

Change the management and what happens — a producer's perspective

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Abstract

The paper begins with a brief outline of old management practices including: land clearing, introduced pastures, fire, high external inputs, focus on animal genetics and individual animal performance, high cost of production, acceptance of 'run-down' in the natural resource base and continuous grazing. The focus on production has been detrimental to soil fertility and has led to drastic modification of landscapes.

Secondly, an outline of the replacement management practices, which incorporate: timber retention, focus on native pastures, pasture diversity, nil fire, focus on kilograms produced per hectare and low cost of production, is presented. The new management package has led to an improving natural resource base, through Cell Grazing, a method that incorporates rest and whole system management.

Finally, an outline is included of the results we have been able to achieve in a relatively short time at 'Duke's Plain'. Specific results include: improvement to the natural resource through more diverse pastures, improved water quality, better water-use efficiency, increased carrying capacity, easier animal management, reduced labour requirement, more trees and fewer weeds. Our performance is benchmarked annually against that of other graziers.

In conclusion, I challenge all of us to question the 'conventional wisdom' of our old systems.

Introduction

At 'Duke's Plain', Theodore, central Queensland, we have changed our land management quite dramatically in the past decade. One of the key changes was the introduction of Cell Grazing in July 1993 with the establishment of 8 cells. By June 1994, we had combined mobs of cattle to provide 21 cells, covering the whole property. In my paper, I will outline the characteristics of the old and the new management systems and the benefits which have accrued during the past 7 years.

What things characterised the old management?

Our old system was characterised by:

- plenty of timber clearing;
- introduced pastures;
- frequent fires;
- high external inputs such as seed, machinery and labour;
- a focus on animal genetics and individual animal performance;
- a high (but average) cost of production;
- a continuous run-down of land and pastures which was considered 'normal';
- continuous grazing and;
- existing ecosystems heavily modified for grazing/cropping enterprises with a focus on production.

I asked myself, do you protect soils and build fertility:

- by clearing trees?
- by introducing monospecific pastures?
- by frequent use of fire?
- through mechanical intervention?
- under continuous grazing?

What does it say about our attitude to biodiversity when we believe that:

- Mother Nature sends us one noxious weed after another;

- chemicals will solve most weed problems;
- frequent fire benefits an ecosystem;
- if we can't change it with chemicals or fire, let's attack it with a D8 (bulldozer);
- we should re-sow our 'improved' pastures when they have declined; and
- we don't need to differentiate between a symptom and a cause.

The landscape on 'Duke's Plain' was managed, prior to 1982, by clearing timber, introducing new pasture species, fire and continuous grazing. Early timber treatment was by ringbarking in the eucalypt woodland. In the late 1950s to mid-1960s the brigalow (*Acacia harpophylla*) and softwood scrubs were pulled with bulldozers, let lie for a couple of years, burned and aerial seeded with a mixture of grasses.

Timber regrowth was a major problem. It was initially dealt with by burning and mechanical means were employed from 1970. This coincided with fuel price rises and commodity price decline. By 1982 the cost of maintaining pasture was beginning to outstrip the return from grazing.

Soil fertility decline was becoming really obvious and mixed introduced pastures were well advanced to becoming monocultures of buffel grass (*Cenchrus ciliaris*) on the scrub country. The native grass pastures were being dominated by unpalatable species, in particular white spear-grass (*Aristida leptopoda*), wiregrass (*Aristida calycigna*) and yabilla grass (*Panicum queenslandicum*).

What are the key elements of the new management system?

Our attitudes are that:

- timber is now retained in the system and is viewed as an ally rather than an enemy;
- we focus on native pastures and getting some diversity back into introduced 'monocultures';
- fire is excluded and we use stock to eat grass;
- we minimise external inputs, *i.e.*, we buy no seed and plough no ground;
- we must run more stock per labor unit;
- kg of beef produced per ha is our focus rather than production per head;
- we aim for a low and sustainable cost of production;
- our natural resource should improve hand in hand with profitable production;

- a grazing system must provide adequate rest for pasture plants; and
- profitable grazing/cropping is just one part of the whole-of-system management.

Therefore, we are now protecting soil and building fertility through:

- better and continuous ground cover;
- reduced fire incidence;
- mixed perennial grass pastures;
- reduced mechanical intervention;
- a grazing system which incorporates adequate rest for plants;
- rest for root development;
- trees for a deep root system and associated benefits;
- high levels of animal production;
- increased rainfall infiltration/water holding capacity/water-use efficiency;
- increased biological activity; and
- the provision of comfort, oxygen, water and food for plants, animals, insects and microbes.

Our attitude towards biodiversity has changed to where:

- we view 'weeds' as an ally;
- so-called 'weeds' are indicators; and
- we have reduced the opportunity for 'weeds' and monoculture.

With an empty wallet and a head full of ideas, I took over the management of 'Duke's Plain' in October 1982.

For the next 10 years, there was a mix of the old and the new and then in 1993 a major breakthrough. This came in the form of the *Grazing for Profit School*, which gave me new skills to blend with my on-ground experience. I could now start to measure the results of the different landscape management methods in \$ terms and had the tools to identify and measure trends both in landscape and business.

I was beginning to understand what actions to take to give the best result both for the landscape and for the business.

Results

Rainfall

Rainfall on 'Duke's Plain' since 1992 has been as follows: 1992–599 mm; 1993–535 mm; 1994–442 mm; 1995–731 mm; 1996–772 mm; 1997–589 mm; 1998–980 mm; 1999–658 mm.

Natural resource

Soil structure over the whole property has improved. Ant, earthworm and other beneficial insect populations have increased. A better balance of wildlife now exists on the property and, despite much more extensive water availability, kangaroo and wallaby numbers have reduced and are at an acceptable level.

One paddock, which has 40% regrowth retention, provides habitat for more than twice as many bird species (Dorracott *et al.* 1998). These regrowth strips are also a great habitat for orb-weaving spiders, which can take out significant numbers of insects such as grasshoppers, which damage crops and pastures.

There has been no timber regrowth control on the property since 1988. We have found that country with high levels of timber cover is highly productive. With the introduction of Cell Grazing, which provides adequate rest, grass has grown back on previously bare ground under trees. It is this grass under the trees which is first eaten when stock are reintroduced to paddocks. If we compromise pasture rest, bare ground will start to reappear and kangaroo numbers will begin to increase.

Ground cover over the whole property is much better than it was in the early 1980s with a good cover of litter and a much denser stand of healthy perennial grass plants. This has contributed to a reduction in surface erosion as well as a reduction in runoff. This reduction in runoff is evident as we rely on dams for our water supply.

Table 1. Ground cover estimates after several years under cells.

Site #	Date	Frequency of 30–50% ground cover (%)	Frequency of >50% ground cover (%)
16	Mar 1998	22	60
	Oct 1998	25	57
	Feb 1999	43	47
	Feb 2000	37	55
28	Mar 1998	8	84
	Oct 1998	37	25
	Feb 2000	24	62
36	Mar 1998	9	84
	Oct 1998	36	40
	Feb 2000	10	90

Site # 16 is open black soil downs with brigalow and bauhinia clumps and native grass pasture.

Site # 28 is brigalow/softwood scrub soil cropping country converting to perennial grass, the first three years.

Site # 36 is spotted gum and ironbark forest with strategic grazing replacing fire as a management tool. Note the high levels of ground cover.

Pastures

Pasture diversity and balance are much improved. Native grass plants have re-emerged with rapid increases in curly mitchell (*Astrelba lappacea*), hoop mitchell (*Astrelba elymoides*), kangaroo (*Themeda triandra*), flinders (*Iseilema membranaceum*), satin top (*Bothriochloa erianthoides*), silky brown top (*Eulalia aurea*) and Queensland blue (*Dichanthium sericeum*) grasses. Another strong re-appearance has been *Sorghum alnum*. This lasted for 3 years when first introduced and has not been present for at least 25 years.

In the introduced pastures, we are seeing a steady shift from the 'buffel monoculture' to a more diverse community. Green panic is leading the charge and it is no surprise that it is coming back under the trees first and then moving out from there, as the soil improves.

There has been a corresponding decrease in white speargrass, wiregrass, yabilla grass and numerous annuals.

Legumes

Native legumes have multiplied, which makes one wonder what all the fuss is about trying to introduce legumes into this country. We have so many already that are indigenous and just need the chance to grow.

Species dominance in pastures

Buffel grass, parthenium (*Parthenium hysterophorus*) and Seca stylo (*Stylosanthes scabra*) were the obvious increasers under the old system, but there were many other species that increased significantly in our pastures over time. On 'Duke's Plain' these included: brigalow and softwood regrowth; black wattle; eucalypts; black spear (*Heteropogon contortus*); white spear; rats tail (*Sporobolus creber*); yabilla grass; bottle washers (*Enneapogon* spp.); sabi grass (*Urochloa mosambicensis*); spear thistle; variegated thistle; and sida to name a few.

Recognising what drove this trend has been of great importance in our business. Lack of any form of managed grazing was the key cause. By

introducing grazing management we have been able to reverse the trend of pasture decline. We have been able to turn what 'the books' call decreaseers in the pasture into increaseers and have turned so-called increaseers into decreaseers.

For example, Anderson (1993) quotes "Because of this high palatability (in silky browntop (*Eulalia aurea*)), stock tend to concentrate on it and eliminate it from the pasture." This grass is then referred to as a decreaseer but it is because of "the grazing animal concentrating on the palatable species". If our stock are making spaces then something will colonise that vacant space, and what better than something the stock don't like, such as the unpalatables which are referred to as increaseers.

Now I hear you saying 'what about Buffel grass?' Well we have buffel dominance because our cattle eat everything else in preference to buffel. It's such a resilient grass we just can't kill it out, a perfect grass, if that's all you want and you don't want to manage your grazing. Quite a few of the more recently introduced species, such as purple pigeon (*Setaria incrassata*) and Seca stylo, also have low palatability and become dominant as the stock graze out the more palatable species. Seca stylo is particularly good at this. It also causes increased soil acidity as it has done in some areas north of Rockhampton.

By managing the grazing pattern of the animals with Cell Grazing, we have in fact gone to the CAUSE of the problem rather than treating symptoms as had been done in the past. The big benefits of changing management have not only been the change for the better in our pastures but a drastic reduction in pasture maintenance cost, increased carrying capacity and increased profitability.

Table 2. GRASSCheck results after several years under cells.

Site #	Date	Desirable perennial	Undesirable perennial	Annual	Legume
16	Mar 1998	33	36	27	3
	Oct 1998	72	22	0	5
	Feb 1999	46	16	13	24
28	Feb 2000	48	24	19	7
	Mar 1998	29	0	71	0
	Oct 1998	58	0	42	0
36	Feb 2000	53	0	46	1
	Mar 1998	67	19	10	4
	Oct 1998	70	15	6	9
	Feb 2000	73	12	7	8

Site # 16 is open black soil downs with brigalow and bauhinia clumps and native grass pasture.

Site # 28 is brigalow/softwood scrub soil cropping country converting to perennial grass, the first 3 years.

Site # 36 is spotted gum and ironbark forest with strategic grazing replacing fire as a management tool.

Water

Water quality has been a major issue with severe algal blooms on farm dams with fish and duck deaths over a number of years. Better overall ground cover and a surrounding 'filter' of grass have contributed to a reduction in heavy nutrient loads washing into our dams. With stock no longer camping around dams, the concentrated source of nutrient (dung and urine) in the immediate area surrounding the dams, has been removed. Water samples collected, after a major rainfall event, at all major outfalls from the property show much less sediment load than in the Dawson River into which the land drains.

Total suspended solids in water samples collected at 7 major outfalls from 'Duke's Plain' following a particularly heavy rainfall event in 1998 were 140, 320, 621, 207, 252, 115 and 85 kg/ML compared with the Dawson River at Theodore with 716 kg/ML. The highest recording of 621 kg/ML was immediately below a newly constructed stock water dam. This same gully, about 1.5 km further along and after passing through a neighbour's paddock, had 877 kg/ML suspended solids.

Water-use efficiency has increased from around 22 stock days per hectare per 100 mm rain (SDH/100 mm) in 1995 to 40 SDH/100 mm in 1999.

Fire

Fire is now used as a 'tool' on 'Dukes Plain', rather than a 'habit' and much of the property has not been burned since 1977. Fire control is by strategic grazing in our fire-prone eucalypt country. There's a good chance that you can actually make some money by putting grass through a cow, but there's no money in smoke! So we need a very good reason to use fire.

Some of our scrub country that is carrying quite heavy stands of regrowth, previously controlled by fire, has not been burned since 1977 and the production has increased from 199 SDH in 1995 to 365 and 400 SDH in 1998 and 1999, respectively. This has been achieved in an environment in which the pasture and soil are improving. The only inputs have been fence and water infrastructure along with adequate rest for pasture.

Eucalypt country, which was previously burnt to reduce the fire hazard to the rest of the property, is now strategically grazed and yields have increased from around 50 SDH to 200–300 SDH per annum. Along with this increase in yield, there is a change in the pasture composition (see Table 2) with an increase in better perennials and a decline in undesirables such as barbwire grass (*Cymbopogon refractus*), blady grass (*Imperata cylindrica*) and reed grass (*Arundinella nepalinensis*).

This eucalypt woodland is fringing on a sandstone escarpment and has had no timber treatment since it was last logged by the local sawmill in the mid-1950s. It is predominantly spotted gum and narrow-leaf ironbark with an understorey of *Acacia* spp., *Crotolaria* spp. and grasses. The grasses had been driven to what I call fire grasses, which are useless for grazing but make a great fire. By removing the fire we have started a trend back to good grazing grasses and I might say this has been quite profitable if you look at the yield increase of 150–250 stock days per hectare and multiply that by 30 cents which is the value of a stock day. That's \$45–\$75 per hectare yield increase just by changing the grazing pattern and removing fire! (See GRASS-Check data site # 36 in Table 2.)

Carrying capacity

Carrying capacity for the whole property has increased from a maximum of 1200 AE (adult equivalents) in 1995 to 2500 AE in 1999, and I predict that we will be able to comfortably carry 2000 AE on average year-in, year-out. This increase has come about due to a change of grazing management to Cell Grazing, which in turn has led to:

- better and more even utilisation;
- increased plant population;
- more productive, more palatable perennial grasses;
- fewer unpalatable grasses;
- better water supply and distribution;
- more effective use of rainfall;
- better ground cover; and
- adjusting stocking rate according to seasonal conditions sooner rather than later.

The grazing system and rest

The key here is adequate rest. By maintaining the grass in a condition where it is 'ready to grow' and then 'letting it grow', we have really seen the property come ahead in leaps and bounds. Now, what do I call 'ready to grow'? For me this is maintaining a minimum stubble height in a pasture and having sufficient leaf on the grass for it to grow from sunlight energy rather than from root reserves.

What about 'letting it grow'? For us this is minimum rest at the start of the growing season of 60 days. This is to allow for maximum root development and storage of energy in the root system. Adequate rest is important, particularly at this time. For the remainder of the year rest varies (40–120 days) depending on the rate of growth of the plants.

I quote here Alan Lauder from an article in the Queensland Country Life: "Soil under perennial grasses has a better structure and a greater ability to absorb and store rainfall". "This is where rest from continuous grazing for four to six weeks after rain is so important". "Rest of three to eight weeks after rain increases plant production by 50 to 80%".

Some other trivia from an unknown source: 100 kg of soil with 4–5% organic matter can store 200kg of water, while the same soil with 1.5–2% organic matter can store only 45 kg of water. So it is of the utmost importance that your grass is perennial and well rooted.

Animal management and labour

"I will not become a dairy farmer." I've lost count of how many times I've heard this. I, too, was guilty! Well time has softened my attitude and we have ended up Cell Grazing and have not looked back!

Stock handling has become a breeze; the most difficult thing was stopping doing what we had always done. Why has stock handling become easier? Simply because the stock see us more

often and it is generally a good experience for them. A bit like Pavlov's dogs. Humans mean fresh feed. Previously, when we had no grazing management and continuously grazed, humans meant a quick trip to the yard to be locked up for a day or two, with no grass and the occasional prod with an electric jigger! Stock tended to run off and not want to cooperate. Now, when stock hear us, they come up to see what we have for them. In labour requirements, we are able to manage more stock with fewer people and dogs. (See table of key performance indicators, LSU managed/FTE in Table 4.)

Trees

What a pleasure it is to have trees as an ally in the grazing system. After years of spending \$100 plus a hectare on regrowth control, to now have 12 years of nil expenditure on regrowth and to have experienced the increases in production that we have recorded is indeed a satisfying reward.

I sat down one day after doing some budgeting for timber treatment and said to myself: "What are the potential benefits of trees in the system?" This was the beginning of a major attitudinal shift that has brought us to where we are today with paddocks that have up to 40% tree cover (brigalow and softwood regrowth) and that are producing more than paddocks that have had the full Monty so to speak. That is, they have been stick raked, ploughed and re-pastured. Also, to have virgin eucalypt country that is producing more now than our best scrub was 5 years ago is a real hoot!

Table 3. Stocking days per hectare for two levels of tree density.

SYSTEM	1995	1996	1997	1998	1999
Fully cleared (nil canopy cover)	240	279	332	339	260
Strip cleared (approx 40% canopy)	214	243	421	383	405

All of this may seem a bit far fetched and contrary to 'good' science but the bottom line is that we are making a profit doing it and that's our business. So for now we can afford to ignore science. We are also seeing an improvement in our resource base and, as land managers, that's part of our duty of care.

The question we are asking now is: if we can have high production at 40% trees, how much higher can we go and at what point do the benefits of trees stop? With grazing charts for the past five and a half years and on-going monitoring we will be in a position to get the answers and know that they are based on reliable data!

Weeds

What has been our experience with weeds? There seems to be an endless wave of weeds taking over grazing/farming land in Australia. Our response to this has been similar to our response to timber regrowth. Treat them as an indicator and an ally.

Parthenium has a happy knack of going through an explosion immediately following drought. What an opportunity all that bare ground provides for it to get established. I have seen many properties where a boundary fence can see a change from a parthenium-dominated paddock to a well-pastured paddock. Is it the wire that does this?

We can use weeds as an ally to colonise bare ground and to help change the nature of the soil to make it more suitable for growing grasses. We have done this very successfully on old cultivation country with various strongly taprooted weeds (*e.g. Sida*). With nothing more than regular grazing and rest we have gone from farming to a perennial grass pasture in 3 years. (See GRASS-Check data from site # 28 in Table 2). The weeds not only provide much needed organic matter for the soil but the taproots help to break up the hard pan. This 'experiment' has been performed successfully on over 800 ha of cropping ground at 'Duke's Plain'.

Benchmarking and the business

Now it's all very well to have a profitable pasture, happy stock, better soils and no weed problem, but we must also have a profitable business so that we can enjoy this love of the land and the lifestyle we choose. We now have 6 years of benchmarking behind our business, and it's telling us we are headed in the right direction, so our change for the better in the landscape is also mirrored by better business performance.

Table 4. *ProfitProbe*TM data on key performance indicators over 5 years on 'Dukes Plain'.

Key performance indicator	94/95	95/96 ⁴	96/97	97/98	98/99
Beef produced (kg/ha)	54.5	37.1	57.3	89.5	137.3
Cost of beef produced (\$/kg)	0.56	1.02	0.73	0.49	0.45
Gross margin (\$/ha)	34.90	-5.10	46.70	52.60	101.30
Price received (\$/kg)	1.13	0.80	0.88	0.89	1.03
Gross product/labour unit (\$'000)	103	37	108	92	253
LSU ¹ managed/labour unit	508	388	791	790	1389
ROAM ² (%)	4.1	-2.8	2.6	3.4	10.7
SDH ³ /100 mm	23	11	23	33	38
Ecological Health Index	100	100	100	100	100
Ecological Trend Index	3.5	9	9	9	9

¹ Livestock units.

² Return on assets managed.

³ Stock days per hectare.

⁴ Destocking program implemented for a cattle tick eradication program.

Conclusion

By changing the attitudes of the people managing this land, we have been able to release a flood of new ideas and have effectively been able to reverse the trends of decline in the resource base, which has led to us truly having pastures for production and protection. This has occurred hand-in-hand with an improvement in business performance.

By putting our focus on the soil and not the cow we have been able to start a change for the better. By continuing to tap into off-farm expertise and ideas we will continue to position ourselves at the cutting edge of best practice in land and business management.

In conclusion I ask: "Are you prepared to make the personal and attitudinal changes that will allow you to: challenge old conventional wisdom that no longer works; have a truly sustainable resource base; go to the cause and not just treat the symptoms; and have a more profitable business?"

References

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