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The Australian Rangeland Society

GETTING AT RISK BEFORE IT GETS AT YOU

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ABSTRACT

Drought risk is one of the key risk factors faced by Australia's rangeland managers, yet is often the subject of emotive rather than objective decision making. Using **RANGEPACK Herd-Econ**, a whole property planning package, we examined examples of both strategic and tactical decision making as they related to the financial risks posed by drought.

For cattle properties in central Australia we compared strategic management options as follows: Average (pray for rain and subsidies), High-Stock (stock heavily in good years, but destock quickly in drought) and Low-Stock (resistance to drought by low stocking rates). Both the High-Stock and Average strategies made better financial returns, but ran a high risk of causing environmental damage. The Low-Stock strategy made a more constant income, and never risked financial failure or rangeland degradation.

Following the failure of winter rains on a sheep property in South Australia, we compared the destocking tactics of a 0%, 20% and 40% destock in early summer. Destocking gave better financial returns over a wide range of product prices and climate scenarios.

We recommend that similar studies be carried out for more rangeland regions throughout Australia. We highlight that the environmental effects of high risk management strategies take long periods to show an effect on production. Because of this economic analyses can ignore the run down in land capital, and show higher economic returns in the short to medium term.

INTRODUCTION

Risk management is the current buzz word for all sectors of our community from the high adrenalin foreign exchange dealer to the more relaxed government clerk worried about the cost of insuring equipment against fire and theft. Australia's rangeland managers have been in risk management for a century or more. They have had to deal with one of the worlds most variable and unpredictable rangeland resources, both in terms of its rainfall and its markets.

Some managers have failed to measure and manage risk effectively. The price of failure is usually seen as personal and economic hardship and forced departure from the pastoral industry. However, landscapes, native animals and vegetation may also be casualties of the failure to manage or avoid risk, and the realisation of this has stimulated "The Decade of Landcare", and its hope to roll back the environmental backlash.

As rangeland scientists we have deliberated on the topic of riskiness, decisions and outcomes, and how they might affect our rangeland resources and the production therefrom. The philosophies of risk management within the Australian Rangeland Society have been led by case studies from the risk avoiders, the Nicholson brothers in South Australia (1), Bob Purvis in central Australia (2) and Rodney O'Connor here in the West (3). In examining the scientific justification for lower stocking rates as a prime input to risk avoidance, QDPI led the way with the Augathella work on Mitchell grasslands (4,5), followed by the Carnarvon work on chenopod pastures (6) and the CSIRO work on mulga lands in NSW (7).

For all this, industry does not seem very interested in being good "risk avoiders". A recent study in Queensland (8) has shown that the stations with higher stocking rates usually make more money in the short term i.e

the negative effects of degradation have not yet been felt. Many managers would like to work at lower and more sustainable stocking rates and agree with them in principle. However there's always a debt to service, a child to educate, or a set of circumstances which accumulate into a 'one off' crisis.

During the past decade the realisation has developed that short term crisis management must be replaced by long term strategic planning, and that short term setbacks do not necessarily mean abandoning long term strategies. It is difficult to separate out long term trends in a highly variable environment, especially when unpredictable specific events can have a large effect. Thus the recent floods in the western Queensland and New South Wales or the next big drought could cause more damage than the mob kept in the paddock for an extra three months. For all of this uncertainty, we can't rule it. However we can understand the punting odds, and prepare for the inevitability that the probable will happen. When it does happen we can manage to lessen the impact of the immediate crisis, but keep the long term strategy well in view.

The recent Federal Government inquiry (9) into drought policy served as a focus for wide and varied submissions from all sectors of the pastoral and the environmental industries. For the CSIRO **RANGEPACK** project and its emphasis on decision making in pastoralism (10,11,12), it stimulated a study on the risk of drought for the cash flow of pastoral enterprises. In particular it focused on the long term **strategies** of enterprise size and stocking capacity, and the shorter term **tactics** of levels of destocking at the onset of drought.

METHODS

The studies used **RANGEPACK Herd-Econ** (10), a whole enterprise computer package which combines the biology and business aspects of pastoral enterprises. This is one of a series of computer packages which have been developed to aid with decision making in livestock industries. **Herd-Econ** has been designed to allow for the variability between years, in our terms...Good, Okay, Poor and Bad. Using biological rates for a herd or flock that are appropriate to these types of years allows the enterprise and its management to be studied under sequences of variable climate typical of Australia's rangelands.

The long term **strategic** aspects of stocking capacity were examined for three beef enterprises in central Australia, termed Average, High-Stock and Low-Stock. These are based on real properties in the region but corrected to the same nominal resource base with a long term carrying capacity of 3000 large animal units (AU's). The Average property, typical of the area, carried 3000 AU's and had no definite attitude to drought risk save to pray for rain and lobby for drought subsidy. The High-Stock property carried 4000 AU's, and destocked by 50% during the first dry summer. It is a very efficient producer in both business and livestock production terms. The Low-Stock strategy carried 2000 AU's and was very averse to drought risk, maintaining low stocking rates and continually reclaiming country with water ponding and plant introduction.

The short term **tactical** aspects of how many to destock were examined for a Merino property with 14,600 sheep in the Port Augusta region of South Australia. Three destocking rates of 0%, 20% and 40% were compared. These took effect in September/October on the assumption that winter rains give the dominant growing season in the region. If they fail then drought is probable, although summer rains can provide a less reliable growing season.

The climatic scenarios which drove both the drought strategy and the drought tactics studies were based on all 59049 possible combinations over a 10 year period, of years of good, average and poor biological quality. In addition, the historic rainfall records of a 100 year period from 1886 to 1985 from Alice Springs and Port Augusta, were used to select the

biological rates of the herds and flock for separate and independent 10 year periods i.e. there was no flow on effect from one decade to the next.

RESULTS

Drought Strategies for Cattle in Central Australia

The full probability distributions for the cash surpluses resulting from all possible sequences of good, average and dry years is given in Figure 1. The highest mean cash surplus, herd number and herd valuation are obtained by the High-Stock strategy. The mean expected 10 year accumulated cash surplus is \$2.28 million for High-Stock, compared to \$1.89 m and \$1.34 m for Average and Low-Stock strategies respectively. The superior result for High-Stock is achieved because this management style allows its breeding herd to grow in a series of good years, and thus reaps the economic benefits of higher stocking rates. By contrast the average strategy is restricted on the positive side of the distribution because lower branding rates and management preference restrict the opportunities in good years. The Low-Stock strategy shows a cash surplus distribution that lacks both a positive and a negative tail i.e. the compensation for the lower mean cash surplus is a much reduced variance in income (a s.d. of \$0.12 m versus \$1.42 m for High-Stock and \$0.62 m for Average).

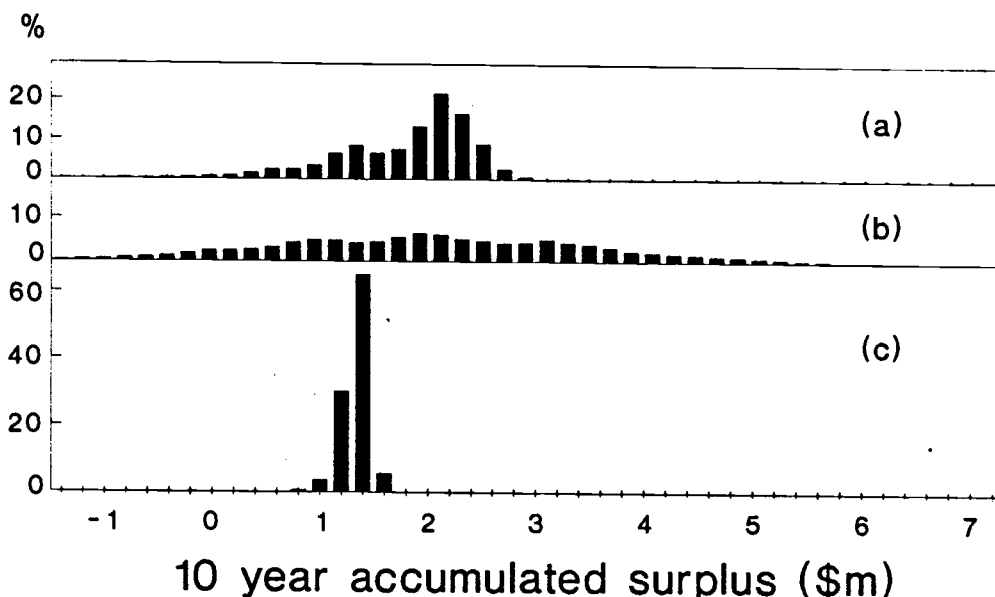


Figure 1. Distribution of the estimated financial returns (10 year accumulated cash surplus in \$m) obtained from all possible combinations of good, average and dry years in 10 year periods for (a) Average (b) High-Stock and (c) Low-Stock management strategies.

When individual decades of the 100 year historical sequence were used to assess the three management strategies, High-Stock gave a better result with a mean for the ten decades of \$2.25 m compared to \$1.79 m for Average and \$1.28 m for Low-Stock (Table 1). It is notable that the last two decades are amongst the best on record in their ability to generate cash surpluses based on the assumption of constant prices. By contrast the previous decade was the worst. In three of the ten decades examined, Low-Stock achieved a higher cash surplus, and thus met its management goal of constancy of income and resilience in the face of drought risk. When the full 100 year sequence was run without restarting at the beginning of each ten year period (i.e. the flow on effect was allowed) the 10 year means were \$1.56 m, \$1.47 m, and \$1.25 m for the High-Stock, Average and Low-Stock strategies respectively. Thus the ordering of economic success remains the same, but the differences were much diminished.

Table 1. Accumulated cash surplus (\$ million over a 10 year period) for the Average, High-Stock and Low-Stock management strategies for historic ten year sequences between 1886 and 1985.

Decade	Management Strategies			Year Sequence
	Average	High-Stock	Low-Stock	
1886-95	2.32	2.13	1.34	adagaadggg
1896-05	1.41	1.17	1.25	aaddadggdd
1906-15	1.46	2.09	1.34	adgdaaaaaa
1916-25	2.35	3.01	1.36	adaagaaagg
1926-35	0.54	0.56	1.17	dddaaaadaa
1936-45	2.40	3.21	1.37	aagadaagaa
1946-55	2.36	2.69	1.39	ggadadgaaa
1956-65	-0.03	-0.48	0.80	dadddddddd
1966-75	2.48	3.17	1.36	aaadagaggg
1976-85	2.64	3.93	1.46	agadagaaaa
Mean	1.79	2.15	1.28	

Note (i) Strategies were started again for each new decade.
(ii) a= average rainfall year; g=good; d=dry.

The effect of interest and taxation rates on the above results is a complex issue, which we have dealt with somewhat simplistically by looking the last 40 years of the historic sequence. If the three management strategies pay income tax at the current company rate of 39%, the Low-Stock strategy gains a slight advantage over the other strategies. Accounting and taxation practices usually reduce this marginal rate of taxation. The High-Stock and Average management strategies regain their monetary advantage at a taxation rate of between 25% and 30%, which is well within the realm of normal business practice. Low-Stock would realise a significant advantage if High-Stock and Average paid interest on negative yearly cash flows during the long drought in the 1956-65 period. Equally, cash surpluses accumulated prior to this decade, or government subsidies, may have lessened the financial effects of drought on the production system.

This analysis of strategic management options highlights the quandary of properties using the drought evasive "Low-Stock" strategy. Their outcomes are more predictable and less erratic, and they seldom have to make decisions during a crisis. By contrast both the High-Stock and Average strategies may achieve better financial results by a mixture of efficient business practices, government subsidies and luck. The biggest and most predictable risk faced by the High-Stock and Average strategies is that of landscape degradation. Financial hardships caused by deficiencies or mistakes in their management strategies can result in large numbers of drought stricken stock on fragile landscapes. Degradation is then inevitable.

Drought Tactics for Sheep in South Australia

The drought management tactics of either a 20% or a 40% destocking in early summer following a dry winter were notably better than the no action tactic for all possible year sequences (Figure 2). They gave ten year accumulated means of \$0.986 m and \$0.822 m for the 20% and 40% destocks respectively, compared to \$0.552 for the no action tactic. The 40% destocking had a slightly worse expected return overall, mainly due to it being disadvantageous in the most common form of dry period which only lasts one year.

Over the past century, but with today's prices and production levels, destocking in the face of drought would have been better in all decades but the first (Table 2). In five decades it would have been better to approach drought by immediately destocking by 40%, and in only four by 20%, but overall there is negligible difference between the two tactics. No action, which was probably a more common tactic on this type of property in earlier years would have been financially disadvantageous, regardless of the

environmental consequences.

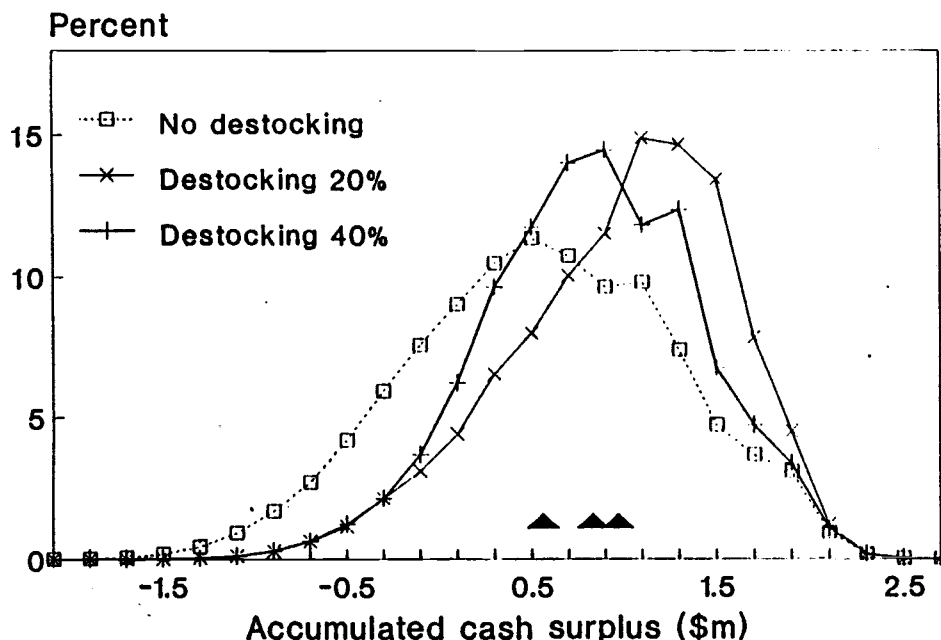


Figure 2. Frequency diagrams of accumulated cash surplus at the end of 10 years for all possible combinations of dry, average and good years for the three drought management tactics on a sheep station. Solid triangles mark the mean of the distribution for each strategy (left to right: no destocking, destocking 40% and destocking 20%).

Table 2. Results of running the three drought management tactics through each decade of the historic weather sequence from 1886-1985. Results are expressed as mean annual cash surplus generated over ten years, with the property starting each new decade in the same initial condition.

Decade	Mean Annual Cash Surplus (\$'000s)			Year Sequence
	No Destocking	20% Destocking	40% Destocking	
1886-95	192	192	192	aagagaagag
1896-06	35	43	46	aaaaadddaa
1906-15	101	128	130	aagaggdadd
1916-25	159	177	173	agaagaagd
1926-35	-67	-34	-33	aaddddgaad
1936-45	-14	32	27	adgaaddgdd
1946-53	85	126	103	aaadgagada
1956-65	-25	24	22	aadadaddaa
1966-75	3	37	48	addgaaadgg
1976-85	22	38	54	addgagadaa
Overall Mean	49.1	76.3	76.2	

Note: Year sequence, a=average, g=good, d=dry

Obviously the result depends on the price of wool and the price of the sheep which are removed. However an analysis of the sensitivity of the results to this showed that the destocking was always worthwhile, with only the precise balance between the 20% and 40% options altering.

DISCUSSION

Short term risks are right now, and have to be dealt with immediately. That is why most managers focus on them ... compare the uptake of animal health technologies with those in the land rehabilitation area. However even short term decision making can be very poor and non-objective. The destocking

tactics studied here illustrate how managers can make decisions which are more economically objective and sensible in the short term, when a sufficiently complete view is taken. For the particular property concerned, this results in substantial destocking being advocated, regardless of the longer term environmental implications.

In reality though, this is merely the first step to a more complete costing of the options, which must include the longer term implications. Recent studies (13,14,15,16) and normal farm practice (8) indicate that economic optima may require higher stocking rates than those considered "normal" or sustainable for a particular area. More importantly though, these studies all noted that the cost of resource damage or degradation have not been included in the farm production equation, and that such effects occur over longer time spans than those included in normal economic analysis.

That past resource damage has been hidden by expanding water supplies, genetic gains in livestock production capability and improved farming technologies, is now becoming apparent. Past investment has concentrated on fences and waters rather than any attempt to maintain landscape production per se. Even the greenest of agricultural technologists, have had difficulty in perceiving a reduction in forage utilisation levels, as being an investment in long term pastoral productivity. They are supported in this by an economics industry which emphasises immediate returns at the expense of those sometime in the future. In the longer term context we have to learn how to cost the land resource, and any decline in its productivity, in an objective manner. If strategies such as High-Stock and Average diminish their land capital, then they must be suitably penalised in both economic and social terms.

As rangeland scientists we are obviously biased towards the risk evading strategy. There is always the vision of landscapes in good heart, herds and flocks seldom under stress, moderate and constant incomes, and green places to take visiting environmental dignitaries. We are not the first to highlight that taxation systems and various forms of government assistance prop up higher risk management strategies. At best these management strategies could become less erratic in their production systems if they took a more moderate view towards grazing intensities. At worst, many high risk management strategies have damaged their productive base. The taxpayer is now being called to pay the price of "Landcare". Some say...yet another subsidy.

The one generalisation that may be made from this study is that there should be more of such studies. Each region in Australia has its own set of climatic risks, landscape nuances and highly individualistic rangeland managers. Destocking once the rains fail seems to be a must, both for dollars and degradation. Tools such as **RANGEPACK Herd-Econ** now exist to allow such destocking strategies to be tailored to each property, and the cash flow implications detailed for the next decade.

That we talk in decades means that we must also plan in decades. If pastoralism is to remain a major landuse on Australia's rangelands, then managers should be rushing towards the implementation of whole property plans which balance the resource, the animals and the dollars. Plans should be by preference, rather by statute and obligation. Witness the rush to the chartered accountants office when new tax laws are imminent. If only the land resource stimulated an equal enthusiasm.

These studies were a response to landholders problems, and their willingness to measure risk, and to face change. We personally have learnt a lot from our hours at the keyboard. There is much 'on property' wisdom that has to be spread around. We need the input from managers about the 'when' and 'why' of their major decisions, how risk affects those decision, and we need good records of their production systems.

Working together we can probably do better than working separately !

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