, but the length time that plants are exposed to animals.

Drought management strategy

Because we are able prepare a feed budget based on the data from the grazing chart and the known quantity of forage available, we are able to plan in advance how many animal days per hectare are available for the planned graze period. We can then benchmark dates to be set whereby carrying capacity can be reduced to match stocking rate, so that plants are not overgrazed in time of moisture stress and hence preserve the natural resource base. This capability also dramatically reduces stress on the land manager during periods of low rainfall.

Animal health

Since our livestock are all in one mob (although there can be more than one), no drenching is required as internal and external parasite life-cycles are broken during the plant recovery period. If any problems do materialise, livestock are seen on a regular basis (every few days) and can be monitored. Because herds always lead better than they drive, labour is reduced and livestock security is increased through the ability to check counts regularly. Fewer seed-stock are required, as females are bunched closely and conception rates are higher. All of these livestock advantages lead to a significant decrease in input costs, greater control of grazed pasture and balanced grass species with fewer weeds.

Water quality

Operating in smaller paddocks requires good water. Planned grazing necessitated that we implement a reticulated stock water supply, extensive and expensive though it is with buried piping. Above ground infrastructure cost is low in that we only require two troughs (one as a spare). Each trough is on a 25 m flexible high pressure hose allowing many different locations in a circle around the riser; consequently there is less bare ground than there used to be around fixed water points. Bare ground, invariably, encourages early broadleaf successors and weeds.

Weeds as colonisers

Weeds are excellent early colonisers, particularly of disturbed or bare ground. However, by and large they are no match for healthy perennial plants, either introduced or native. Some years ago we had an issue with rat tail fescue, the advice was to spray with simazine, instead we used high stock densities (4000 DSE/ha) followed by a long recovery period to promote the growth of perennial grasses and utilised the vigorous summer pasture growth of perennials that followed to overcome the problem.

Regenerative agriculture

At the same time that we were dealing with the previous issue of rat tail fescue, we were improving the water and mineral cycles of the area as well. I see this as a form of regenerative agriculture, one which builds top soil and bio-capital, rather than one which is merely sustainable. As land managers, Margot and I reflect these thoughts in our ongoing goal.

Weeds which are still an issue

Blackberry (*Rubus fruticosus* agg.), an introduced and invasive woody weed, is probably the only plant which poses a problem to us because of its thick stemmed characteristics, it tends to be more difficult to control than most others forms of weeds when utilising planned grazing. Also fleabane (*Conyza* spp.), being an annual tends to be more of an occasional and seasonal issue. In seeking ways to control weeds such as these, we are constantly searching for their weak link in order to rectify the problem.

Conclusion

In summary I would say that we have made great progress in the past twelve years in controlling weeds and living in balance with the land around us, due almost entirely to a change in our decision making process which then led to a dramatic change in our grazing management. We no longer believe that we need to make war on weeds but that by changing the way we think and approach issues we can increase our biological capital, return a financial profit, but most importantly, live in balance with the land that we are part of.

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