Is rehabilitation profitable?

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Abstract

Have you ever sat and watched what cattle eat in about half an hour? Have you counted the number of species of plants they prefer to eat? To be productive, cattle should have a variety of nutritious and palatable pasture. To have that variety of plants, pastures have to be receptive to the moisture and nutrients to convert CO2 into the energy required to grow and produce enough seed and leaf matter. Bare soil is vulnerable to bombardment by raindrops (when it does rain) and the soil is pulverised into smaller particles which in turn seal the soil surface, causing more water to run off down the creek instead of soaking into the soil profile. Hardset soils affect seedling emergence and if we can ensure there are plants or plant residues like butts of the perennial pasture species, then we are helping to slow the evaporation rate from the soil and increase the seedling's chance of establishment. Picture a particular piece of country and what it looked like 20 – 30 – 40 years ago – has it changed? What is different? If there are gullies there, were they as big as they are now? Think of all the grass that may have been there that may not be now. How many cattle would that have fed? There are always arguments for and against rehabilitating soil that has started to shift with the wind or water or scalded country

Introduction

Good pasture contains productive, palatable, and perennial pasture species, and without these species, pasture could be in a state of decline. Plants respond to the available water in the soil, determined by rainfall, evapotranspiration and the water holding capacity of the soil within the root zone. The more rapidly water can infiltrate a soil profile the less flows into creek lines and is lost from the productive pastoral areas (Wilkie 1999).

Degradation consumes marginal country because the sweeter country is over-utilised. Has your country changed since your family took it up? What is different? If there are gullies, are they wider or deeper? Think of all the grass that may have been there that may not be now. How many cattle would that have fed? Other than not being able to feed your livestock, consider also the other flora and fauna helping keep your pasture in good condition. What happens to them, and where do they go? Degradation reduces the capacity of rangeland resources to produce goods and services of value to society and should be assessed in terms of lost capacity to produce livestock and their products in the longer term (MacLeod and Johnston 1990).

Situation

MacLeod and Johnston (1990) say the benefits and costs of a rangeland restoration investment should include (amongst other things), the specific cost of a restoration treatment, including subsequent restoration of treatment and maintenance and improvements in profitability of the existing activity relative to that in the base period.

My family bought Mt Riddock Station in December 1986 with over 10,000 head of cattle and nearing the end of the Brucellosis and Tuberculosis Eradication Program. Table Hill Paddock (131 km^2) was the receiving paddock for the 'tested clean' cattle before being redrafted to tested 'clean' areas.

The paddock consists of open woodland on weathered and eroded fine-textured calcareous soil with low limestone plateaux. Vegetation is typical of many calcareous areas in central Australia and consists of trees, shrubs and pasture species such as: *Acacia georginae*, *A. aneura*, *A. kempeana*, *Senna artemisioides* var. *filifolia*, *Atalaya hemiglauca*, *Eragrostis* spp., *Astrebla pectinata*, *Bothriochloa ewartiana*, *Eulalia fulva*, *Digitaria brownii* and *D coenicola.*

Characteristic of many Centralian calcareous areas, the impact of overgrazing had degraded the pastures in Table Hill Paddock. Measurements of pasture yield of the Range Condition Assessment (RCA) Site 407 in June 1988 showed a decline of the palatable perennial Umbrella grass (Digitaria coenicola) from 40% of the pasture bulk in 1981 to 0% in 1988 (Bastin et al 1989). Other palatable perennial species declined by 21% in total with an

increase by 65% of the less than palatable forb species in the same period. A combination of mediocre to poor seasons, overstocking, loss of perennial grasses, and high rabbit numbers contributed to the downward trend in pasture yield. Less desirable pasture species such as *Aristida contorta*, *Sclerolaena* spp., and *Sida* spp., which do not meet the nutritional requirements for cattle, were increasing.

The paddock was destocked in March 1989 and preliminary areas pitted and sown with non-native perennial grasses. Some rabbit warrens were ripped in an attempt to give it a chance to regenerate. In October-November of 1990, a concerted effort began with two men employed to rip rabbit warrens and pit the scalded areas of the paddock, broadcasting buffel seed as they went.

Budget breakdown

An appraisal of the expenditure and returns of rehabilitating Table Hill paddock show the first year (1990) included the following expenses (Table 1) – after destocking the paddock in 1989 and excluding the 1989 costs:

Table 1: Expense items for the rehabilitation of Table Hill Paddock, Mt. Riddock Station N.T. (PLEASE NOTE: values presented are in 1990 dollars and are from Mt Riddock Station records)

ITEM	COST
Opposed Disc Plough with seeder box	$5,530
Seeder unit to be placed on top of D6 rippers	$2,495
20,000 gallon Squatter's Tank	$5,000
7 kilometres of polythene pipe @ $1000/km	$7,000
20 km's new fencing @ $1,000/km	$20,000
1800 kg's Buffel seed @ $5/kg (harvested on property)	$9,000
1 water trough for the cattle	$2,000
D6 dozer for 30 days @$75/hr x 8 hrs (240 hrs)	$18,000
Fordson wheel-tractor for 30 days @ $50/hr x 8 hrs (240 hrs)	$12,000
1 week's labour for 3 people to erect tank, trough & lay pipe	$1050
Construct 35 ponding banks (0.5 hrs each)with Grader @$60/hr	$1080
Construct 100 ponding banks w/D6 Dozer (av. 2.5 hrs/bank) @ $300/bank	$30,000
Total	$113,155.00

Around 100 km^2 of the paddock were treated by either ripping warrens, pitting or ponding, with ponding banks constructed on the worst affected areas. Costs averaged approximately \$1131/km^2. The paddock remained unstocked with no other rehabilitative work carried out. In 1992, a savage hailstorm damaged the vegetation and floodwaters breached many ponding banks, scouring the topsoil and cost \$3000 to patch the damage.

The paddock remained unstocked until the introduction of 600 cows in 1996. The yearly mustering costs of \$12/head including helicopter hire totalled \$7,800/year (Table 2). The calculated returns from these cows included an 80% calving rate and \$300/calf yield (Table 2). The Net Present Value of this project is estimated at \$1.2 m as at 2010 (Table 3).

This project showed the initial 1990/91 cash outlay is fully paid between six and seven years, after the first muster (Table 3). Calculations for the Internal Rate of Return showed the returns on the project were relatively high; between 30% and 31% but did not take into account the average nominal financing charge on credit nor subtract the inflation rate, so in reality the internal rate of return would probably be around 4% or 5%; better than bank interest.

Table 2: Payback Period Payback Period for rehabilitation and Benefit:Cost Ratio of Rehabilitation of Table Hill Paddock, Mt. Riddock Station N.T. (PLEASE NOTE: values presented are in 1990 dollars

Year	Receipts	Disc factor (i=0. 03)	Present Value	Expenses	Discount factor (i=0. 03)	Present Value	Net cash	Discount factor (i=0.03)	Present Value	Cumu-lative Present Value
	$			$			$		$	$
1990	0	1	0	113,155	1	113,155	113,155	1	113,155	-113,155
1991	0	0.9709	0	0	0.9709	0	0	0.9709	0	-113,155
1992	0	0.9426	0	3,000	0.9426	2,828	3,000	0.9426	2,828	-110,327
1993	0	0.9151	0	0	0.9151	0	0	0.9151	0	-110,327
1994	0	0.8885	0	0	0.8885	0	0	0.8885	0	-110,327
1995	0	0.8626	0	0	0.8626	0	0	0.8626	0	-110,327
1996	144,000	0.8375	120600	7,800	0.8375	6,533	151,800	0.8375	127,133	16,806
1997	144,000	0.8131	117086	7,800	0.8131	6,342	151,800	0.8131	123,429	140,234
1998	144,000	0.7894	113674	7,800	0.7894	6,157	151,800	0.7894	119,831	260,065
1999	144,000	0.7664	110362	7,800	0.7664	5,978	151,800	0.7664	116,340	376,405
2000	144,000	0.7441	107150	7,800	0.7441	5,804	161,800	0.7441	120,395	496,800
2001	144,000	0.7224	104026	7,800	0.7224	5,635	151,800	0.7224	109,660	606,460
2002	144,000	0.7014	101002	7,800	0.7014	5,471	151,800	0.7014	106,473	712,933
2003	144,000	0.681	98064	7,800	0.681	5,312	151,800	0.681	103,376	816,309
2004	144,000	0.611	87984	7,800	0.611	4,766	151,800	0.611	92,750	909,058
2005	144,000	0.6419	92434	7,800	0.6419	5,007	151,800	0.6419	97,440	1,006,499
2006	144,000	0.6232	89741	7,800	0.6232	4,861	151,800	0.6232	94,602	1,101,101
2007	144,000	0.605	87120	7,800	0.605	4,719	151,800	0.605	91,839	1,192,940
2008	144,000	0.5874	84586	7,800	0.5874	4,582	151,800	0.5874	89,167	1,282,107
2009	144,000	0.5703	82123	7,800	0.5703	4,448	151,800	0.5703	86,572	1,368,678
2010	144,000	0.5537	79733	7,800	0.5537	4,319	151,800	0.5537	84,052	1,452,730
	TOTAL RECEIPTS =		1475683	TOTAL EXPENSES =		203,358	payback period was between 6 & 7 years			
	Benefit : Cost Ratio = 7.26: 1						(i.e. after 1st muster)			

Table 3: Present Value of Rehabilitation of Table Hill Paddock, Mt. Riddock Station N.T. (PLEASE NOTE: values presented are in 1990 dollars)

Year	Receipts	Expenses	Net cash flow	Discount factor (i=0. 03)	Present value $aus
1990	0	113,155	-113,155	1.0000	-$113,155
1991	0	0	0	0.9709	$0
1992	0	3,000	-3,000	0.9426	-$2,828
1993	0	0	0	0.9151	$0
1994	0	0	0	0.8885	$0
1995	0	0	0	0.8626	$0
1996	144000	7,800	136,200	0.8375	$114,068
1997	144000	7,800	136,200	0.8131	$110,744
1998	144000	7,800	136,200	0.7894	$107,516
1999	144000	7,800	136,200	0.7664	$104,384
2000	144000	7,800	126,200	0.7441	$93,905
2001	144000	7,800	136,200	0.7224	$98,391
2002	144000	7,800	136,200	0.7014	$95,531
2003	144000	7,800	136,200	0.6810	$92,752
2004	144000	7,800	136,200	0.6110	$83,218
2005	144000	7,800	136,200	0.6419	$87,427
2006	144000	7,800	136,200	0.5950	$81,033
2007	144000	7,800	136,200	0.5702	$77,659
2008	144000	7,800	136,200	0.5454	$74,285
2009	144000	7,800	136,200	0.5206	$70,912
2010	144000	7,800	136,200	0.4959	$67,538
Net present value =					$1,243,380

Justification

Consider also the ecological as well as monetary cost of rehabilitating degraded land that ultimately affects the bottom line of a pastoral business. Rangeland degradation frequently involves irreversibilities such as soil loss, loss of species – at least locally – and, in some extreme cases, loss of complete ecosystems (Macleod & Johnston 1990). Soil macropores are also formed by ants, termites and other types of soil fauna, the presence of which are

directly related to increased plant cover, organic matter and soil moisture levels (Wilkie 1999). If there is no vegetation, there are no ants, termites or other types of soil fauna and hence no macropores for water to filter down into the soil.

Sugars and Dance (2003) noted in Table Hill 77% of the pasture behind the ponding banks were perennial species (32% buffel grass and 35% other perennial species) with similar results found on other properties in the district.

Wilkie (1999) found areas treated with ponding banks had a higher average initial infiltration rate, steady state flows, and total infiltration after 10 minutes than unponded soils. Slowing and concentrating rainfall runoff with ponding banks, allows greater infiltration into the soil profile, increased soil moisture levels, improved conditions for plant growth and ultimately an increase in the pastoral productivity of the ponded area (Wilkie 1999).

Critical to the success of rehabilitation works is the exclusion of cattle from the treated area until the banks have stabilised and pasture has re-established. Costs increase when have to continually repair your banks because livestock have a lovely time in fresh dirt.

There are very few practical methodologies for arresting soil loss; however, in this instance, the ponding method has proven superior. Pitting does not create a big enough water reservoir, and the furrow quickly silts over. Ford (1992) found the lower initial costs of other types of treatments allowed for lower returns in terms of increased pasture growth and carrying capacity than those involving ponding banks. Friedel, Cann, and Wauchope (1994) discovered the return for the best pitted site with bought seed was 19% for good quality steers (10% for average) having an initial 400 kg liveweight at the beginning of an average year. Supplying your own seed, the annual return was 26% for good quality steers and 13% for average stock.

Managing the downside of rehabilitation

Secondary effects of any rehabilitation project include the added impact on the remainder of the property due to increased stock numbers in other paddocks. Kangaroo numbers may increase in the closed paddock because of less interruptions and competition for feed.

Unidentifiable and unforseen events such as little or no rain, temperature extremes, bushfires and prolonged drought, are just a few of the intangibles hovering over a rehabilitation project, affecting its rate of success. A rehabilitation project can cause the pastoralist concern, because rehabilitation is believed to be an unprofitable business decision. However, failure to rehabilitate is also unprofitable for both your business and for the ecosystem.

- Rainfall builds soil moisture
- Soil moisture and temperature drive pasture growth
- Pasture growth is the basis for animal productivity (MLA)

Conclusion

Mt Riddock Station faced a dilemma in 1989. Table Hill Paddock was one of the most productive paddocks, but they really could not afford to spend the money required to rehabilitate having only recently purchased the property. Do we shut it up and forget about it or do we 'bite the bullet' and rehabilitate the whole paddock? The decision was to rehabilitate. The initial outlay of $113 k was a substantial amount of money at the time.

The analysis of costs and returns of the rehabilitation project were for a 20-year period, with the belief that there would not be a positive return on the money during that period. The benefit to cost ratio came in at over $7 for each $1 outlaid. The payback period was six to seven years, but only one year after reintroduction of cattle to the paddock. The Net Present Value of this project estimated as at 2010 is $1.2 m making the initial $113 k a very good investment indeed. The same outlay into real estate may gross around $692 k at the end of the 20-year period.

If your country is allowing most of your rainfall to go down the creek, then your business may be heading in the same direction. So, do not feel ashamed about asking those first questions – where do I start, what will others think of me, and how will I be able to cope with the financial burden of a project such as this? Talk to the individuals who have seen the benefits of pasture rehabilitation – they are willing to help you, because without soil, we do not have pasture, livestock, jobs, lifestyle.

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