Rangel. J. 20(1) 1998, 104-18

LEARNING FROM HISTORY TO SURVIVE IN THE FUTURE: MANAGEMENT EVOLUTION ON TRAFALGAR STATION, NORTH-EAST QUEENSLAND

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Abstract

Managing rangeland enterprises requires balancing socio-economic goals within a production environment characterised by ecological complexity and large climatic variability. Trafalgar Station in north-east Queensland, has been trying to maintain this balance over a period of 80 years and three generations of the one family. This paper explores how management on Trafalgar Station has gone through four evolutionary phases and examines the advantages and disadvantages of each of these stages of development. The first 50 years of management was a technologically constrained era of low stock numbers and poor productivity but there were few resource management problems. Next followed a 20 year period of production maximisation which was made possible by improved cattle genetics and nutritional technologies. With drought feeding occurring more frequently and loss of perennial grasses and soil becoming more evident, there came the realisation that this high stocking strategy was unsustainable. The management of Trafalgar then embarked on a new philosophy based on conservative stocking (similar to historical levels) and increased emphasis on herd, pasture and financial management. This new management philosophy required a transitional phase where stock numbers, and income, were very low to allow pasture condition to improve. Current herd management focuses on maintaining quality rather than quantity, strategic use of supplements for production, and developing a diverse range of markets for sale cattle. Conservative stock numbers have increased opportunities in pasture management with 15 to 20% of the property now annually rested from grazing. Fire has been reintroduced to restrict "thickening" of native woody plants and to control exotic woody weeds. Together with long-term financial planning, these improvements in management are reducing economic risk. The perceived benefits of the current management philosophy are supported by simulation modelling studies of pasture and animal production and analyses of property economics.

Introduction

It is difficult to successfully manage rangeland grazing enterprises because of the need to balance economic and social goals with a production environment that is both ecologically complex and highly variable. Adding to this complexity are the often slow feedback effects of management practices on the soil and vegetation resource and the time it takes for a change in this resource condition to be reflected in property economics.

Of all the management decisions made by pastoralists, getting the balance right between stock numbers and the forage resource is one of the most challenging, both from a production and resource impact viewpoint. Why is it so apparently difficult to determine a proper rate of stocking? First, because of the close link between animal numbers and short-term economics, financial demands can lead to an increase in animal numbers that creates an imbalance between forage supply and demand. Second, because of highly variable rainfall in rangelands, the forage resource on which these animals depend fluctuates greatly from year to year. This second problem may not seem as important in the tropical rangelands of north-eastern Australia because they are relatively mesic, and as such are often viewed as being more benign, less variable and therefore easier to manage than more arid areas. However, rainfall variability in this region is just as high as in other rangeland environments and managers face the same difficulties in managing the forage resource even though mean forage production is relatively high.

Managers of grazing enterprises in north-east Queensland are no different to pastoral managers in other rangeland regions in that most emphasis is placed on production and short-term economic performance with the vegetation and soil resource given a relatively low priority (the exception to this being invasion by exotic woody weeds which receives a high priority). Consequently, stocking rates usually err on the high side, and when this is coupled with generally unrealistic expectations of receiving good rain in the immediate future, overstocking is common practice. The result has been that large areas of north-eastern Australia have deteriorated in condition and degradation is now widespread (Tothill and Gillies 1992). However, much of this damage has occurred relatively recently in pastoral history (Ash *et al.* 1997) and it is believed that it can be reversed through improved grazing management (Tothill and Gillies 1992). In this paper we explore how such management changes have been achieved on one property, Trafalgar Station, in the Dalrymple Shire. Management of Trafalgar was initially characterised by low stock numbers because of technological constraints (e.g. poorly adapted British breeds, mineral deficiencies, few watering points)[1] once these constraints were removed, unsustainable profit maximisation was made possible. More recently, the management philosophy has been one of conservative grazing management with a more balanced approach to managing animals, vegetation and soil, in combination with well defined market goals, technological innovations, and input optimisation. We examine these different approaches to management, and the changes required in strategies, style and attitudes when there is a fundamental shift in property management philosophy.

The region

The Dalrymple Shire of north-eastern Queensland covers approximately 68,850 km^2, most of which lies within the catchment of the Burdekin River (Fig. 1). Open eucalypt woodlands with a grassy understorey dominate the region, though there are pockets of open grassland and non-eucalypt woodland. There are eight major geological landscapes (De Corte *et al.* 1991) giving rise to soils varying from sands to duplex soils, massive earths and cracking clays, most of which are low in nitrogen and phosphorus. The climate is semi-arid tropical with most areas having average annual rainfall from 500 to 700 mm (CV 38-48%), 80% of which falls between December and April.

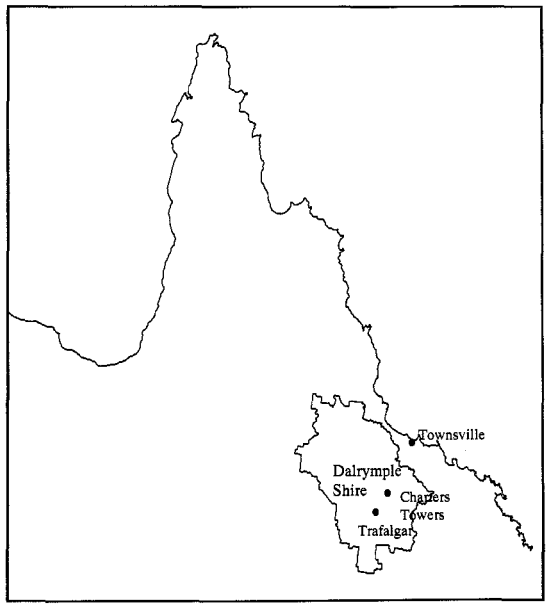

Fig. 1. Map showing location of Dalrymple Shire and Trafalgar Station in northern Queensland.

[1] This paper was originally intended for publication in the Special Issue on Grazing Management (Vol. 18, No 2, 1996). Readers may wish to refer to other papers in that issue.

Trafalgar Station

Trafalgar is a 32,000 ha pastoral property located 60 km south-west of Charters Towers (Fig. 1). The soils are mainly phosphate deficient yellow earths, though there are more fertile and productive alluvial soils flanking three large creeks which run through the property. Brown cracking clays, which have a higher phosphorus content, make up about 25% of the property. These clay soils support blackwood (*Acacia argyrodendron*) and gidgee (*Acacia cambagei*) scrub while the remainder of the land is mainly open eucalypt country with predominantly box (*Eucalyptus brownii*), ironbark (*Eucalyptus xanthoclada*), bloodwood (*Corymbia erythrophloia*), silver leaf ironbark (*Eucalyptus melanophloia*), wattle (*Acacia* spp.) and quinine (*Petalostigma pubescens*).

The understorey is dominated by perennial tussock grasses with *Bothriochloa* spp., *Dichanthium* spp., *Heteropogon contortus* and *Themeda triandra* being the main species. A wide range of summer annual grasses, forbs and native legumes make up the remainder of the herbaceous layer.

There are a number of natural waterholes scattered around the property, with one natural hole in each of the major creeks. These waterholes can be used by cattle for drinking for about nine months in an average year before they dry up. Average annual rainfall is 642 mm, with high year to year variation (Fig. 2).

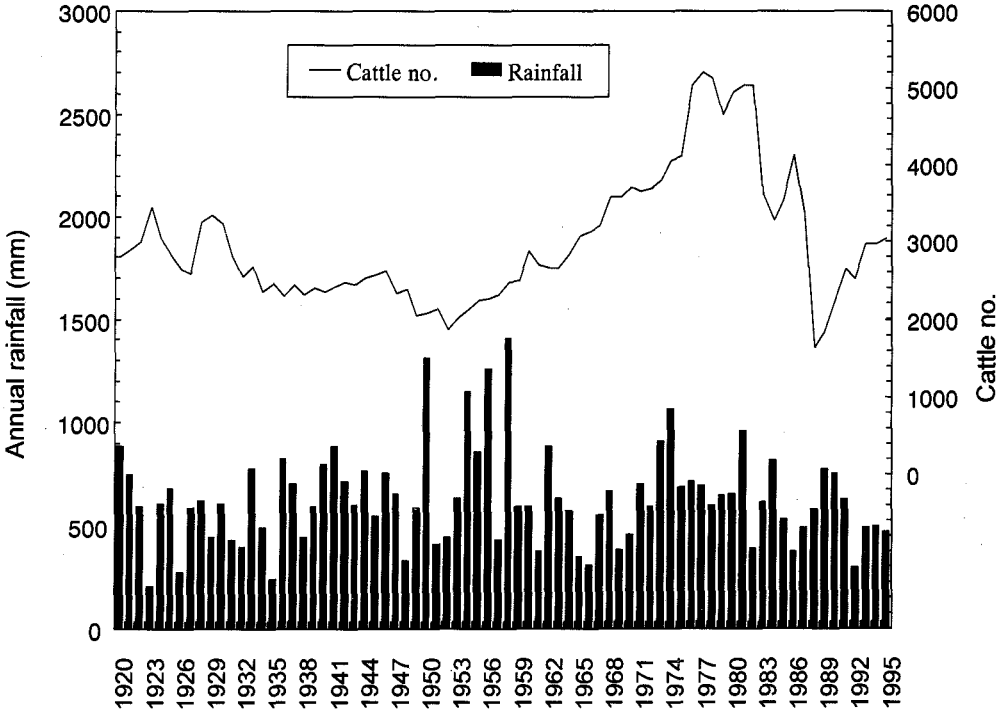

Fig. 2. Annual rainfall (mm) and stock numbers at Trafalgar from 1920 until 1996.

History of settlement in the region: 1840-1910

The pastoral potential of the rangelands of north-eastern Australia was first recorded by Leichhardt (1847) in his account of his expedition from Moreton Bay to Port Essington (Darwin) in 1844-45. His journey took him up the Burdekin River where he commented, "Our route lay through a fine well grassed country; the grass being very dense. After establishing our camp, and making the necessary preparations, we killed one of our little steers, and found

it in excellent condition. The graziers will judge by this simple fact, how well the country is adapted for pastoral pursuits."

With better lands still available closer to major settlements, pastoral expansion into the region did not occur until 1852 when two 'runs' were marked out in the Burdekin catchment. However, they were not taken up as the land was deemed by the Queensland Government not to be available for selection. It was not until further favourable reports by George Elphinstone Dalrymple (Bolton 1960) in 1860 ("undoubtedly capable of becoming one of the finest and largest pastoral and agricultural regions of Australia") that the Queensland Government was encouraged enough to open up the Burdekin district for settlement. The Land Act of 1860 provided that 14 year leases would be granted only to those run-holders who stocked their country within a year of taking out a grazing licence. Settlement of the region was then rapid and by 1863 all of the Burdekin district had been taken up. Expansion towards the west was slower and still taking place well into the 1870s.

Initial stocking of runs was with sheep, but cattle quickly became the favoured animal as sheep were unproductive in the tropical environment and required considerably more labour than cattle. Cattle numbers increased quickly and reached a peak in 1894. The arrival of ticks and tick fever greatly reduced cattle populations in the following few years with numbers falling to a low level in the drought of 1902, when only 109 mm of rain were recorded at Charters Towers. While cattle numbers increased again in the 50 years following the 1902 drought, they never reached the levels of 1894, with ticks in wet years and lack of water and feed in dry years combining to keep the cattle population in check, despite steady improvements in property infrastructure and herd husbandry.

History of settlement and development on Trafalgar Station: 1910-1960

Trafalgar was purchased by the Landsberg family in 1913, fully stocked with 3000 cattle and 300 horses for £10,000, £5000 of which was borrowed. By selling off the horses to the Indian remount market and the majority of male cattle, the property entered the drought of 1915 unencumbered. This was fortunate, as at the end of 1915 there were only 300 breeders surviving.

At the time of purchase there was only one 'man-made' water facility, and one divisional fence, which virtually halved the property. One set of dip yards, centrally positioned, serviced the husbandry requirements of the cattle herd.

Recurrent deaths among the herd during the next 10 years caused concern, and the cause was finally identified as botulism. Cattle grazing phosphorus deficient soils attempted to satisfy their craving for phosphorus by 'bone chewing', and in so doing consumed the botulism spores that caused their death. Advice to supplement the herd with bone flour licks and burn all carcass material, was accepted and religiously adhered to until better supplementation technology, together with vaccination, became available in the mid to late 1960s.

The supplementation program adopted at Trafalgar and other properties in the mid-1920s was effective, and although mortalities still occurred, they had been reduced. During the 1950s, deaths on many properties in the district increased markedly; some herds suffered 25% losses annually. Botulism was also responsible for these mortalities and they were only brought under control with the release of the C & D bivalent vaccine. This vaccine is still used on an annual basis today with excellent results.

The Trafalgar herd was Shorthorn and Shorthorn/Red Poll cross until 1928, when it was replaced with 800 Hereford breeders. During the early days the numbers fluctuated widely, due to drought and botulism mortalities. Drought conditions in 1919,1923,1926,1935,1948 and 1951 were responsible for up to 20% of breeders dying, and more importantly, as much as

80% reduction in brandings the following year. The build up in stock numbers in good years and losses in dry years resulted in herd numbers fluctuating around 3000 head.

Improvements from 1915 to 1946, consisted of four wells and seven dams supplementing the natural waterholes and the creek sand soaks. In 1950, management of the property transferred from one generation to the next and this resulted in a development program consisting of improvements in the cattle herd, water and stock facilities and pastures.

History of development on Trafalgar Station: 1960-1995

The majority of the water and yard facilities, were completed in the 1960s, while fencing and pasture improvements were pursued in the 1970s and 1980s.

The biggest change during this period was the shift from British breeds of cattle to Brahman animals. Brahmans were first introduced at Trafalgar in 1958 and by the mid-1960s were the dominant bloodline. Coinciding with this revolution in cattle genetics was the introduction of urea supplementation, which resulted in tremendous effects on breeder performance and herd turn-off.

The beef industry price slump in the 1970s saw a major rise in the cattle populations as producers preferred to hang on to cattle rather than sell them at a loss. At Trafalgar, cattle numbers rose to over 5000 head (Fig. 2), while the numbers in the Dalrymple Shire increased from 300,000 to over 600,000 head.

The early 1970s enjoyed good rainfall and productive pastures, but as the seasons became drier in the late 1970s, feeding technology, hardy Brahman cattle and more intensive management saw the high numbers maintained. The ramifications of this increased grazing pressure only became apparent in the mid to late 1980s when land degradation was being recognised as an issue of both regional and national importance (Gardener *et al.* 1990).

Prior to Brahmans and supplementation, many cattle died during drought, thereby relieving the grazing pressure on pastures. This allowed native perennial grasses to remain dominant. In those days of good grass cover, fires were common and provided three benefits: green 'pick' enabling selection of a diet high in nutritive value; control of exotic and native woody weeds and eucalypt regrowth; maintenance of pasture condition with a good mix of perennial tussock grasses. The result was that open eucalypt forests were not overgrown with suckers and weeds, and erosion was minimal.

By keeping cattle on the land during drought, particularly during the 1980s, the grazing lands of northern Queensland deteriorated, and in some areas severe degradation is now evident (De Corte *et al.* 1991, Tothill and Gillies 1992). Exotic woody weeds are increasing, as are native shrubs and eucalypts, tussock perennial grasses are declining, soil erosion is increasing, and inappropriate tree clearing practices are leading to potential salinity problems.

As well as degradation, the previously unencountered problem of how to manage a large cattle herd in the face of critical feed shortages has posed new challenges for producers. At Trafalgar, this problem arose on three occasions (1978-79, 1982-83, and 1987-88) in a decade of generally low rainfall. On each of these three occasions a different 'drought' strategy was employed, and each time the strategy was reactive, never planned.

The three drought strategies used on Trafalgar were:

- Agistment (1978) - This exercise had problems with supervision away from home and high percentage losses ('lost' cattle).

• Sale (1983) - All adult breeders were sold direct to slaughter and 900 calves fed in the homestead yards. The exercise was successful, as these young stock went ahead after the April-May rains, for an outlay of about $17 per head.

• Feeding (1987) - The initial feeding program began in early June, and numbers of cattle were added as the months progressed, until by the end of the year all cattle were included. The program finished when relief rains came in January 1988, and at this time about $75 per head had been invested. However, with no follow up rain, lack of pasture yield resulted in a forced sale of 60% of the herd, leaving about 1600 head. The exercise must be deemed a failure for two reasons: (a) the investment became a loss, and (b) further land degradation occurred.

Towards a new management philosophy

New goal developed

After greatly reducing cattle numbers in early 1988, a decision was made to assess the viability of Trafalgar Station given the difficulties and stresses experienced in the previous 10 years in trying to manage a herd of 4000 to 5000 cattle. The property was also showing signs of being 'stressed' as by 1988 there was little ground cover and woody weeds were increasing. Just waiting for those 'good seasons' to return in the hope that nature would repair things was not a realistic option.

With this in mind a goal was set for the property:

"To live as comfortably as possible, provide an education for our children and a comfortable retirement for my parents" (Roger Landsberg).

To achieve this goal, productivity improvement was essential but it was realised the style of management that had been used was not going to achieve the level of economic and ecological integrity being sought. Other pastoralists, both in this region (Mann 1993) and in other regions (Purvis 1986), have similarly recognised the need for long-term planning and goal setting that takes into account both economic imperatives and a need to nurture the land to maintain ecological sustainability.

Before embarking on a plan to achieve this goal, immediate decisions were needed on stocking management, given that the property carried only 1600 head in 1988. The first strategic decision was to maintain low stock numbers to allow pastures to regenerate. A new target 'safe' carrying capacity of 3000 head was decided upon (this was about the same number carried between 1920 and 1960) but rather than restock immediately it was decided to rebuild numbers slowly to allow perennial grasses to recover and set seed.

Using simulation modelling to assess grazing management changes

One of the difficulties in making management changes based on experience accumulated over decades is that memory of events, and their perceived cause and effect, can often alter through time. Good record keeping and monitoring can help overcome some of the problems of properly attributing cause and effect. Unfortunately, monitoring of land condition and relating this to management practices has received little emphasis in rangeland management in northern Australia until recently.

However, simulation modelling of pasture and animal production can allow reconstruction of the past if good climate and stock records are available. Trafalgar Station has a good history of record keeping; daily rainfall has been measured since 1910 (it is a Bureau of Meteorology rainfall station) and accurate stock records have been kept since 1920.

The forage production model GRASP (McKeon *et al.* 1990) was used to simulate changes in pasture production, level of utilisation (grazing pressure), basal area of perennial grasses and perennial grass percentage over the period 1920 to 1996. In open eucalypt woodlands, where perennial grasses are the dominant herbaceous component, pasture productivity and basal area of perennial grasses reflect the influence of both climate and grazing management. In contrast, maintenance of perennial grass composition is largely management driven i.e. in the absence of grazing, perennial grasses will constitute about 90% of the pasture yield largely independent of annual variation in rainfall. For the simulation of Trafalgar Station, stock numbers were converted to stocking rates, which were changed on June 1 each year in line with changes in station stock records. The herd was gradually altered from British breeds to Brahmans over a 10 year period in the 1960s. Brahmans are more efficient at foraging and this has been incorporated into the model. Results of these simulations are shown in Figs 3 and 4.

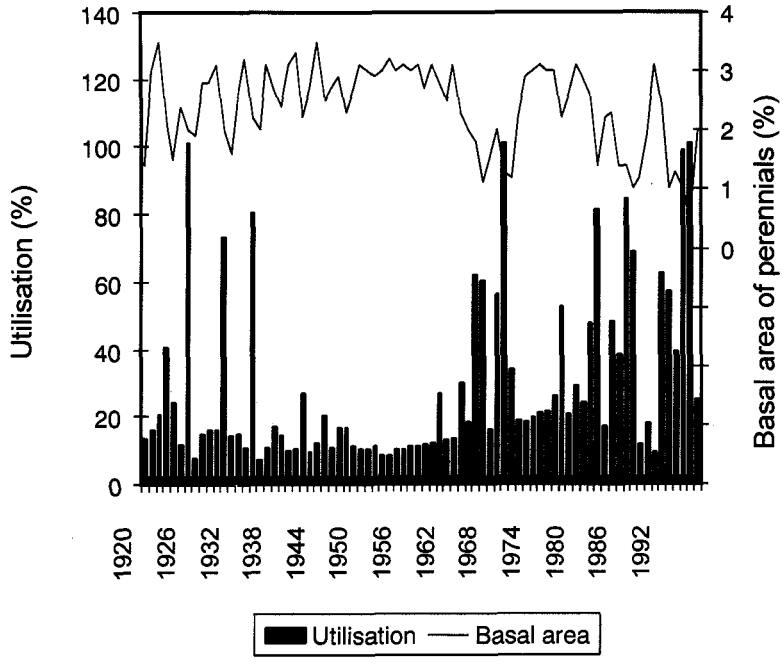

Fig. 3. Simulated utilisation rate and basal area of perennial grasses on Trafalgar Station using the forage production model GRASP model with station records of rainfall and stocking rates for the period 1920-1996.

Figure 3 shows that until the 1960s utilisation rates were, on average, less than 20%; though during isolated drier than average years in the late 1920s and 1930s they exceeded 40%. However, with increasing cattle numbers in the 1960s utilisation rates increased markedly, particularly in the late 1960s and most of the 1980s when rainfall was below average. The increase in utilisation rate at these times was mirrored by a decrease in basal area of perennial grasses. While basal area showed large inter-annual variation prior to the 1960s there was always a rapid recovery after drought i.e. climate variability alone can cause large natural fluctuations in grass basal area but these natural fluctuations can be perturbed by high grazing pressures. During the 1960s and early to mid 1980s, the simulation results suggest that high grazing pressures did not allow a rapid recovery in basal area. Indeed the grazing pressures exerted from the late 1970s to the mid 1980s were sufficient to cause a significant loss of perennial grasses, as shown in Fig. 4. The change in management philosophy in 1987/88, with the resultant large reduction in stock numbers, significantly reduced grazing pressure. The

combination of reduced grazing pressure and good seasons in the following three years allowed perennial grass basal area and composition to fully recover in the simulation and this result is supported by observations at the time.

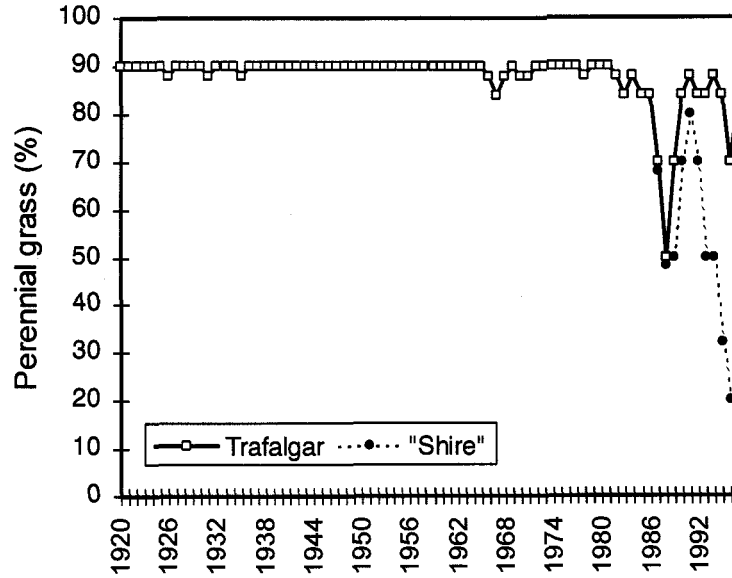

Fig. 4. Simulated change in perennial grass percentage on Trafalgar Station using the forage production model GRASP using actual stocking rates (1920 to 1996) and simulated "Shire" stocking rates for the period 1985 to 1996. For "Shire" stocking rates the Trafalgar figure for 1985 was adjusted each year according to relative changes in stocking rate in Dalrymple Shire using Australian Bureau of Statistics records.

The wisdom of the decision not to rebuild herd numbers quickly following the 1987/88 drought is now evident when one looks around the Dalrymple Shire. While good seasons in 1989 and 1990 allowed pastures to recover well on Trafalgar given the low stock numbers, many properties in the district retained relatively high stock numbers. Although pastures seemed to 'bounce back' on these properties, this was only in terms of short-term production, and not botanical composition. With the sequence of the driest years since European settlement experienced in the first half of the 1990s many properties have apparently lost a significant proportion of their perennial tussock grasses and with it potential pasture productivity, even if good seasons return. This extended drought from 1992 to 1996 also affected Trafalgar Station and while total standing dry matter and perennial grass percentage also declined, a good wet season in 1996/97 allowed pastures to significantly recover. These observations are supported by simulations of perennial grass composition (Fig. 4) using actual stock numbers at Trafalgar compared with a simulated 'Shire' strategy of maintaining a relatively high herd number during and following the 1987/88 drought event. The simulated 'Shire' stock numbers were derived by applying percentage changes in the Australian Bureau of Statistics cattle numbers for Dalrymple Shire to the Trafalgar herd from 1985 until 1997. The simulations indicate that Trafalgar Station would have been in considerable trouble, in terms of the pasture resource, if the 'high' stock strategy had been maintained through the late 1980s and 1990s. These simulation results provide some further justification for the change in grazing management philosophy in 1988.

The new sustainable management plan

Careful budgeting, planning and expenditure enabled the enterprise to compensate for the reduced income during the 'transition' phase of low stock numbers in the period 1988 to 1990. The next step in developing the new management plan was to re-assess the property resources, including infrastructure such as water facilities, equipment and fences, pasture resources and the cattle herd. A detailed cash flow analysis of previous years revealed serious deficiencies in budgeting, mainly because budgets were prepared for 12 month periods, and assumed provision of average rainfall and cattle prices based on normal CPI predictions. It was recognised then that a critical component of any new management plan would have to entail better financial planning and management.

In formulating a new management plan three key elements were therefore recognised and each element is integral to the success of the others:

- Cattle management
- Pasture management
- Financial management

Cattle management

The key aim of the cattle management program was to increase the productivity of the herd and to improve the profitability, but at the same time to maintain a limit on numbers of around 3000 head. To achieve this aim required a better understanding of the markets available and their potential accessibility. Also more attention needed to be paid to livestock genetics and nutritional aspects of production.

The beef industry faced radical market changes in the late 1980s with more emphasis on the high value markets; Japan, Korea and to a lesser degree, the EEC. The Trafalgar herd had the basic potential to gain access to those markets, and plans were put in place to realise this potential.

There was investment in stud breeding sires and Limousin sires for cross breeding purposes. As the herd was still small it was an ideal time to improve its overall performance. The key to any herd productivity improvement is breeder and weaner management. Correct handling of this section of a herd creates the base for producing a steer at two to three years of age with a carcase weight greater than 300 kg.

A stringent culling regime and maiden heifer pregnancy testing program was put in place and is still in practice today. This has resulted in an early calving and fertile breeder herd with a quiet temperament. Weaners are retained in a yard for a period after weaning; they are fed, handled and educated and after three weeks they are depastured to a fresh paddock and supplementary fed so that minimal weight loss occurs during this stressful period of their lives.

At about 12 months of age, heifers and steers are put in separate paddocks and the weaner paddock spelled for about five months during summer and autumn. Heifers are mated at two years of age for about four months after which time bulls are removed. After their pregnancy status is diagnosed, the empty heifers are sold to slaughter or the live export market.

The balance of the commercial breeders are continuously mated due to lack of available bull paddocks. If land was available to keep bulls segregated the preferred option would be to control mate. All breeders are pregnancy tested in August/September and empty cows are sold. They graze on native pasture and are supplemented with phosphorus /urea blocks, with an average branding percentage of 75%. Due to this supplementation program, most cows are in reasonable condition regardless of season and realise fair money in the marketplace. Despite

drought conditions during the 1990s calving percentages have remained above 70% and are expected to increase in better seasons. It is estimated that the average calving percentage in the Dalrymple Shire is 54% (Hinton 1993).

The commercial F1 Brahman-Limousin cows are mated with Brangus bulls to produce an ideal local butcher trade steer or heifer at around two years of age. These animals have proved to be very successful at achieving premium prices.

The steer market is the most challenging because of volatility in prices. This requires a flexible approach in management and marketing to achieve the best returns. The options for the steer market currently are: the Asian live export trade, local butcher trade and the American, Korean and Japanese export beef markets.

The Japanese ox trade proved to be the most lucrative in the early 1990s. The requirement for a 560-580 kg animal by three years of age with a carcase of greater than 300 kg could be met by the grazing management strategies at Trafalgar. A significant drop in prices in this beef export market, as well as the Korean and American markets, over the past few years has highlighted the need for flexible marketing strategies to improve options. Diversification into the Asian live export trade has allowed good returns to be maintained in the past few years and because this market requires younger animals, it has the added benefit of being able to relieve grazing pressure during drought because of the earlier turnoff age of animals. However, the very recent and sudden downturn in the live export trade has re-emphasised the inherent dangers of placing too much faith in any one market. The local trade, mentioned above, has been reliable and has greatly improved the flexibility of the operation.

A key factor in being able to meet market specifications for weight and age has been the conservative stocking rate strategy which now provides a year round forage supply thereby allowing stock to be retained, if necessary, to meet more favourable markets. Supplementation of steers only occurs during extended droughts or if a particular market advantage can be obtained.

Pasture management

Native pastures

The open forest country that allowed easy mustering in the first half of this century is now dense sucker infested thickets where visibility is reduced to a few metres. This is the legacy of the 'no fire' period of the 1970s and 1980s. Fire has been re-introduced on Trafalgar as an important pasture management tool. Opponents of 'burning off' argue that it is a waste of resources to spell a paddock, that the grass is best utilised in growing stock. This is true in the short-term, but if we are to be serious in managing our resources in the long-term, then these 'perceived' sacrifices must be made. As mentioned previously, fire has the added advantage of promoting 'green pick' and increasing animal production, it can be used to manipulate native pastures to a more desirable composition (Orr *et al.* 1991), and has an important role in control of exotic woody weeds, particularly rubbervine (*Cryptostegia grandiflora*) (Grice 1997).

'Locking up' paddocks or paddock spelling to improve fuel loads for fire also gives the manager other options. Burning is a first choice providing fair seasons prevail; however, in critically dry times these 'spare' paddocks provide for drought mitigation, allowing the flexibility of not being forced to sell. Currently at Trafalgar, 15 to 20 % of the property is spelled per annum on a rotational basis. This is relatively easy to achieve given the level of divisional fencing. The combined benefits of conservative stocking and resting of pastures is now noticeable in terms of the density of perennial grasses on Trafalgar, especially compared with the majority of properties in the shire (Fig. 4).

Using fire to successfully control woody plants is already evident on Trafalgar. Currant bush (*Carissa ovata*) is increasingly becoming a problem in Dalrymple Shire but regular use of fire in the past eight years has kept it under control on Trafalgar.

Pasture improvement and tree clearing

The first recognised pasture improvement on Trafalgar began in 1936 with the introduction of Townsville stylo (*Stylosanthes humilis*), which spread in moderate proportions until its demise in the 1960s due to anthracnose. Small areas of buffel grass were introduced in 1954, but the first serious attempt at pasture improvement, together with timber treatment was in 1960, when some 2500 ha were 'ring barked' to kill eucalypt trees in an effort to increase pasture growth.

In the late 1960s about 3000 ha of eucalypt country were cleared by chaining and sown to buffel grass (*Cenchrus ciliaris*) and urochloa (*Urochloa mosambicensis*). Prolific grass growth followed, together with a sucker regrowth equally as strong. Control of the sucker problem is by recurrent chaining every six to eight years. About 11% of the total area of Trafalgar is maintained in this 'cleared' state, 8% of which is eucalypt country and 3% is acacia scrub.

Due to the financial cost of maintaining eucalypt clearing, and the probable long-term ecological cost, in the form of dense eucalypt woodland, woody weeds, and potential salinity problems, it was decided that no further eucalypt clearing would proceed. Also, the benefits of tree clearing in terms of improved pasture growth decrease as soil fertility declines, because nutrients rather than competition for water from trees becomes the primary limiting control on pasture growth (McIvor and Gardener 1995). The financial benefits of improved pasture growth on the nutrient limited eucalypt country are probably therefore not matched by the initial and recurrent clearing costs. Care is taken in managing the cleared areas so overgrazing does not occur, as soil minus grass and trees leads to disaster with erosion and spread of woody weeds.

The present policy is to clear small areas of acacia scrub, namely gidgee and/or blackwood and sow with buffel grass and stylo. The better soils, and residual benefit of these legume species, tend to produce pastures of better quality and quantity. Also, suckering is minimal. Particular care is taken to retain timber on water intake areas i.e. slopes of ridges, and along stream bank lines. Care is also observed in providing native animal refuge areas.

Financial management

Detailed financial records have always been kept on Trafalgar, and now with the aid of a personal computer, comprehensive cash flow analyses are commonplace. Forecasting is fairly accurate, and management changes can be made before problems get out of hand. Electronic record keeping also makes it easier to present cash flow details immediately for a variety of reasons.

The financial records show that despite greatly reducing stock numbers from over 5000 head in the early 1980s to around 3000 head presently, property gross margins have been maintained i.e. a reduction in stock numbers has not been accompanied by a reduction in profit This is reflected in the gross margin performance for the period 1979-1995 shown in Table 1. To account for inflation and fluctuating prices of beef (i.e. to remove the confounding effects of changes in terms of trade), Australian Bureau of Agricultural Resource Economics (ABARE) indices of prices paid and prices received (beef) have been used to adjust income and costs to allow more valid comparisons through time. Gross margin values are in 1979 dollars.

In addition to maintaining profitability with a lower herd size there are a number of other benefits of this new management strategy:

• gross margin/head carried has increased significantly. This improvement reflects higher turn-off percentages as a result of better herd husbandry and management.

• relatively high gross margins in the period of new management practices have been achieved in the worst drought since European settlement. Modelling simulations indicate that running the high stock numbers of the 1980s over the period 1991 to 95 would have resulted in lower gross margins than were actually achieved because of the huge supplementary feeding costs incurred.

Table 1. Financial performance on Trafalgar Station for the period 1979-1995. Values are expressed in 1979 dollars using prices received (beef) and prices paid indices (ABARE) to remove inflationary effects and fluctuating beef commodity prices.

	Stock number	Annual rainfall (mm)	Gross margin $/ha/a	Gross margin $/head/a
1979-1986 - High stock	4280	622	3.48	26.8
1988-1991 - Transition	2087	684	1.80	27.3
1992-1995 - Sustainable management	2876	372	3.35	37.0

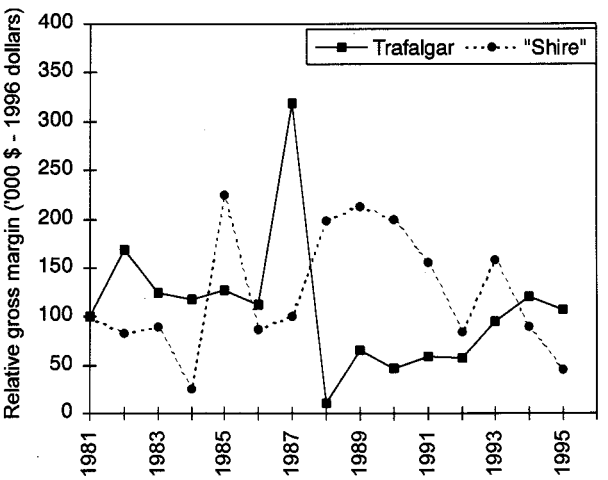

Fig. 5. Relative economic performance of selected properties in Dalrymple and Etheridge Shires (figures courtesy of ABARE) and Trafalgar Station over the period 1981 to 1995. Relative gross margins were set at a base level of $100,000 in 1981 to allow comparison.

Gross margin patterns at Trafalgar over the past 15 years contrast with Australian Bureau of Agricultural and Research Economics farm income figures for the region (Fig. 5 - gross margin/farm income values have been adjusted to 1996 dollars). In the drought of 1982/83, Trafalgar sold many cattle while Shire cattle statistics indicate most properties retained stock, which would have required considerable supplementary feeding. This cost is reflected in the regional statistics as reduced farm income. Trafalgar sold much of their herd in 1987/88, which caused a temporary increase in gross margin. This was followed by a period (1989 to 1991) of poor financial performance as the station started to introduce its new management strategies and only slowly increased animal numbers to allow pastures to regenerate following the overuse they had received in the previous decade. In contrast, financial performances in the Shire were high during this same period as producers were able to capitalise on good seasons with high herd numbers that had been maintained with feeding during the 1987/88 drought. While financial performances were good during this 1989-91 period, pastures did not 'bounce back' completely and a large portion of the region entered the extended drought in 1991 in

only fair or poor land condition (Tothill and Gillies 1992), with reduced potential pasture productivity. As a consequence of continual feed deficits over the last four years, financial performances of properties in the Shire have been declining rapidly. At the same time, gross margins at Trafalgar have been trending upwards as the financial benefits of improved management strategies are being realised. While some financial difficulties were experienced in the transition period of management (Table 2) it is believed the long-term benefits will far outweigh the short-term stresses.

Table 2. Advantages and disadvantages of the new sustainable management regime at Trafalgar

Advantages
1) Reduced steer turn off age
2) Being able to take advantage of premium market values
3) Increased herd efficiency (bulls and heifers mated earlier, increased calving percentages, improved growth rates)
4) Lower input costs e.g. supplements, mustering
5) More sleep at night
6) The land is the winner
Disadvantages
1) Transition period costs (destocking to allow regeneration, lower turnoff numbers)
2).More office hours

Conclusion

For 80 years, Trafalgar Station has been managed by three generations of a family committed to the grazing of cattle. The aims and objectives over this period have always been directed to provide a living for the family and to care for the land. From the experiences of these managers, and their decisions, some good, some bad, the status of the property today can be said to be above average for the area. The mistakes that were made in the past are now recognisable, and learning from these errors has been the basis for forming the management strategies for the future (Table 3).

The critical factor in the successful management of Trafalgar Station has been the willingness to accept the need for change, to develop new philosophies and operating principles, and to implement appropriate strategies and tactics to bring about this change. This level of commitment to change is necessary because of the financial hardships that might be involved during the transition from old to new management regimes. Perhaps federal and state government adjustment, support and subsidy schemes should place more emphasis on encouraging and assisting enterprises during this difficult phase of major structural and operational change rather than supporting unsustainable management practices.

The current management strategies on Trafalgar, of conservative stocking with 15 to 20% of the property rested annually (to enable use of fire or to act as a drought fodder reserve), breeding and nutritional programs designed to produce cattle for a range of markets, and long-term financial planning combine to form an operation that is both risk averse and profitable. If management practices can be maintained to fulfil the aims of this strategy then Trafalgar Station should remain an economically viable and ecologically sustainable property into the foreseeable future.

Table 3. Summary of the management strategies adopted on Trafalgar

Development and marketing strategies

1) Allow flexibility for development - e.g. pasture development, paddock sub-division, water facilities, diversification into other enterprises
2) Determine cash flow problems early
3) Plan marketing strategy early but allow flexibility to cater for unexpected premiums
4) Plan and budget for ongoing development

Drought management strategies

1) Understand the critical grazing pressure thresholds of individual paddocks in any given year
2) Do not comprehensively 'drought feed'
3) Set turn-off dates if it does not rain by predetermined date.
4) Sell, sell, sell. Agistment is fraught with danger, particularly wet females.
5) Determine marketing strategy e.g. cows, steers etc.
6) Money in the bank can be invested in other things. Dead cows in the paddock or costly feed down their necks can't. Remember it doesn't have to rain.

Grazing system and herd management strategies

1) Stocking rate to suit paddock's sustainable capacity
2) Spell 15 to 20% of the property annually for seed generation, burning and/or drought mitigation.
3) Determine carrying capacity for the dry season after summer rains and adjust stocking rate
4) Well defined and planned strategy for control and management of noxious weeds
5) Ongoing commitment to fencing off riparian zones to prevent degradation of major stream banks and water quality.
6) Aim to balance nature conservation with production
7) Ongoing carcase improvement with an eye to market trends
8) Ongoing herd improvement program.
9) Persist with culling standards
10) Maintain quiet cattle

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Manuscript received 29 December 1997, accepted 31 March 1998