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THE WILD HARVEST AND MARKETING OF KANGAROOS:

A CASE STUDY OF THE PROFITABILITY OF KANGAROOS COMPARED WITH SHEEP / BEEF IN QUEENSLAND

by

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SUMMARY

- The main objective of the study was to determine the conditions under which kangaroo harvesting and traditional farming (sheep/beef) are equally profitable. A further objective was to ascertain the probability of attaining these conditions in practice.
- ABARE survey data were used as the basis for establishing a control or average farm, against which various scenarios were developed and tested. These scenarios were used to answer the primary question of the profitability of kangaroo harvesting relative to sheep/beef using current prices, yields etc. Sensitivity analysis was then used to alter key variables or parameters and further test what effect they had on both absolute and relative profitability of the scenarios. The report does not attempt to deal with the issues of defining sustainability, degradation, or total grazing pressure.
- The base or control is a sheep/beef property in the Mitchell Grass Mulga region carrying 5350 sheep and 850 cattle on 220 square kilometres. Potentially, it can carry 23500 kangaroos in the absence of sheep and beef.
- **It takes unrealistically high prices for kangaroo products, and improbably favourable conditions for kangaroo production, to equate the profitability of 100% kangaroo harvesting with the traditional sheep/beef farming system. That is, converting a farm from sheep/beef to kangaroos is simply not profitable. Further, it is over simplistic and unrealistic to claim that the conversion of traditional grazing properties to kangaroo harvesting properties will rectify land degradation. At current and expected prices, the grazier is better off with sheep/beef, despite a poor financial performance over recent years due to a combination of drought and low wool prices. This means that efforts to address the issue of land degradation will need to be directed elsewhere.**
- The potential supply of kangaroo meat in Australia, based on 100% quota utilisation, is estimated to be 57000t/year (or 3.2kg/person/year based on 57000t/18M people) from 4.8M kangaroos harvested (1993 National Quota) (Switala 1995). This is only about 4% of total red meat production of 2,807,000t/year (75 - 80kg/head/year). The underlying assumption here is that kangaroos remain a harvested rather than a farmed resource and that existing grazing industries are not replaced by kangaroos. If this were to occur, the extra production is likely to severely depress kangaroo meat prices.
- The current situation in Queensland and most other states is that 75% of kangaroos are shot for their skin only, (carcasses not utilised), and the remaining 25% are shot mainly for pet food at a retail price of \$0.85 - \$1.05/kg. Given this, it is evident that even if 100% quota usage is assumed, the current retail value of kangaroo meat would not exceed about \$15M. The value of skins is additional to this. This estimated income of \$15M is shared among a relatively small group of professional shooters, processors, tanners, and retailers. Most graziers benefit in an indirect manner only, if at all, through temporarily lower grazing pressure on their pastures. They receive no direct cash benefit.
- However opinions vary widely as to the potential value of kangaroo meat, depending upon the proportion of the quota harvested, the proportion sold for human consumption versus that for pet food, and the retail price used. For example, using a retail price of \$6.00/kg, Switala (1995) estimates the potential value of kangaroo meat to be about \$342M/year

(57000t @ \$6.00/kg). This assumes all kangaroos harvested in Australia are sold as game meat. It is evident therefore that the difference between actual and potential gross values of kangaroo meat in Australia is enormous, and may be the source of unrealistic expectations within the industry.

- If in the interests of arresting land degradation, large numbers of graziers converted their sheep/beef properties to kangaroo harvesting operations, the production of kangaroo meat would soar. For example, for the Mitchell Grass mulga area used in this report (ABARE Region 314), 723 properties each run an average 5350 sheep and 850 cattle, a total of approximately 3.86M sheep and 0.6M cattle. In the absence of sheep and cattle, each property will run about 23456 kangaroos, a total of 17M for the Region. From this number, the annual harvest will average 3518 per property, a total of 2.5M, yielding a total of 26000t of saleable boneless kangaroo meat (10.17kg dressed weight/carcase). This is approximately half of the total Australian potential production (57000t) - from one fairly small area in Queensland alone! It is also about half of the total volume of world trade in game meat. The downward effect on domestic and export prices of such a large increase in supply for both game meat and pet food would be immediate and drastic.
- Kangaroo meat has some excellent characteristics (low fat etc.). A sound marketing program might enable higher prices to be obtained. However, it is doubtful if this will translate to substantial price increases at the farm gate. Thus kangaroos are likely to continue to be considered by graziers as providing unwanted competition to sheep and cattle rather than a resource. Solving the problem of land degradation will require other methods and approaches. In summary, it is most unlikely to be done by replacing sheep/beef with kangaroo harvesting

I. INTRODUCTION

1.1 Background

The problem of land degradation in Western Queensland has long been recognized and well documented. For example, according to the Queensland Department of Lands, "Land degradation is evident on some two-thirds of the Mulga Region of south-western Queensland, affecting both the regional and State economies to the extent of some \$52 million in lost production per year." (Position Paper January 1993). This has led to the search for a land use system which has greater long term stability. That is, a farming system which is sustainable in both economic and environmental terms.

Opinions vary widely as to the best way to achieve this goal, but central to the issue is how to deal with the most prevalent large native herbivores - kangaroos, in addition to sheep and cattle. Kangaroos have long been regarded by many as pests which compete with sheep, beef, and cropping for available resources. Those who hold this view see kangaroos as a destabilising influence in grazing management, invariably leading to land degradation.

Opposing this view are those who believe that it is the influence of man with the introduction of sheep, beef, cropping and other animals which has destroyed the natural equilibrium once believed to exist. Some in this group feel that if properly managed, kangaroo harvesting might replace the introduced farming systems. That is, it could prove to be just as profitable while at the same time, environmentally sustainable with no land degradation.

In practice, no property uses 100% of its water and pasture to run sheep and beef since an estimated 40% of these resources are used by kangaroos and other wild fauna and feral animals.

1.2 Problem statement and study objectives

The aim of this report is to examine the profitability of the land use alternatives (sheep/beef vresus kangaroos), and determine the conditions under which financial equality between them may be attained

The problem may be expressed as follows:

“Is it likely that kangaroo harvesting could be as profitable as the current grazing land use in western Queensland?”

In defining the problem as outlined above, there is an inherent assumption that kangaroo harvesting will not result in more land degradation. However, the evidence to date suggests that when competing for feed with sheep and cattle, kangaroos do add to total grazing pressure, and this can increase land degradation, particularly in times of drought.

The main objective of the study is to determine the conditions (prices, yields etc) under which kangaroo harvesting and traditional farming are equally profitable.

The probability of attaining these conditions is discussed. Marketing data, including export information, are included to provide a realistic basis underlying price estimates and sales volumes, and to give an idea of potential sales in the future.

1.3 Ownership of kangaroos

Kangaroos are owned by the Crown and their harvest controlled by the Australian Nature Conservation Agency (ANCA) through control of exports of kangaroo products, and the Queensland Department of Environment (DoE) through the quota system and the issuance of tags to licensed shooters. Legally, kangaroos cannot be contained (trapped) within a kangaroo proof fence for purposes of harvesting. In any case, from a financial viewpoint, the cost of a strong fence about 2.4m high (approximately \$8000/km) would appear very questionable. Therefore kangaroos will continue to migrate from one property to another.

1.4 Kangaroo Population Data

Over the ten year period from 1961 to 1990, total kangaroo population for major commercially harvested species varied from approximately 10 million to 18 million. The main reason for this was variation in seasonal conditions.

Under the *Commonwealth Wildlife Protection (Regulation of Exports and Imports) Act 1982*, those States with approved kangaroo management schemes are entitled to export the products

from their harvest up to a quota. In 1993, the approximate quota as approved by the ANCA for all states was 4.8M (ANCA). However, in most years, only 60% to 90% of the quota seems to be harvested.

Kangaroo densities also vary greatly from year to year and between locations. The range seems to be from 5 to 35 kangaroos per square kilometre.

Presently, the overwhelming end use of kangaroo meat is for pet food and the average wholesale value is about \$1.00 per kilogram. The current use of kangaroo meat for human consumption is estimated to be only 100 - 150t/year in Queensland and New South Wales, 400t/year in South Australia, and about 500 to 600t/year for all of Australia. The rest is sold at much lower prices for pet food.

Supply also can vary widely from year to year depending upon seasonal conditions. The potential supply for 1996 would not exceed 40000t, and has been as low as 20000t/year in the early 1980's.

1.5 The distribution of the benefits from kangaroo harvesting

Shooting for the skin

When a kangaroo is shot for its skin, the carcass has no meat value and so it is left in the field to rot. The professional shooter gets the value of the skin. The grazier gets no direct financial reward from this transaction, only the indirect benefit of reduced grazing pressure on his pastures from fewer kangaroos. Skin shooting is often conducted in (but not restricted to) fairly remote areas where it is difficult or uneconomic to get chiller boxes for meat. About 75% of all kangaroos shot in Queensland are shot for their skin only.

Shooting for meat

When a kangaroo is shot for its carcass or the value of its meat, the shooter is paid for delivery of the whole carcass with the skin on. While the shooter is paid for the meat on a per kilogram basis, he is actually being paid for both the skin and the meat because the processor claims the value of the skin regardless of carcass weight. As before, the grazier gets no direct benefit from this transaction.

The situation for the new "roo man" or kangaroo harvester.

If a grazier decides to transform his property from sheep/beef to kangaroo harvesting, he will be restricted to the same market constraints as the professional shooter. That is, his kangaroos will be shot for either their skin or their meat, as outlined above. Benefits beyond the farm gate will be captured by the processor, the wholesaler/distributor, the retailer, and the exporter. Graziers who convert their properties to kangaroo harvesting are still likely to employ professional shooters.

2. THE MARKETING OF KANGAROO MEAT

2.1 The "marketing solution"

There seems to be a perception that if only the correct marketing techniques were applied and sustained, most of the problems within the industry could be resolved. For example, if improved marketing led to a significantly higher price for kangaroo meat, kangaroos would be recognized as a valuable resource, and shooting for skins only with the consequent wastage would be a thing of the past. Graziers would benefit, as well as all others involved in the industry. Considered to be an oversimplification, this approach is termed the "marketing solution"

Without question, if graziers felt they could profit from kangaroo harvesting, they would have certainly moved in that direction by now. However, a large scale shift to kangaroo harvesting as advocated by some would also result in much higher volumes of kangaroo meat of all description on both domestic and export markets. This would have a depressing effect on prices. Thus while locating new markets is obviously the first step, the industry's capacity to gear up quickly to supply more product should not be underestimated. The cessation of shooting for skins only would of itself provide an additional potential volume of about 13000t/year.

The "kangaroo industry" is made up of what appears to be a loose affiliation of five sectors or stakeholders. They are the shooters, graziers, processors, wholesaler/distributors, and retailers. They are represented respectively by the Association of Professional Shooters, United Graziers of Australia (UGA) and Cattlemens Union (CU), and the Australian Game Meat Producers Association. Other related bodies include the Kangaroo Industry Association of Australia (KIAA) who have developed a strategic plan and intend to appoint a Development Officer. Associated with these groups are the various state and federal departments responsible for maintenance of the kangaroo population and hygiene and export regulations. Research funds are provided by other organisations such as the Rural Industries Research and Development Corporation (RIRDC). However, absent from the above seems to be a strong cohesive body which speaks with authority for the whole industry. This acts as a constraint in the formulation of a national policy for the kangaroo industry.

2.2 Domestic market perceptions of kangaroo game meat

Kangaroo meat has a negative market image in Australia and in some overseas markets. There has been some adverse publicity from animal liberationists, along with stories of the dangers of toxoplasmosis and salmonella. As previously stated, some proponents of kangaroo harvesting have long advocated that if the kangaroo game meat market was further developed for human consumption, the profitability of the kangaroo industry would be significantly improved. The central issue here is to estimate under what conditions kangaroos are equally profitable with sheep/beef.

Table 1 shows the breakdown in the sale of an average 18kg carcass for domestic consumption, dressing out at 10.17kg (56.5% DW).

Table 1**ESTIMATION OF AVERAGE RETAIL PRICE - KANGAROO GAME MEAT**

Top quality meat	10	1.0107	4.00 - 9.50	4.07 - 9.66
Second line meat	20	2.034	2.50 - 3.50	5.09 - 7.12
Manufactured mt	70	7.119	0.85 - 1.05	6.05 - 7.47

The likely average price range to the retailer for the 10.17kg saleable game meat carcass is \$1.50 to \$2.38/kg.

Top quality meat is made up of fillets, rumps, and topsides. Second line meat is comprised of rounds and silversides. Manufacture 1 meat is made up of necks, shoulders, bellies, and shanks. Sales of kangaroo meat to the domestic market almost entirely refer to the 10% top quality component only. The rest is mainly exported. As previously stated, of the domestic sales, approximately 400t/year is sold in South Australia where kangaroo meat has long been commonplace on the domestic retail market, and about 100 to 150t/year to the NSW and QLD, a nationwide total of between 500 and 600t/year.

(b) Profitability of game meat, pet meat, and skins

Is the current price range high enough for kangaroos to be equally profitable with sheep/beef? To answer this question, the marketing chains for the two main kangaroo products, game meat and pet food, are first outlined in Table 2 below. The value of the skin is also incorporated.

Table 2 shows that at current domestic prices, the available profit margins for both the game and pet food markets are very small. Nor do the calculations include margins of profit for the processor or the retailer. There is little to be gained by increasing the supply of kangaroo meat for pet food since the margins are so small and alternatives for the retail trade such as low grade beef are readily available.

While margins for game meat appear a little more substantial, they still have to provide a profit for the processor as previously stated. However, the real opportunity for improving financial returns seems to lie in increasing the market proportion and price for the second line meat, now commanding the same or similar price as pet food. A rise in the price of the manufactured component would also be beneficial. It is in these categories that the public perception of kangaroo meat needs to undergo the greatest change. In general, profit margins for kangaroo game meat on the domestic market are not conducive to an expansion of supply.

Table 2		
DOMESTIC MARKETING CHAIN - CURRENT SITUATION		
Item	Game Meat	Pet Food
Raw material - Roo at chiller box - (\$/kg carcass wt)	0.50 - 0.528	0.472 - 0.50
Average kangaroo carcass weight - (kg)	18.00	18.00
Average cost in the field to processor (\$/roo)	0.90	0.84
Plus		
Freight cost per kangaroo (\$/roo)*	3.00 - 4.50	1.00 - 3.00
Other bush costs - (electricity, repairs, misc) (\$/roo)	0.75 - 1.25	0.75 - 1.00
Sub-total of costs to processor at factory door (\$/roo)	4.75 - 6.25	2.59 - 3.54
Less		
Value of skin (\$/roo)	8.00 - 9.00	8.00 - 9.00
Net value of roo at processor - door (\$/roo)	1.85 - 2.75	1.85 - 2.75
Plus		
Processor's cost - estimate only (\$/roo)	7.00 - 10.00	5.00 - 7.00
Total cost to processor - no profit included (\$/roo)	11.75 - 16.75	7.44 - 10.54
Average dressing out rate (%)	54% - 51%	60%
Average dressing out weight (kg/roo as boneless meat)	9.72 - 9.18	10.80
Average cost ex processor factory door (\$/kg boneless meat)	1.21	0.97
Plus		
Freight to Wholesaler/distributor (\$/kg boneless meat)	minimal	0.06 - 0.15
Wholesaler's commission and other costs (30% to 35%)	0.36 - 0.62	0.20 - 0.36
Total cost to the retailer (\$/kg boneless meat)	1.57	1.13
Compared with:		
Current price range - domestic retail market		

* Most of the initial processing for pet food is done in provincial areas, whereas processing for game meat is located in capital cities.

Source: Licensed Fauna Dealers

2.4 Exporting kangaroo meat

For game meat in the period 1985 to 1991, the volume exported has varied from 48 to 290t/year, the average being 142t/year. Prices were in the range of \$1.00 to \$1.50/kg FOB in most years. In 1994/95, a total of 1600t was exported for human consumption. In the three previous years, it had averaged only about 500t/year. The largest consumers in more recent years are the Russian Federation, Belgium, and Germany. The FOB prices were quite low at \$0.54/kg, \$2.07/kg, and \$2.70/kg respectively for these countries. Overall, the average price in 1994/95 was still only \$1.59/kg for all countries. It is obvious that profit margins for kangaroo meat exporters must be very small, although the market for game meat in particular appears to be growing in volume (ABS).

For pet food, the volume exported varied from about 200 to 500t/year, the average being 352t/year. Prices were in the range of \$0.60 to \$0.80/kg FOB in most years. The major petfood markets in recent years are Indonesia and Macau. The unit price received across all markets has been in the range of \$0.63 to \$0.80 (ABS).

More recent market research work in Europe by officers of QDPI suggests that for small volumes of top grade kangaroo game meat, wholesale prices of \$12 to \$21/kg FOB appear possible (Miles, et al forthcoming). This research found top quality kangaroo meat cuts selling for higher retail prices than most game meats in some European markets. Note also that these prices are for the top 10% (1kg) of the saleable meat per carcass only.

Perhaps the best indication of the most likely price range in the long term for kangaroo game meat is to be found in the prices paid for other types of game meats. In 1993, total world trade in game meats approximated only 47000t. In previous years, it was 34000t in 1990, 39000t in 1991, and 46000t in 1992 (UN Trade Database). Prices in 1993 ranged from approximately \$4.50 to \$17.50/kg CIF (say \$1.50 to \$14.50/kg FOB Australia), the average being \$7.53/kg CIF (approximately \$4.50/kg FOB Australia). Miles et al found that Germany mainly used kangaroo meat as a cheap filler with other game meats. As a result, kangaroo has a low profile in this market as consumers are not aware they are eating it.

To summarise, the overwhelming evidence suggests that current export prices for kangaroo meat of all descriptions are relatively low. However as noted, Miles et al have identified some small volume, high value, niche markets in Europe where top quality kangaroo meat cuts have been sold for higher retail prices than most game meats. Given the state of the industry as described in this report, niche marketing of itself is not considered to be a significant factor in the development of the kangaroo industry.

Total world game meat production does not exceed 50000t a year, although consumption is growing. This growth can be partly attributed to consumers' growing need for clean and green products in the face of growing food crises such as Britain's mad cow disease. Hopefully, this may mean future opportunities for the expansion of kangaroo meat on international markets.

Marketing the product on the export market is only part of the solution to the industry's problems. Major increases in the overall prices will require better utilisation of the entire carcass and addressing the production and quality issues surrounding the product.

3. MODELLING THE POTENTIAL WILD HARVEST OF KANGAROOS

3.1 Methodology of the study

The approach adopted is to estimate the financial performance of an average property in a simulated transition from 60% sheep/beef (regarded as the norm or "control") to 100% kangaroos. (The remaining 40% of the pasture on the property is assumed to be used mainly by kangaroos, but also by other wildlife such as feral goats, wild pigs, emus, etc.). By varying key parameters such as prices and yields either singly or as a combination, the effect on profitability is measured and observed.

The sheep/beef "control" used in the report measures the performance of an average farm for the five year period 1990/91 to 1994/95. This period was one of severe drought (1989 to 1995) and low commodity prices. To this extent, the traditional farming system is portrayed under very unfavourable conditions. Data prior to 1990 were excluded on the grounds that the wool price support scheme then existent resulted in prices not applicable to conditions currently faced by the wool industry.

The report does not attempt to define what long term sustainability is for any farming system nor answer the question of how to achieve it. Nor does it try to define total grazing pressure. These matters are covered by the various land use reports on the subject. Instead, it confines itself to determining the profitability of a number of hypothetical farming systems which may be viewed as alternatives to the traditional sheep/beef grazing for which actual data are known; and which are believed to be biologically and economically sustainable.

3.2 Data collection and sample selection

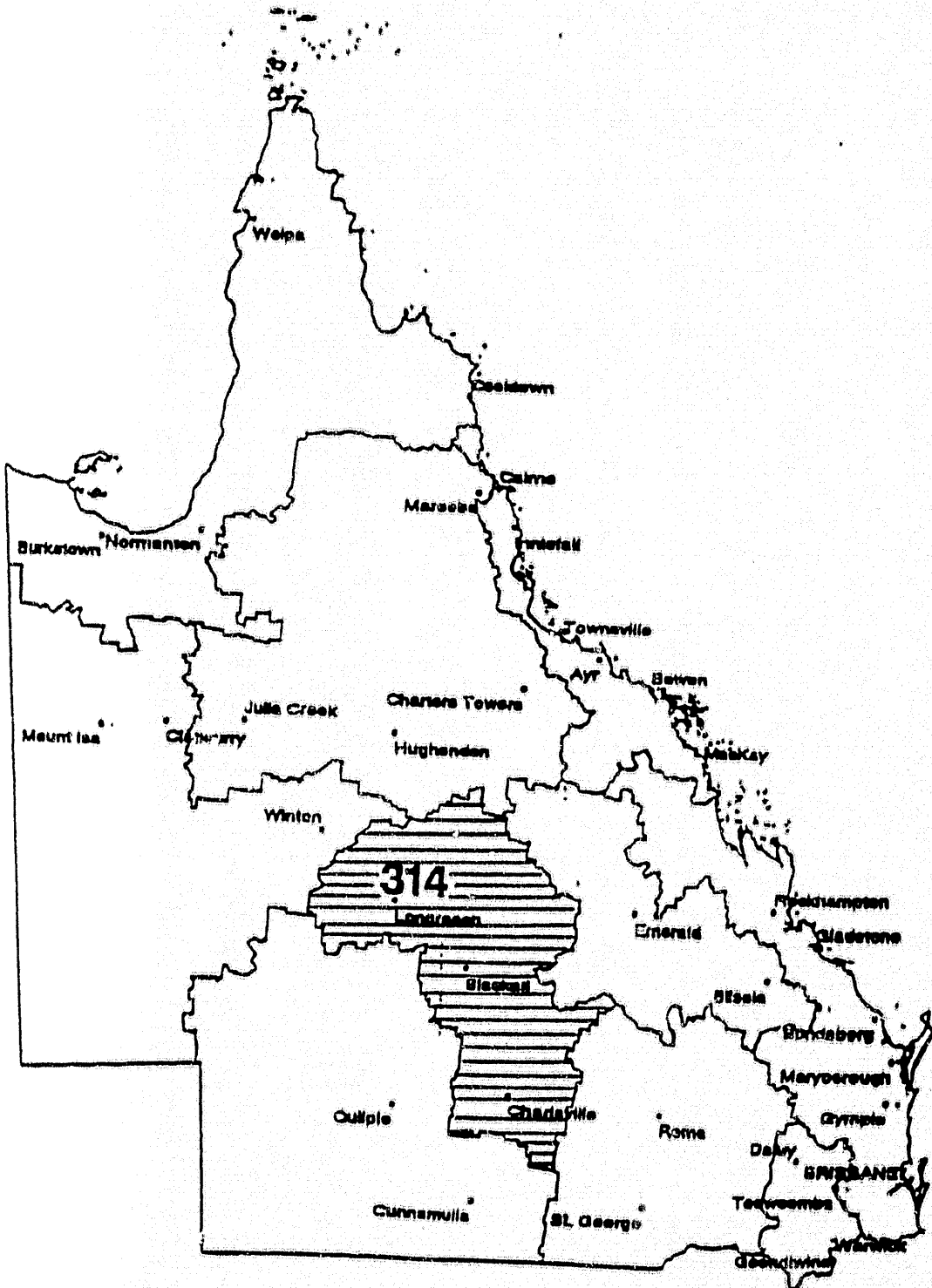
Data required relate principally to effecting the transition from sheep/beef to kangaroos. These have been collected from a number of sources including the Queensland Department of Primary Industries (QDPI), the DoE, the Australian Bureau of Agricultural and Resource Economics (ABARE), and the Kangaroo Industry Association of Australia (KIAA).

Kangaroo harvest data for 1992-93 indicate that about 50% of all kangaroos harvested in Queensland were obtained from the Southern Mitchell Grass / Mulga area of central western and south western Queensland. Because this area is the most prolific in terms of numbers of kangaroos harvested in the state, it was chosen for analysis in this report. Known also as an area where considerable land degradation has occurred, it has three distinct grazing systems. These are:

- (a) sheep;
- (b) beef; and
- (c) sheep/beef.

The annual Australian and Grazing Industries Survey is conducted by ABARE. The Southern Mitchell Grass / Mulga area is contained within ABARE Survey Region No.314, extending from south of Charleville to north of Longreach (Figure 1).

Figure 1: Map showing ABARE survey region No.314



Over the five year period 1990-95, the 723 grazing properties in this region were evenly divided between specialist sheep (33%), specialist beef (33%), and combined sheep/beef producers (33%). Since there is no dominant farming system, ABARE survey data for all farming systems (723 properties) has been used.

Of the total of 723 properties, 40 (5.6%) were sampled. The average physical and financial performance of these sampled properties is the "control" property. This forms the basis for simulation work which transforms the property from sheep/beef only through a series of intermediate stages (called scenarios) until it is entirely devoted to harvesting kangaroos. The control property in the survey region has about 5350 sheep, 850 beef cattle, and 5000 kangaroos on almost 220 square kilometres.

3.3 Feral goats

Harvesting feral goats for sale is fairly common on many western Queensland properties. Provision is made for this in the analysis (Table 3), based on a stocking rate of 5 goats per square kilometre, a harvesting rate of 30% per year, and an average price of \$12 per head. Provision is also made in the model to vary these parameters as required.

3.4 Identification of key variables

Key variables are defined as those which have a major bearing on profitability and relate mainly to yield and price. Others include the substitution ratios of kangaroos for sheep and cattle. These variables are shown in Table 3.

Table 3							
KEY VARIABLES							
KEY VARIABLES							
Average	farm	area (ha)	22056				
Sheep						Likely range	
Average greasy wool price (\$/kg) =			3.525			3 to 4	
Average wool yield (kg/head) =			4.339			4 to 5	
Av. price/sheep sold (\$/head) =			8.755			8 to 10	
Beef							
Average price/head sold (\$/head) =			455			400 to 500	
Kangaroos							
No. of roos per sheep equivalent =			1.52			1.45 to 1.65	
No. of roos per beef equivalent =			12.16			11 to 13	
Aver. no. roos carried per Km ² =			23			20 to 30	
Aver carcass price-pet food(\$/kg) =			0.45			0.36 to 0.56	
Aver carcass price-game meat(\$/kg) =			0.50			0.42 to 0.56	
Kangaroos shot for skins (%) =			75.00			70 to 80	
Kangaroos shot for meat (%) =			25.00			20 to 30	
Meat roos sold as pet meat (%) =			95.00			95 to 100	
Meat roos sold as game meat (%) =			5.00			1 to 5	
Av. roo carcass yield(kg DW) =			18			16 to 22	
Average roo skin price (\$/skin) =			9.00			7 to 10	
Farmer's roo shooting costs (\$/roo)=			3.00			(Excl. lab and deprec.)	
Contract roo shooting costs(\$/roo)=			7.50			(Variable costs only)	
Kangaroo harvesting rate (%) =			15.00			15 to 40	
No. of goats per km ² =			5			0 to 10	
Average price per goat on farm (\$)=			12.00			8 to 20	
Goat harvesting rate (%) =			30.00			20 to 40	
Labour rates-all types (Av \$/wk)			357.23				

Source : ABARE, ODPI, DoE, Licensed Fauna Dealers

3.5 Construction of the model

Setting the parameters

A spreadsheet model was constructed to outline and directly compare the control with five scenarios depicting the transition from sheep/beef to kangaroos. There is no income to producers from kangaroos in the control. The aim of this approach is to identify the financial benefits and costs of the transition, while at the same time, acknowledging the rigidities and limitations of such models. One of the scenarios (No.1) actually reduces the number of

kangaroos through heavier than normal shooting but leaves unchanged the number of sheep. Wool production is assumed to increase by 10% in this scenario.

In terms of grazing pressure and the use of resources, these scenarios are:

Scenario No	Sheep/beef (%)	Kangaroos (%)
1	70	30
Control	60	40
2	50	50
3	40	60
4	20	80
5	0	100

Results are expressed in terms of the standard ABARE measures of financial performance:

(A) Total cash receipts

less

(B) Total cash costs

= (C) Farm cash income

less imputed costs(stock adjustments, depreciation, farmer's labour)

=(D) Farm business profit

Provision is made in the model for variation in costs and returns in the transition from sheep/beef to kangaroos. For example, since kangaroos do not require shearing or crutching etc., these costs are eliminated on a pro rata basis as kangaroos replace sheep/beef. Other adjustments are made to costs as required. The substitution rate is 1.52 and 12.16 kangaroos respectively per dry sheep and adult beef equivalent.

Professional shooting costs of \$7.50/head are used in this report, the shooting being done by contracted professionals in all the transition stages from sheep/beef to kangaroos (Scenarios 2 to 5). For the current situation (Control), all shooting is also done by professional shooters but at no cost to the grazier since they (shooters) keep all the revenues from sale of kangaroos. With Scenario 1, the grazier seeks to deliberately reduce kangaroo numbers by employing a professional shooter. In this case, he also pays \$7.50/head shot with all revenue from kangaroos accruing to the shooters.

4. RESULTS

4.1 Profitability of alternative enterprise mixes

At present day commodity prices and input costs, the conversion of the average sheep/beef farm to a pure "kangaroo harvesting" property is highly unprofitable. The greater the proportion of kangaroos relative to sheep/beef, the greater the financial loss. Given the key variables as outlined, no grazer would consider changing his current farming system in favour of kangaroos. For detail, refer to Table 4.

Note also that even the control farm is operating at a loss: (an average Farm Business Profit of -\$25848 for the five year period 1990-91 to 1994-95). This loss is mainly due to low wool and cattle prices during the prolonged five year drought from 1990-91 to 1994-95, the period of the study. Thus, if ever there was a period when kangaroo harvesting was in a position to more favourably compare with the traditional grazing industries, this should be it. However, despite these most unfavourable circumstances from the viewpoint of sheep and beef, kangaroo harvesting is still relatively unprofitable.

Therefore, under present day physical and financial constraints, kangaroo harvesting as an alternative to sheep/beef cannot be recommended. A return to better seasonal conditions and higher average prices for sheep and beef products would only strengthen this conclusion.

4.2 Sensitivity to changes in farm productivity and practices

The next objective of this study is to determine the set of conditions under which kangaroo harvesting and traditional farming are equally profitable. To do this, key variables used in the model were modified to see what effect they had on farm profitability. By modifying these variables outlined in Section 3.4, the effects on the profitability of the average sheep/beef farm in the region (the control) and the related five scenarios were determined.

For simplicity of illustration, a series of nine changes or "sensitivity runs"(SR) are made. For each run, one or more variables are altered. These runs and associated commentary are listed below. For detailed results, refer to Table 5.

SR8 and SR9 show the price required at the farm gate for kangaroos in carcase form to generate the same farm business profit as sheep/beef. As previously stated, the question remains as to the practicality of such prices.

Using the same marketing chain format as shown in Table 2, Table 6 inputs these "equalising prices" into the chain and traces their effect on final prices required at the retail level. It is evident that under current circumstances, a price of \$3.75 at the farm gate is inconceivable for domestic market sales. Even the farm gate price of \$1.31/kg results in a price to retailers approximately double that currently being paid by them for kangaroo game meat. Note that these costs still do not include a margin of profit for the processor.

Table 4: Summary of results

Item	Scenario No.1	Control	Scenario No.2	Scenario No.3	Scenario No.4	Scenario No.5
Resource mix ratio (Sheep/beef : Roos)	70%:30%	60%:40%	50% : 50%	40%:60%	20% : 80%	0% : 100%
	(\$)	(\$)	(\$)	(\$)	(\$)	(\$)
(A) Estimated cash receipts						
Crops	1218	1218	0	0	0	0
Sheep (a) Wool	97720	88836	73728	59519	29317	0
(b) Sheep and lambs	7932	7932	6584	5314	2618	0
Beef	109200	109200	90545	73255	35945	0
Other livestock	555	555	461	372	183	0
Other (off-farm contracts etc)	19890	19890	16509	13326	6563	0
Sub-total	236515	227631	187826	151786	74626	0
Kangaroos (a) Skins	0	0	8310	11288	17610	23749
(b) Meat	0	0	2507	3405	5312	7164
Sub-total	0	0	10816	14693	22922	30913
Feral goats	0	0	3970	3970	3970	3970
Total cash receipts (A)	236515	227631	202613	170449	101518	34883
(B) Estimated cash costs						
Operating costs(seed,fert,chemicals)	850	850	0	0	0	0
Livestock husbandry	53929	53929	44761	36132	17797	0
Plant & machinery (fuel,oil,R&M)	34131	34131	28329	22868	11263	11262
Shed costs, marketing(inc shooting)	39578	30345	34419	32873	29580	26388
Wages	9288	9288	9288	4287	0	0
Administration	73765	73765	70280	64354	54525	46620
Total cash costs (B)	211541	202308	187077	160514	113165	84270
Farm Cash Income (A - B)	24974	25323	15536	9935	-11647	-49386
Adjusted by:						
Build up in trading stocks (+)	12012	12012	9970	8048	3964	0
Depreciation (-)	23547	23547	23547	23547	12000	10000
Operator and family labour (-)	39636	39636	38224	32865	27864	18576
Farm Business Profit	-26197	-25848	-36265	-38429	-47547	-77962

Table 5

FARM BUSINESS PROFITS FOR SENSITIVITY ANALYSIS

Item		Sensitivity No.1	Control	Sensitivity No.2	Sensitivity No.3	Sensitivity No.4	Sensitivity No.5
Resource mix ratio (Sheep/beef: Roo)		70%:30%	60%:40%	50%:50%	40%:60%	20%:80%	0%
		(\$)	(\$)	(\$)	(\$)	(\$)	(\$)
	BASE	-26197	-25848	-36265	-38429	-47547	-
	Sensitivity No.1	Both wool price and yield up 5%	-16181	-16742	-28708	-32329	-44542
	Sensitivity No.2	70%:30% game:pet	-26197	-25848	-36196	-38335	-47400
	Sensitivity No.3	Roo harvest up from 15% to 30%	-35430	-25848	-34682	-36279	-44191
	Sensitivity No.4	Game meat up from \$0.50 to \$3/kg	-26197	-25848	-35573	-37489	-46079
	Sensitivity No.5	Pet meat up from \$0.45 to \$0.90/kg	-26197	-25848	-33897	-3212	-42528
	Sensitivity No.6	Game meat \$7/kg game:pet meat 50% : 50% ratio	-26197	-25848	-18136	-13804	-9128
	Sensitivity No.7	All the above for SR2 to SR5	-35430	-25848	-22743	-20062	-18892
	Sensitivity No.8	50/50 skin:meat 50/50 pet:game 15% harvest, \$3.75/kg game on farm price	-26197	-25848	-18275	-13992	-9241
	Sensitivity No.9	0/100 skin: meat 0/100 pet : game 15% harvest \$1.31/kg game on farm price	-26197	-25848	-18503	-13691	-8952

Table 6

GAME MEAT DOMESTIC MARKETING CHAIN - SR8 AND SR9

Item	SR8 (17 - harvest)	SR9 (17 - harvest)
Raw material - Roo at chiller box - (\$/kg carcass wt)	3.75	1.31
Average kangaroo carcass weight - (kg)	18.00	18.00
Average cost of roo at processor's door - (\$/roo)		
Plus		
Freight cost per kangaroo (\$/roo)*	3.00 - 4.50	3.00 - 4.50
Other bush costs - (electricity, repairs, misc) (\$/roo)	0.75 - 1.25	0.75 - 1.25
Sub-total of costs to processor's door - (\$/roo)		
Less		
Value of skin (\$/roo)	8.00 - 9.00	8.00 - 9.00
Net value of roo at processor's door - (\$/roo)		
Plus		
Processor's cost - estimate only (\$/roo)	7.00 - 10.00	7.00 - 10.00
Total cost to processor's door - (\$/roo)		
Average dressing out rate (%)	54% - 51%	54% - 51%
Average dressing out weight (kg/roo DW)	9.72 - 9.18	9.72 - 9.18
Average cost ex processor's door - (\$/kg DW)		
Plus		
Freight to Wholesaler/distributor (\$/kg DW))	minimal	minimal
Wholesaler's commission and other costs (30% to 35%)	2.17 - 2.83	0.81 - 1.16
Total cost to the retailer - (\$/kg DW)		
Compared with:		
Current price range - domestic retail market		

* Most of the initial processing for pet food is done in provincial areas, whereas processing for game meat is located in capital cities.

Source : Licensed Fauna Dealers

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