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PROFITABILITY, STOCKING RATES AND LAND DEGRADATION IN THE MULGA REGION OF QUEENSLAND

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1. INTRODUCTION

The semi-arid mulga region of Queensland is an important wool and meat producing region covering approximately 13% of the State's land area. The area contributes around 25% of total State wool production and is also important for beef cattle production.

The bases for the region's importance are the native grass species and the mulga tree, a type of acacia, which provides an excellent source of feed during drought. Over the last few decades, land degradation has become a major concern and many graziers fear that productivity will decline. The main features of degradation are a decline in native grasses, an increase in woody weeds which are of little or no grazing value, and extensive sheet and gully erosion. Degradation is thought to have occurred as a result of heavy grazing and the frequency of drought during the main growing season in recent years.

A range of historical and economic factors are thought to have contributed to the over-utilisation of the mulga pasture lands. For historical reasons, many properties are smaller than a minimum living area. The subdivision of the large stations into small properties after World War I was a product of the social and political needs of the time and demonstrated a lack of understanding of the fragile mulga environment. For all graziers and especially those with smaller areas, recent economic pressures such as high input costs, high interest rates and debt pressures are thought to have further contributed to excessive grazing. These economic problems have been more severe for the smaller properties. The high costs of transport, communication, education and living have placed additional financial pressure on all graziers.

The increasing awareness of environmental issues in general and specific issues such as degradation in recent years have led to the need for more information on areas such as the mulga. The QDPI has a deep involvement in research in native pasture areas, and considerable work has been done on evaluating the extent of degradation, the physical causes and possible solutions.

Over the three-year period 1985-86, 1986-87 and 1987-88, the mulga region carried approximately 320 000 beef cattle, or 3.6% of the State's beef cattle population. The sheep population of some 3.6 million in the four shires represented 25% of Queensland's sheep numbers. Similarly, wool production was about a quarter of total state output.

Average gross total value of production was \$127m, mostly in livestock products. The region produced 15% of the State's total gross value of livestock products and 3% of livestock gross value. Since the late sixties, wool productivity growth in the mulga shires has not matched the Australian average, and sheep numbers in the mulga shires have fallen over a period when national sheep numbers have risen. Cattle numbers in the mulga have not risen as rapidly as the national average.

1.1 Project objectives

The objectives of the study were:

- . to review and assess the current financial performance of predominantly mulga grazing properties;
- . to identify the factors which influence stocking rate decisions of mulga graziers; and
- . to identify and review policy options for rangeland preservation.

The first objective was met by means of a survey of randomly selected mulga graziers. The data were compiled to provide a financial profile of graziers and to allow a comparison with other rural industries.

The financial and production data collected in the economic survey were combined with data collected from a land condition survey. This survey was conducted by QDPI staff in the Land Resources and Pasture Management Branches. A second report reviewing these data was planned.

2. SAMPLE SURVEY DESIGN AND DATA COLLECTION PROCEDURES

2.1 Population frame and sample selection

Property population lists were obtained for the Paroo, Quilpie, Murweh and Bulloo Shires of western Queensland. The total population of properties in these four shires was 494. Lands Department information on property titles were used to determine property sizes in the region. Holdings that were less than 5000 hectares were not included in the list.

From this list a sub-set was taken of properties whose land area was predominantly mulga country, the criteria being that properties needed to have approximately 80% or greater of land area as mulga. Properties run in conjunction with other properties outside the mulga region were excluded. The number of properties in the sub-set, properties with approximately 80% or greater land area being mulga was 259. When property amalgamations were taken into account this number was reduced to 234.

The population sub-set of 234 graziers was divided into two regional groups. The first group, referred to as eastern mulga, included properties in the area to the east of the Warrego River and north of Cunnamulla. The second group included all other mulga properties (to the west of the Warrego River and south of Cunnamulla) and was referred to as the western group. The regions are differentiated by their vegetation types and the differing degradation problems. Generally, the west region is hard mulga and degradation problems are the expansion of woody weeds and soil erosion. The eastern region is mostly soft mulga and has a higher rainfall, while degradation problems relate mainly to excessive mulga regrowth.

The eastern region comprised 64 properties and the west 170 properties.

An initial sample of 60 graziers was selected on the basis of the expected accuracy of sample statistics, and time and cost constraints in data collection. The western group was stratified according to size to ensure more precise sample statistics and to ensure a wide cross-section of property sizes for an analysis of size economies. Property size was chosen as the criterion for stratification as it was thought to be closely related to incomes and was also hypothesised to be correlated with stocking rates.

The selected strata bounds, sample allocations, and survey response rate are detailed in Table 2.1. The initial objective was to completely enumerate the large-property category in the western mulga (group W3).

Table 2.1. Sample allocation and strata bounds

Region	Eastern mulga			Western mulga	Total
	W1	W2	W3		
Western mulga group					
Size strata (ha)	-	5-24 999	25-54 999	>55 000	
No. in population	64	82	71	17	234
No. in original sample	10	14	19	17	60
Final sample	8	12	20	7	47
Response rate (%)	26	41	59	41	43
Sampling fraction ^a	12.5	14.6	28.2	41.2	20

a. Sampling fraction is the stratum sample size divided by stratum population.

The response rate was relatively low with only 43% of graziers contacted able to fulfil the requirements of the survey. A major cause of non-response was inability to provide a complete three years of data.

2.2 Study variables and questionnaire design

In order to reduce variability attributable to climatic conditions or other factors, data were collected over a three-year period from July 1985 to June 1988. The information to be collected by the survey was identified as covering three broad areas. These were financial performance data, land use and production data and socio-economic data.

Financial data were collected from taxation returns, property cash books, account sales and wool returns. The questionnaire was structured to closely approximate the items and headings used in taxation records. Information collected included value of property, capital investment, debt, assets, cash receipts and cash payments.

Land use and production data were obtained from account sales, wool returns, shearing tally books, farm diaries and ABS questionnaires. Information collected included property area, stock numbers, timing of purchases and sales, numbers shorn, wool cut, lamb marking percentage and use of mulga feed.

Socio-economic data were collected by asking the grazier specific questions regarding various aspects of management, including type of business entity, land tenure, ownership intentions, education expenses, attitudes to stocking rates, and major concerns.

A second part of the survey examines the land condition of the properties surveyed. A land condition score will be given on the basis of pasture quality, extent of woody weeds and the presence of gully and sheet erosion. The results of the condition survey will be contained in a separate report, and data will be available for further analysis.

2.3 Definition of financial measures

All financial data collected in the survey were expressed in 1987-88 dollars before being averaged. All cash receipts for the 1985-86 and 1986-87 years were indexed forward using the ABARE Index of Prices Paid for Queensland, and all cash payments were indexed forward using the prices paid index closest to the item in question. This procedure ensured that all cash values represented dollars with an equivalent purchasing power.

Capital items (machinery, workshop equipment, fences, buildings, water) were valued using the grazier's estimate of value. The value of unimproved land was calculated by subtracting the estimated value of buildings, fences and watering facilities from the grazier's estimate of the bare value of land.

All fixed equipment and machinery were valued at either current second-hand value or new market price and depreciated for age.

Livestock values were obtained by using the average of all purchase and sale prices of sheep and cattle collected in the survey. The values were then expressed in 1988 dollars using the ABARE Index of Prices Paid.

The imputed value of family labour was estimated using the Queensland Station Hands' Award. The Federal Pastoral Industry Award does not apply to Queensland. This was another departure from the ABARE method.

3. SURVEY RESULTS

3.1 Land area and production

3.1.1 Property areas

The survey average property areas and their relative standard errors are given in Table 3.1, together with population averages obtained from available records.

Table 3.1. Property areas

	Average for eastern mulga	Western mulga property size groups			Average for western mulga	Average for all properties
		W1	W2	W3		
		ha				
Survey average property areas	20 010 (9.6)	18 527 (5.9)	37 179 (3.9)	121 992 (19.3)	36 670 (6.8)	32 113 (5.9)
Population average property areas	22 197	16 171	36 083	140 704	36 941	32 908

The survey results were generally close to the population averages, with the exception of the western mulga small property size group (W1). The population mean for this group was just under two standard errors from the survey average. The average property area in the sample was 32,100 ha.

3.1.2 Stock numbers and stocking rates

The stock numbers and stocking rates for survey properties are detailed in Table 3.2.

Table 3.2. Stock numbers and stocking rates, average of all properties

	Average for eastern mulga	Western mulga property size groups			Average for western mulga	Average for all properties
		W1	W2	W3		
		ha				
Sheep numbers (DSEs)	5 348	5 266	8 890	14 926	7 747 (6.4)	7 091 (6.3)
Cattle numbers (DSEs)	2 821	1 883	2 377	12 457	3 147 (16.5)	3 058 (14.9)
Total DSEs	8 170 (11)	7 149 (9.7)	11 267 (5.5)	27 383 (16.3)	10 893 (5.6)	10 149 (5)
Sheep % of total	68	78	79	57	76 (4.6)	74 (5.0)
Ha/DSE	2.70 (12.2)	2.92 (9.3)	3.49 (4.6)	4.95 (16.3)	3.36 (5.0)	3.18 (4.8)

The data showed consistently that stocking rates were higher on smaller properties, and tended to be higher on eastern mulga properties than on western mulga properties. The difference between east and west was significant at the 5% level, as was the difference in stocking rates between W2 and W3 properties. Another feature was that the proportion of cattle in total DSEs was higher in the eastern mulga and was significantly higher in the western W3 group. The largest properties tended to stock a larger proportion of cattle. The reasons for this are not known, but may be due to easier mustering, labour costs or suitability of the country. The higher proportion of cattle in the eastern mulga (32% compared to 24% in the west) may be due to regional differences and suitability of vegetation. This difference was not significant at the 5% level.

On western mulga properties with areas between 5000 and 55 000 ha, about 80% of total DSEs stocked were sheep. The proportion of cattle in total DSEs was greatest on the large category properties, at 43%. The stocking of cattle by wool-growers is often due to the belief that a small number of cattle do not affect stocking rates due to their different grazing habits. Another reason is purely for diversification, to reduce the risk of relying on only one product. On average, around 26% of total dry sheep equivalents in the mulga were cattle.

The average stocking rate in the mulga during the survey period was one dry sheep equivalent to 3.18 ha (around 8 acres). In the western mulga the average was slightly lower, at one dry sheep equivalent to 3.36 ha. Stocking rates were lowest on the larger properties in the western mulga with only one sheep to almost 5 ha, and highest in the eastern mulga with one sheep to 2.7 ha.

3.1.3 Wool production and sheep population data

Table 3.3. Wool production and breakdown of sheep numbers by type, mulga properties with sheep

	Average for eastern mulga	Western mulga property size groups			Average for western mulga	Average for all properties
		W1	W2	W3		
		ha				
Cut per head (kg)	4.26 (15.8)	4.54 (3.2)	4.47 (5.5)	4.92 (12)	4.55 (3.0)	4.47 (4.7)
Ewe numbers (DSEs)	997	2085	3717	6538	3212 (10.6)	2606 (10.4)
Wether numbers (DSEs)	4861	2686	4883	7010	4037 (8.7)	4262 (8.0)
Lambing %	43.3	50.8	59.1	47.5	53.9 (7.8)	51.0 (7.8)

Note: Lambing percentages are the average for properties with ewes.

In Table 3.3 data are presented for wool cuts per head and various measures of sheep numbers.

Cuts per head given in the table are the average of wool producing properties and of wool producing years. Where data were not available for wool production in any particular year or for a property, the observations were omitted. The average cut per head was 4.47 kg, slightly higher than the ABS average of 4.27 kg for the four mulga shires over the same period. Cuts per head were highest among western mulga properties, with the large properties (group W3) showing the highest average of 4.92 kg. This result may be due to the lower stocking rate observed for these properties. Similarly, the lowest cut per head (4.6 kg) for the eastern mulga graziers reflected the higher stocking rates of this group.

The data showed that the average mulga sheep or mixed-stock property carried 4260 DSEs as wethers and 2600 DSEs as ewes. Eastern mulga properties carried proportionally fewer ewes, while the larger western mulga properties stocked the highest proportion of breeding stock. In terms of total DSEs for all properties, ewes and wethers comprised 25% and 40% respectively.

3.2 Capital investment and farm business debt

A summary of the survey results for capital investment per property is presented in Table 3.4. The average total capital value was estimated at \$960,000, and ranged from \$736,000 for the small western mulga size group to \$2.49m for the large size group.

After land, which consisted of around 53% of total capital regardless of property size or region, the largest capital item was livestock. Livestock consisted of over 17% of the total investment on the average mulga property, ranging from 16% for the smaller western mulga properties (W1) to over 20% for the largest properties (W3).

Details of total business investment, debt and equity ratios at 30-6-88 are also given in Table 3.4.

Table 3.4. Total capital investment, debt and equity.

	Eastern mulga	W1	W2	W3	Western mulga	Total
Average total capital investment (\$)	743,100 (10.8)	736,281 (9.7)	1,056,525 (6)	2,488,780 (9.1)	1,045,393 (4.7)	962,715 (4.3)
1987-88						
Total capital investment (\$)	760,129	731,789	1,082,859	2,523,875	1,057,745 (4.6)	976,347 (4.2)
Farm business debt (\$)	160,945	94,861	152,233	286,142	137,971 (12.0)	144,254 (11.4)
Farm business equity (\$)	599,184	636,928	930,626	2,237,733	919,774 (4.8)	832,093 (4.4)
Equity ratio (%)	79 (5.0)	86 (3)	86 (2.2)	90 (3)	87 (1.7)	85 (1.8)

Regional differences in equity ratios between eastern and western mulga properties were significant at the 5% level in 1987-88. The low average equity ratios of eastern mulga properties may be related to the small property sizes or slightly higher land values in the region.

Between 1985-86 and 1987-88, the average equity position of all mulga properties established for four years or more grew from 80% to 85%. This development would likely be a result of sharply improved wool prices, which allowed graziers to reduce debt levels and boosted their total capital assets by raising the value of livestock.

3.3 Financial summary data

3.3.1 Farm cash operating surplus

The average farm cash operating surplus is given in Table 3.5. This figure represents the difference between cash costs and cash receipts, and includes interest paid and lease payments.

The average cash surplus was \$51,245 for mulga properties, ranging from \$23,181 for eastern mulga properties to \$108,322 for the large (W3) western mulga properties. Cash surplus was \$1.89/ha or \$4.86/DSE for average mulga properties.

Table 3.5. Key financial summary data: average per property

	Eastern mulga	W1	W2	W3	Western mulga	Total
	\$					
Total cash receipts	165,691 (17.8)	150,404 (9.7)	225,035 (6.0)	429,870 (23.5)	209,546 (6.5)	197,552 (6.5)
Total cash costs	142,510 (19.8)	108,110 (6.6)	151,846 (7.1)	321,549 (16.5)	147,736 (5.3)	146,306 (6.5)
Farm cash operating surplus	23,181 (41.9)	42,293 (21.9)	73,188 (10.4)	108,322 (59.8)	61,810 (13.7)	51,245 (13.1)
Depreciation	17,085 (23.2)	16,697 (5.6)	22,258 (8.2)	51,187 (6.0)	22,471 (4.2)	20,998 (6.1)
Operator & family labour	20,925 (14.2)	17,169 (8.1)	18,522 (5.1)	18,176 (22.6)	18,125 (5.0)	18,891 (5.5)
Return to capital & management	-14,829 (70.4)	10,108 (96.1)	35,584 (22.5)	41,186 (149.6)	23,865 (35.3)	13,283 (50.9)
Return adjusted to full equity	5,525 (141)	23,800 (42)	59,742 (13.2)	82,184 (75.3)	44,662 (19)	33,958 (19.2)
Rate of return to capital & management (%)	1.32 (91)	2.6 (57)	5.72 (15)	3.43 (55)	3.99 (20.5)	3.26 (20.8)
Cash margin	-12,760 (99)	15,303 (64)	40,106 (22)	61,313 (116)	30,272 (30.8)	18,502 (41.2)
Income per work year of family labour	4,408 (126)	23,112 (31.4)	40,271 (15.8)	54,645 (29.4)	33,437 (14)	25,498 (14.6)

3.3.2 Return to capital and management

The return to capital and management is simply the farm cash operating surplus less depreciation and family labour costs. Lease payments were added to avoid double counting.

Eastern mulga graziers earned a negative return to capital and management. The average for all mulga graziers was \$13,300, \$0.47/DSE and \$0.35/ha. The results showed a significant difference between eastern and western mulga graziers.

3.3.3 Return adjusted to full equity

The return adjusted to full equity represents a return assuming no debts associated with the business, or a return on the resources employed in the business. It was calculated by adding back interest paid and rent to the return to capital and management.

The average return on full equity was \$34,000, equivalent to \$1.13/ha and \$2.66/DSE. A substantial difference, although not statistically significant, existed between eastern and western mulga graziers (\$5,500 compared with \$44,700). The strong performance of the medium (W2) western mulga properties was noteworthy. These graziers achieved a strong cash operating surplus, especially on a DSE basis, and this was matched with relatively low depreciation costs compared with the large (W3) western mulga properties.

3.3.4 Cash margin

The cash margin was net of an imputed principal repayment estimate and the cost of one family labour unit. The cash margin averaged \$18,500 for mulga graziers, and again, significant differences were found between eastern and western mulga graziers. The average cash margin was \$0.56/ha and \$1.02/DSE.

3.3.5 Income per work year of family labour

Income, when expressed in terms of dollars per work-year of family labour, averaged \$25,500 on mulga properties. Incomes were significantly lower on eastern mulga properties, at \$4,400 per work-year.

These estimates can be interpreted as the residual income from which the operator and family labour would receive a 'salary'. They can be compared with estimated family labour costs or salaries received by operators of other businesses.

3.3.6 Rate of return

The rate of return was derived by expressing the rate of return to capital and management adjusted to full equity as a percentage of total capital. The rate can be compared with returns from other forms of investment.

The average rate of return was 3.3%. The medium (W2) size western mulga properties achieved the highest rate of return of 5.7%, whilst the eastern graziers achieved the lowest rate of return, at 1.3%.

3.4 Analysis of financial performance

3.4.1 Comparison with ABARE survey results

Table 3.6 contains a comparison of the survey results with those of the ABARE survey of the sheep and sheep-beef industries in Queensland.

The most notable variations were in operator and family labour costs, total farm capital and total farm debt. The difference in operator/family labour may be partly due to the slightly different methods used in valuing labour. The mulga survey used state awards for station hands while the ABARE survey used the Federal Pastoral Industry Award.

Further variations may be due to the more regional focus of the mulga survey compared to the ABARE survey which included graziers across the entire state. The average property size in the mulga survey was 32 000 ha, compared with 16 400 ha for the ABARE sheep industry group and 23 000 ha for the ABARE sheep-beef group.

Despite reservations about the comparison, it appears that mulga graziers under-performed the state average for the grazing industry. The cash surplus and financial return measures were all lower for mulga properties and the level of debt as a proportion of equity was higher. The mulga survey results were closest to the ABARE sheep-only results.

Table 3.6. Comparison of mulga survey results with ABARE survey estimates (1985-88)

Item	Mulga survey	ABARE survey (Qld)	
		Sheep	Sheep-beef
		\$	
Total cash receipts	197,552	189,405	236,250
Total cash costs	146,306	120,544	153,502
Farm cash operating surplus	51,245	68,861	82,748
Depreciation	20,998	16,376	20,246
Operator & family labour	18,891	25,202	23,699
Return to capital & management	13,283	27,976	39,421
Return adjusted to full equity	32,958	38,091	55,740
Income per work year of family labour	25,498	27,784	32,814
Rate of return to capital & management (%)	3.26	5.5	4.4
Farm capital	962,715	693,656	1,272,280
Farm business debt	158,764	80,750	120,369
Equity ratio (%)	82	88	91

Note: ABARE survey results given in the table are average of the three financial years expressed in 1987-88 dollars. The 1987-88 ABARE data were provisional estimates.

3.4.2 Distribution of properties by financial performance

The distribution of mulga properties by return to capital and management at full equity is given in Table 3.6. The data indicate that 23% of graziers achieved a negative average return over the three years. A further 28% of graziers achieved a return of between 0 and \$40,000. The distribution of graziers was evenly spread across the range, with around 19% of graziers realising a return of more than \$80,000.

Table 3.7. Distribution of properties by return to capital and management at full equity (average of 1985-88 years)

Return at full equity (range)	%
Less than -\$20,000	8.5
-\$20,000 to \$0	14.9
0 to \$19,999	6.4
\$20,000 to \$39,999	21.3
\$40,000 to \$59,999	14.9
\$60,000 to \$79,999	14.9
\$80,000 to \$99,999	2.1
More than \$100,000	17.0

3.4.3 Properties 'at risk'

The ABARE assesses a property as being at risk if both the following criteria are met:

- . a negative cash margin for the previous 12 months;
- . an equity ratio of less than 70%.

Only 2% of survey properties were at risk in 1987-88. A contributing factor to this low level was the buoyant wool market of recent years. In the previous two years, 12.2% of properties were at risk.

Over the three-year period, the percentage of graziers realising negative cash margins declined from 66% to 13%. Graziers were also able to improve their equity positions, with the proportion of properties below 70% equity declining from 15% to 8.5%. Over the period, the average equity ratio rose from 80% in 1985-86 to 85% in 1987-88.

To conclude, the survey results indicated that the wool price improvement enabled many graziers to move out of the 'at risk' category. However, the sample bias inherent in the survey would affect this finding. New graziers may be in the 'at risk' group but were excluded from the survey as three successive years of records were required.

4. STOCKING RATES, PRODUCTION AND LAND DEGRADATION

4.1 Introduction

A major objective of the study was to identify the factors influencing stocking rates and the impact if any, of stocking rates on land degradation. It was hypothesised that factors such as property size, debt commitments, planning horizon, education costs and availability of mulga feed would influence stocking rate decisions. The survey questionnaire was designed to collect information to test these hypotheses. Graziers were asked to provide details of their education costs, the length of period of ownership and intentions for the future. The extent of mulga feeding measured in months for the three year period 1985-1988 was also collected.

In addition to questions regarding specific issues, graziers were asked to put their view on the preferred stocking rates in a non drought year for their properties, and to state how their average stocking rates compared to their preferred rate. Graziers were also asked to identify problems and to expound ideas known on ways to overcome or prevent land degradation.

In this section, the results of this analysis are presented. Simple statistical methods were used to test the hypotheses regarding those factors affecting stocking rates, and a summary is given of graziers opinions regarding stocking rates and other problems.

Two measures of stocking rates were used in the analyses, both expressed as Ha/DSE. The method of calculating DSEs differed between the two measures. The first measure combined sheep and cattle to calculate total DSEs, while the second measure used only the major type, that which exceeded 50% of total stock numbers in DSEs. This latter measure was based on some evidence that sheep and cattle grazing capacities should be assessed separately (Mills 1989). Until further evidence becomes available, this measure should be interpreted cautiously.

4.2 Factors influencing stocking rates

Over time, stocking rates are likely to be influenced by rainfall, wool prices, beef prices and various other external factors including interest rates. At any point in time factors which could be expected to influence stocking decisions on individual properties might include property size, debt levels, grazer's planning horizon and ownership intentions, and other demands on property finances. The survey data were analysed to determine if any correlation existed between stocking rates and these factors.

A correlation matrix is presented in Table 4.1.

Table 4.1. Correlation matrix

	Property size	Equity ratio	Region	Period owned	Sheep %	Stocking rate (main stock type)	Return to capital & management
Stocking rate	0.4820	0.1902	0.2542	0.0806	-0.2186	0.9144	-0.1929
Property size		0.1557	0.2284	-0.0832	-0.3481	0.3770	-0.0887
Equity ratio			0.3476	0.1990	-0.2488	0.2989	0.3754
Region				0.1523	0.0940	0.2051	0.2003
Period owned					-0.2464	0.2088	0.0880
Sheep %						-0.2787	0.3256
Stocking rate (main stock type)							-0.1241

Note: Stocking rate expressed as ha/DSE, region equated to 0 for Eastern mulga and 1 for Western mulga.

The matrix indicated a strong positive relationship between stocking rate and property size. As property size increased, the area per DSE also increased, that is, the stocking rate became lighter.

4.2.1 Property size

A multiple linear regression model was tested using stocking rate measured with total DSEs as the dependent variable and property size, debt/equity ratio, length of ownership and a regional dummy variable as explanator variables. Only property size was a significant explanator at the 5% level.

A simple regression of property size on stocking rate yielded the following results:

$$SR = 2.74 + 0.015 \text{ area}$$

(10.9) (3.6)

$$F: 12.86 \quad R^2 = 0.21$$

where SR is stocking rate expressed as Ha/Total DSE, and Area is in 1000 ha units.

The equation indicated that as the property size increased, the stocking rate measured as Ha/DSE also increased. The positive link between stocking rates and property size was also evident in the financial analysis which showed lower average stocking rates on larger properties.

The reasons for this result are not known. However, some explanations are:

- . the minimum number of stock required for a living income can be more easily achieved on larger properties;
- . larger properties may be characterised by lower quality pastures or land types or may receive a lower average rainfall. This possibility will be examined when data on land condition become available.

4.2.2 Debt commitments

The equity ratio was used as an indicator of the debt position of each property in the survey.

A regression of equity ratio on stocking rate revealed no significant correlation. On the basis of these findings, the hypothesis that debts influence stocking rate decisions was rejected. While this may be the case for the average grazier, there may be individual cases where debts do force higher stocking rates.

4.2.3 Education costs

The high cost of education for grazier's children was considered a possible factor in stocking decisions following comments by grazier associations and individual graziers. Not only are graziers confronted with boarding school fees, but also travel and incidental costs. In the survey graziers were asked to provide estimates of education costs, the type of expense incurred and the number of children involved.

An initial regression analysis indicated that education costs were not significant in explaining stocking rates. An additional analysis divided graziers into two groups: graziers with over \$10,000 in education expenses and those with under \$10,000 in expenses. The results showed that stocking rates were significantly lower for those with less than \$10,000 in education expenses (3.47 ha/DSE compared with 2.7 ha/DSE).

4.2.4 Property ownership and Intentions

It was hypothesised that the grazier's planning horizon may influence stocking decisions. For example, if a grazier intended to sell within a few years, he may increase stocking rates to maximise short-term income. Conversely, if a grazier was planning to pass the property to the next generation of his family, his stocking rates may be conservative.

Reliable data on the planning horizon were not available. However graziers were able to provide information on intentions regarding future ownership. Over half of the graziers interviewed intended to pass the property on to their offspring, and 20% of graziers intended to sell before their retirement. The remaining 27% of graziers were uncertain.

There was no significant difference between stocking rates of those graziers intending to sell and those intending to pass the property to the next generation. The data collected in the survey do not support the hypothesis that stocking rates on the average mulga property are influenced by ownership intentions.

4.3 Production effects of stocking rates

The average wool cut per head among those graziers stocking sheep was 4.47 kg.

It was hypothesised that cuts per head are positively correlated with stocking rates. As the grazier increased stocking rates, the cut per head was expected to fall.

The results of a simple regression analysis (using separated annual data rather than the three year averages) showed that in fact, stocking rates and cuts per head were negatively related. Thus, with heavier stocking rates (reduction in Ha/DSE), cuts per head increased. An explanation for this result was that stocking rates were heavier on those properties with better quality pasture and hence wool cuts were also higher. The strength of land condition as an explanatory variable will be assessed when data are available.

$$\text{cph} = 4.75 - 0.20 (\text{sr})$$

(14.82) (-2.3)

$$F \quad 5.36 \quad R^2 \quad .03$$

The low R^2 indicated that stocking rate explained only a small part of total variation in cut per head.

4.4 Grazier's views on stocking rates

Survey graziers were asked their preferred stocking rate and an estimate of their actual stocking rate. Where the actual rate exceeded the preferred, graziers were asked to give reasons.

The results indicated that 21 graziers or 45% of those interviewed were stocking heavier than their preferred rate. Graziers' reasons for heavier stocking are detailed in Table 4.2.

Table 4.2. Graziers' reasons for stocking at higher than preferred rates

Reason	Number of responses
Property too small to support living expenses	8
Property too small to meet debt repayments	8
Property is large enough, but have to stock heavily to meet living expenses	1
Property is large enough, but have to stock heavily to meet debt repayments	8
Kangaroos' competition	2
Use of mulga to supplement feed	2

These results indicated that debt was a significant factor for stocking decisions, and that small property size was a major reason for stocking at a heavier than preferred rate. Of those nominating property size as the major reason half referred to debt repayments as the financial constraint, and half referred to living expenses. Seventeen per cent of interviewed graziers stated that their properties were large enough, but that debt repayments were forcing them to stock at a higher than preferred rate. Other graziers referred to kangaroo competition for pasture as a reason, while others stated that mulga feeding enabled them to stock at a higher rate.

While 21 graziers stated that they were carrying more stock than preferred, a further 13 graziers were found to be stocking at levels lower or equal to their preferred rate. The remaining 13 graziers thought they were stocking at lower than preferred rates but were in fact stocking higher.

In summary, almost half (45%) of graziers knew they were stocking at heavier than preferred rates and were able to give reasons. Only 27% were stocking within their own guidelines.

A frequency distribution of average stocking rates is illustrated in Figure 4.1.

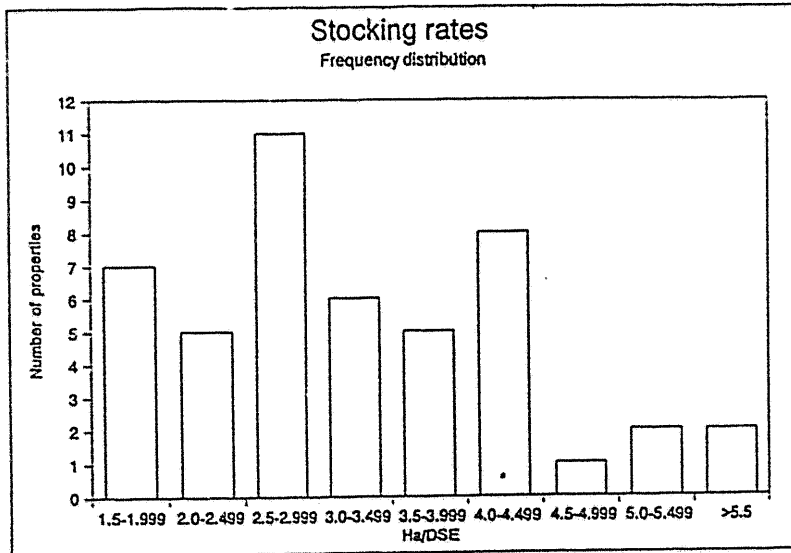


Figure 4.1. Frequency distribution of actual stocking rates.

The chart shows the range in stocking rates of the surveyed graziers and the number of graziers falling within each range. Almost half of the graziers stocked heavier than 3 ha/DSE.

4.5 Grazier's concerns

Each grazer was asked to state their perception of the main concerns for the future of grazing in the mulga. The question was open to any answer and involved no prompting. A list of the main concerns is presented in Table 4.3, ranked according to the number of times raised.

By far the biggest single concern was woody weeds, noted by half of the graziers interviewed. Many graziers attributed the increase in woody weeds to the absence of summer rain and changing rainfall patterns, a problem nominated by ten graziers. The increased distribution of rain in winter months favoured woody weeds and the absence of grasses enabled the weeds to flourish.

Rising general costs concerned ten graziers or around 20% of the sample. Other graziers nominated specific cost areas, including interest rates (7), labour (5), fuel, energy and transport (2), education (1), living costs (1) and mustering (1).

The next biggest problem was competition for pasture from kangaroos. Graziers indicated that stocking rate differentials between paddocks tended to be reduced by native grazers. Thus, kangaroos can reduce the benefits of paddock-spelling. As indicated in Section 4.3, some graziers stocked at higher than preferred rates because of kangaroo competition.

Table 4.3. A list of graziers' concerns for the future

Problem	Number of mentions
1. Woody weeds	24
2. Absence of summer rain/change in climate pattern	10
3. Rising general costs	10
4. Competition from kangaroos	9
5. Gully and sheet erosion	8
6. Property sizes too small	8
7. High interest rates	7
8. Mulga regrowth	6
9. Drought	5
10. Overseas markets unreliable	5
11. Shortages and cost of skilled labour	5

Gully and sheet erosion was noted as a problem by eight graziers, or 17% of the sample. A similar number identified small property sizes as a problem. Seven graziers complained of high interest rates, a result which may reflect the timing of the survey.

5. CONCLUSIONS

The financial survey has shown that improved wool prices have enabled mulga graziers to reduce debt and increase their returns over the 3-year period. The average ratio of equity to total assets was 85% at 30-6-88, compared with 80% at 30-6-86. Only 2% of properties were 'at risk' in 1987-88 on the basis of ABARE criteria of negative cash margin and an equity ratio of under 70%.

Eastern mulga properties underperformed the regional average due to smaller property sizes, higher debt levels and a slightly greater reliance on beef cattle. Economics of size were evident among western mulga properties, particularly in labour costs and capital investment.

A preliminary analysis of stocking rates found correlation between property size and stocking rates. Large properties stocked at lighter rates, possibly due to variations in land type. No correlation between stocking rate and equity ratio or ownership intentions was found. A more detailed analysis will be prepared when land condition data becomes available.

A survey of graziers' concerns revealed that the features of degradation were foremost in graziers' problems. Woody weeds were by far the greatest problem.

Further research is planned towards determining stocking rate and investigating the impact of land prices on management decisions.

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