

IMPROVING CAPACITY FOR THE KANGAROO INDUSTRY TO BENEFIT SOUTH AUSTRALIAN REGIONAL COMMUNITIES AND RANGELAND ENVIRONMENTS

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ABSTRACT: Commercial kangaroo harvest contributes to sustainable regional communities and rangeland environments by bringing social, economic and environmental benefits. However, the South Australian kangaroo industry is not delivering these benefits to its potential capacity. South Australian harvest rates are lower than any of the other states, but demand from South Australian kangaroo meat processors for product is high. Therefore, low harvest rates cannot be explained by insufficient demand. This paper describes the factors that contribute to low harvest rate in South Australia, with particular attention to institutional and economic factors. Institutional reform of the South Australian kangaroo management system, including the introduction of competition, incentives and training, is required for the industry to provide greater environmental, social and economic benefit to South Australian regional communities.

1. INTRODUCTION

Kangaroos have been harvested over millennia by Aboriginal people who continue to value kangaroos for subsistence, economic, social and cultural purposes (Thomsen et al 2006). When Europeans arrived late in the eighteenth century kangaroos also became important for their survival and over time non-indigenous Australians have developed a range of values for kangaroos. In Australia today kangaroos are variously considered an icon of symbolic importance, a valuable, high quality resource and, during times of overabundance, kangaroos may be considered a nuisance or threat to agriculture and nature conservation.

Regardless of various perceptions of the kangaroo, the status of kangaroos as a resource is important to promoting sustainable land use in rangeland environments where livestock grazing occurs. The Australian rangeland environment is arid, fragile and easily degraded by overgrazing (Ludwig and Tongway 1995). Livestock grazing in the rangelands has resulted in water points being introduced to a previously dry landscape. Kangaroo populations, previously limited by water supply, have proliferated (Shepherd and Caughley 1987; Calaby and Grigg 1989) to the extent that kangaroo grazing makes significant contribution to total grazing pressure in the rangelands (McLeod

2004). Overabundant kangaroo populations can have severe deleterious effects on native vegetation and may impact on the survival of other native species (Fisher et al. 2005). Commercial kangaroo harvest is an important mechanism for managing kangaroo populations and maintaining ecological balance in rangeland environments (Grigg 1995).

Commercial kangaroo harvest is not only important to the ecological sustainability of rangeland environments, it also brings benefits to regional communities. The kangaroo industry contributes to the economic wealth of regional communities through the local purchase of fuel, food and other consumables by harvesters and transport companies. With the vast majority of South Australian harvesters living in regional towns or on pastoral stations¹, the revenue injected into regional communities by the kangaroo industry has a significant impact on small businesses that rely on local trade to keep their business afloat (Gerlach 2003).

The kangaroo industry also makes important social contributions to these communities. Skilled labour is a scarce resource in the rangelands and harvesters often contribute to property operations by checking water supplies and fences. Harvesters are often also skilled in other trades, as electricians, welders, plumbers or station hands. They make significant contribution to the human capital available in regional communities.

Declining population levels in country towns across Australia has led to speculation about the future of regional Australia (Alston 2004). Alston (2002:94) has noted that “much of rural Australia finds itself in serious economic decline”. People require an economic base in order to remain in regional areas. The kangaroo industry provides an economic base for people working as harvesters and, as noted above, brings social and other benefits to regional areas. The kangaroo industry employs over 4000 people and many of these people live and work in regional areas.

Our research exploring the social and institutional issues for the kangaroo industry has highlighted the importance of the industry to regional Australia. However, in South Australia the kangaroo industry could be making far greater contribution to regional communities. This paper presents the problem of low harvest rates in South Australia and makes recommendations for changes to the institutional framework that will promote higher a harvest rate and increase industry benefits to regional communities.

2. REGULATION OF THE SOUTH AUSTRALIAN KANGAROO INDUSTRY

Three species of large kangaroos are harvested in the South Australian rangelands for commercial markets: red kangaroo (*Macropus rufus*), western grey kangaroo (*M. fuliginosus*) and euro (*M. robustus*). Annual harvest quotas are set by the state wildlife authority, the South Australian Department for

¹ In 2002, when there were 126 kangaroo harvesters licensed to operate in SA, four resided in Adelaide and one in western NSW. The remaining 121 were located in regional or remote areas of SA.

Environment and Heritage (SA DEH), and approved by the Australian Government Department of the Environment and Heritage. SA DEH conducts an annual aerial survey to estimate population levels of harvested species. Annual kangaroo harvest quotas are set at 15 to 20 percent of population estimates.

In 1996 SA DEH introduced property level quota allocation as a way to promote the role of landholders in kangaroo management (Alexander 1997). Since this time SA DEH have offered annual quota allocations to landholders for a particular number of each species that may be harvested from the property. Annual quota allocations are set using data collected during aerial survey together with regional land systems information. The landholder may accept, reduce or reject the quota allocation offer. For the most part, landholders accept quota allocations. Landholders are supplied with a quota allocation return form where they must designate the harvester and meat processor that will hold harvest rights to the property. Although it is possible for more than one harvester and meat processor to be nominated for each property, the form does not make this option evident to landholders. Therefore, nearly all landholders release the quota to a sole harvester.

The quota system is monitored through the use of sequentially numbered tags. Tags are allocated specifically according to property level quotas. Tags are specific to kangaroo species, denoted by colour, and the property of quota allocation, denoted by tag number. Tags are purchased from SA DEH by meat processors and currently cost \$1.20 each. Following purchase, meat processors supply property specific tags to harvesters according to the properties to which that harvester holds harvest rights. Harvesters may then harvest on properties to which the tags have been issued.

3. THE PROBLEM OF LOW HARVEST RATE

From 1997 to 2004, South Australian harvesters harvested a low proportion of the quota, averaging only 43.1 percent. During these same years harvest rates in other states were higher, averaging between 54 percent and 67 percent of quotas. However, prior to 1997 the South Australian harvest rate was similar to, or even greater than, the harvest rates of other states (Figure 1).

Low harvest rates are not due to lack of demand. Research conducted by Purtell and Associates (1997) found that South Australia has the highest level of consumer acceptance of kangaroo meat for human consumption amongst Australian states. South Australian meat processors currently import carcasses from interstate to meet demand for their products domestically and for export. Over the period 2002 to 2005, an average of 200,000 carcasses per annum were imported in to South Australia from New South Wales and Queensland. During these years the annual harvest fell short of the quota by an average of 280,000 kangaroos. Theoretically at least, the imported carcasses could have been harvested in South Australia.

The 200,000 carcasses imported annually from interstate represent significant lost earnings to South Australian harvesters. With an average carcass weight of 20 kg and the price paid in other states of around \$1.00 per kg, this equates to an

average loss of \$4 million per annum for South Australian harvesters. However, South Australian harvesters are paid less per kg than their interstate counterparts. If the 200,000 imported carcasses were harvested by South Australian harvesters at the current rate paid to them of 80 cents per kg, this would still be \$3.2 million that would be returned to South Australian harvesters and the regional communities in which they live and work.

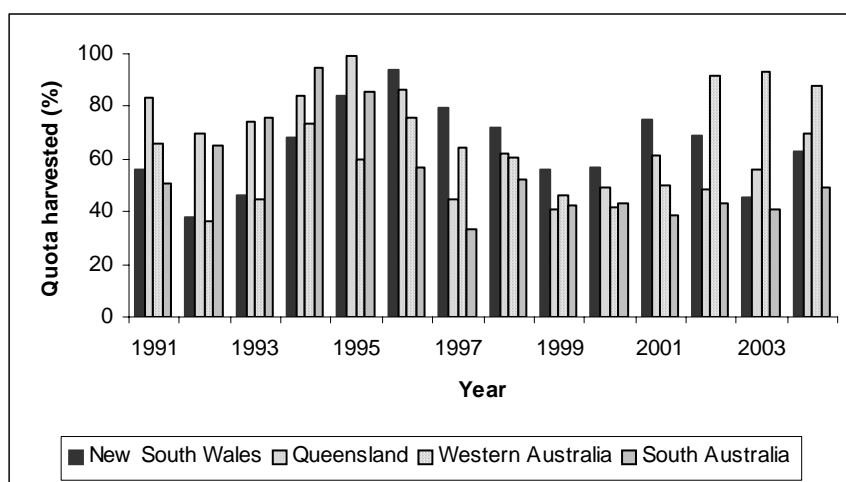


Figure 1. Kangaroo quota harvested (%) in NSW, Qld, WA and SA, 91-04

SA DEH is also missing out on significant revenue. 200,000 carcasses imported annually amount to a loss of \$240,000 that could have been made from the sale of tags. Revenue from the sale of tags goes directly to the SA DEH to fund the kangaroo management program, an entirely self-funding program that is heavily reliant on the sale of tags and cost of licensing to conduct kangaroo population surveys, issue quotas and licences and employ staff. Currently South Australian harvesters pay much higher licence fees than their interstate counterparts² as SA DEH tries to balance the cost of running the kangaroo management program with incoming revenue.

Import of kangaroo carcasses from interstate while there is quota available for local harvest means that the kangaroo industry is not returning benefits to South Australian regional communities to its full potential.

The problem of the quota not being taken is an issue, which can indicate that an inappropriate level of grazing is still occurring. (Landholder)

² South Australian harvesters pay approximately \$700 per annum in comparison to other states where \$120 per annum is the average price paid for a licence.

The harvest of a greater percentage of the quota in South Australia could lead to:

- Greater contributions to the management of total grazing pressure;
- An increase in the economic contribution of the kangaroo industry to regional communities; and
- More people living and working in regional communities

Understanding why South Australia harvests less than half of the quota is important to the social, economic and environmental sustainability of regional communities and landscapes. There is a need to consider ways to strengthen the South Australian industry and increase harvest rates. Developing an understanding of the problem has been an important focus of our research and forms the discourse of this paper.

4. METHODS

Our research has examined social, institutional and cultural factors that impact on the commercial harvest of kangaroos in South Australia. It involved qualitative research methods, primarily in-depth interviews with people engaged with the kangaroo industry. In three regions of the South Australian rangelands we interviewed people involved in the kangaroo industry as landholders, harvesters or meat processors. Our case study regions were: Port Augusta region, Northern Flinders Ranges region and Marla-Oodnadatta region, as shown in Figure 2.

Within each of these regions we introduced the research to, and requested participation from up to 12 landholders, the harvesters who conduct harvest activities on these landholders' properties and the meat processors who buy carcasses from these harvesters. After establishing our credibility, research participants were pleased that we were seeking to learn about issues of concern to them and would be presenting these in publications and forums. They provided detailed information on harvest activities, decision making, financial and social issues relevant to their livelihoods. The open-ended interview questions covered a range of topics including how people make decisions about harvesting, legal or policy barriers to implementing these decisions, and the costs and financial returns associated with harvesting.

Specific content of each interview varied according to the issues that research participants brought forward. Interviews varied from relatively short discussions of 45 minutes to long and detailed interviews of up to six hours duration. The interviews resulted in rich and detailed data. Robust analysis was assisted by use of qualitative analysis software which simplified the complex task of data management (Richards 1999). Our analysis of the data was tested for validity and accuracy using a second round of interviews with key research participants and other people that research participants had identified as rangeland experts. Liaison with staff from state government regulatory bodies also provided helpful feedback about the findings that emerged from data analysis.

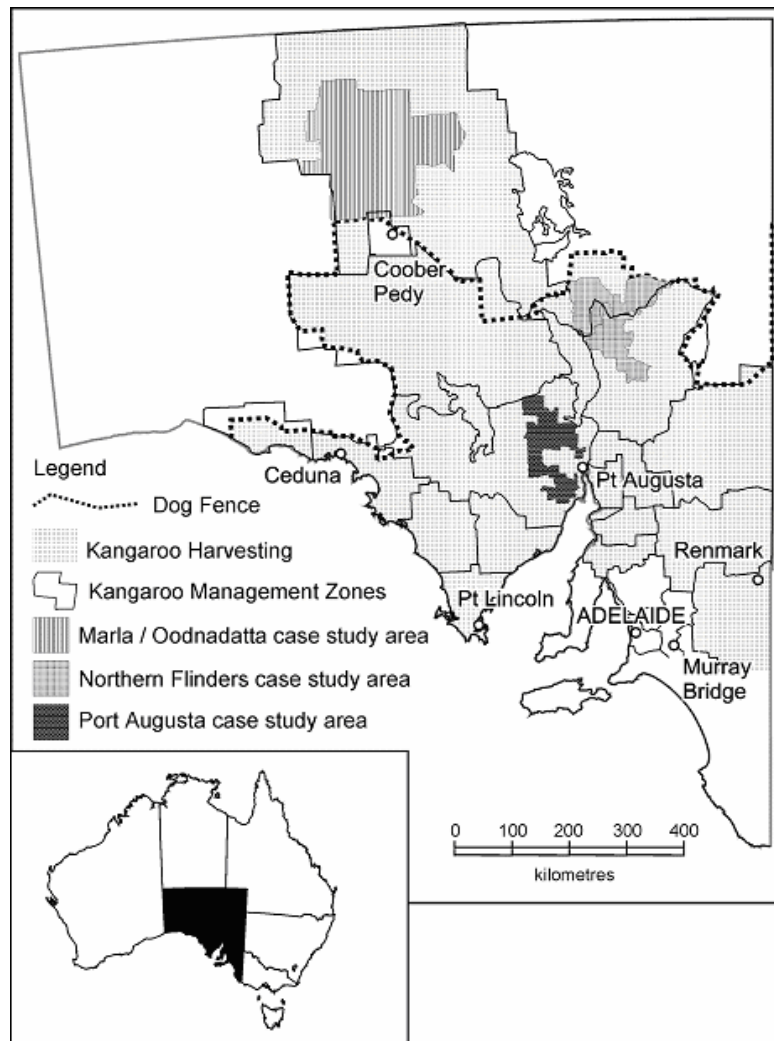


Figure 2. Case study regions in the South Australian rangelands.

5. UNDERSTANDING LOW HARVEST RATES

5.1 Individual harvester's rate of harvest

In South Australia kangaroo harvest rates and the spatial distribution of harvest effort are influenced by many variables. Harvesters described the factors that may influence the number of animals harvested, as presented below:

- Weather conditions: Harvesters generally do not try to harvest in poor weather conditions. They said that wind makes the kangaroos 'skittish' and may compromise shooting accuracy, while rain can make many places totally inaccessible.
- Topography: Terrain influences access to areas of a property. Before entering an area of rough terrain a harvester considers whether the vehicle will safely make it out again once loaded.
- Travel time: The distance a harvester travels to the place of harvest and then to a chiller post-harvest influences the number of hours spent harvesting.
- Skills and knowledge: Experienced harvesters have considerable knowledge about habits and movements of kangaroos. They know where to find kangaroos under particular conditions and also know the properties on which they harvest very well. As a result, their harvest effort is usually more efficient than those who are less experienced.

5.2 Explanations of South Australia's low harvest rate

The above factors influence harvest rate for individual harvesters. To help understand factors impacting on harvest rates at a broader level we asked harvesters, landholders and meat processors to explain why South Australia harvests less than half the annual quota. These research participants offered a range of reasons. The two main factors were:

- Few harvesters hold exclusive rights to too many properties, and
- Isolation and lack of infrastructure

Other important factors were:

- Rough terrain hinders access to kangaroos, and incurs high costs
- Low number of harvesters in South Australia
- Low prices paid to harvesters
- Meat processor preference not to process smaller kangaroos

Discussion of each of these factors follows.

Few harvesters hold exclusive harvest rights to too many properties

As mentioned earlier, the South Australian kangaroo management system was altered in 1996 to introduce property level quota allocation. This institutional framework resulted in a single harvester being allocated harvest rights to each property. A harvester can hold exclusive harvest rights to more

properties, and quota, than they can feasibly harvest in a year. Many harvesters and meat processors said that this impacts on harvest rate.

Some field processors [kangaroo harvesters] do not have access to much property and [their] ability to harvest kangaroos really depends on the property they have...There are some that have too much country tied up and are unable to shoot the quota for that country. (Meat processor)

There are no restrictions on how many properties for which one harvester may hold harvest rights and quota. Some harvesters said they could harvest many more kangaroos each year but find gaining access to additional properties on which to harvest problematic. When they seek harvest rights to other properties they face strong opposition from the harvesters who already hold harvest rights to those properties.

Somebody has got to die before you can get in. Because at the end of the day there's not enough country...Some people have a hell of a lot of land tied up where there could actually be somebody else shooting. (Kangaroo harvester)

The most important factor that contributes to difficulty gaining harvest rights to additional properties is the strong relationship of trust and loyalty between harvester and landholder. The landholder trusts that the harvester will conduct harvest in a professional manner and will contribute to management of the pastoral lease where appropriate. Harvesters often check water points and fences during their night's work and advise landholders of any problems the following morning. The high level of trust and loyalty that develops between the landholder and harvester means that they have more than a business relationship, they have a social relationship.

Harvesters hold on to the properties where they have harvest rights very tightly for good reason. Kangaroos are a mobile resource and local kangaroo populations move across the landscape according to changing environmental conditions. Therefore, harvesters find it advantageous to hold harvest rights to many properties in order to secure the greatest likelihood of access to a property with high kangaroo density and maximize the cost efficiency of harvest activities.

I'm one of those that hold a lot of country, I hold more country than what I should. I've got too much but it's not enough. (Kangaroo harvester)

Isolation and lack of infrastructure

Landholders and meat processors identified isolation and lack of infrastructure in the South Australian rangelands as an important factor that impacts on low harvest rates.

Geographically it's difficult because there's a lot more isolation and there's not many larger towns where shooters can work from. That is a big factor. (Meat processor)

The cost of harvest increases with distance from a harvester's residence because of increased fuel and vehicle maintenance costs. Furthermore, increased travel time results in reduced actual harvest time. Access to properties and transport of harvested kangaroos are also affected by the quality and quantity of the regional road network, including station tracks. These factors reduce the capacity of kangaroo harvesters to harvest more remote areas.

Our most remote case study region, the Marla-Oodnadatta area, was used to examine the spatial distribution of harvester effort within a region. Two harvesters were living at the township of Marla and two at Cadney Park. Table 1 shows that harvest rate declined with distance from where harvesters were living.

Table 1. Harvest rate (% quota harvested) and the relationship to distance from harvester's residence in the Marla-Oodnadatta case study region.

Property	% quota harvested	Distance from harvester's residence (km)
A and B	35-45%	0-100
C, D and E	15-35%	0-100
F, G and H	10-15%	100-200
I	No harvest	Over 200

Proximity to regional service centres influences spatial distribution of harvest effort not only within but also between our case study regions. Port Augusta is a major regional centre for the South Australian rangelands and approximately 40 percent of all South Australian harvesters are based there. In comparing harvest rates between case study regions we see that the Port Augusta region has a higher harvest rate than the other two case study regions (Table 2). Thus, properties located close to where many harvesters live are subject to greater harvest effort.

Table 2. Average quota harvested in case study areas 1997 to 2001.

Case study area	Average quota harvested
Port Augusta	44.33%
Northern Flinders Ranges	25.1%
Marla / Oodnadatta	29.25%

Many South Australian harvesters leave the family home for days or weeks at a time to live in a bush camp. This is necessary because of the long distances that often need to be traversed to reach the property of harvest.

A lot of shooters are living out at camps or somewhere, which is probably hard on them. I mean you've always got somewhere to live but it's not somewhere you'd like to call home...I've seen guys in tanks with the sides cut out of them. (Kangaroo harvester)

Living away from home incurs high social costs. Harvesters told us about missing out on their children growing up, being grumpy and tired while at home and the stress that the profession places on family and friends.

A lot of shooters are out on their own away from their families...I think the main strain you would find would be on family and relationships. (Kangaroo harvester)

The impact of terrain on kangaroo harvest

Spatial distribution of harvest effort is not uniform across the South Australian kangaroo harvest zone. The amount of land accessible for kangaroo harvest varies between properties depending on local geography and the condition of access roads.

They probably only work 10% of this place, it might be a bit more than that but they are not going to go up into the rough hills. So there's huge areas that will never see a shooter. (Landholder)

Some landholders and harvesters said that rough terrain and associated difficulty accessing kangaroos possibly has a large impact on harvest rates in South Australia. The harvesters that mentioned terrain as an issue generally made the link between rough terrain and increased harvest costs. Vehicle maintenance, time and risk of roll over all increase in rough terrain and impact on harvest rate.

It's as rough as guts on most stations around here. You won't get into some areas unless you want to bash your car to pieces and then you're not making anything. (Kangaroo harvester)

Meat processor preference for larger kangaroos

Some harvesters and landholders said that meat processor preference for larger kangaroos impacts on harvest rates in South Australia. There is a minimum weight limit of 14 kg placed on dressed³ carcasses by South Australian meat processors. Some refuse to pay harvesters for carcasses that are below this minimum weight on arrival at the processing plant.

Harvesters said that a carcass weighing 14 kg when placed in the chiller on the morning after harvest will generally weigh less when it arrives at the processing plant due to 'drying out' during cold storage and transport. Therefore, they must ensure that each carcass weighs 16 kg when placed in the chiller to be certain they will be paid for the carcass. An additional factor that impacts on the weight of kangaroo carcasses is the removal of the tail, a practice that is often requested by meat processors when tails are not in demand in order to reduce payments to harvesters.

If we can actually, instead of throwing the tail in the paddock, keep the tail attached to the kangaroo and get paid an extra 70 cents to a dollar a

³ A 'dressed carcass' is a harvested kangaroo that has been shot in the field, bled soon after and field dressed according to the requirements of the meat processor to which the harvester is supplying carcasses. Standard field dressing requirements involve removal of the internal organs other than the heart, lungs liver and kidneys, removal of feet up to the tarsal joints and paws to the carpal joint, removal of the head and often the tail.

kangaroo...Kangaroos use their tail as a fat store, so we're chucking away the best bit of the kangaroo which gives us a deficit on our weight, which brings us to an underweight, which makes shooting roos unviable. (Kangaroo harvester)

The reason meat processors place a minimum weight limit on carcasses is purely economic. It costs the same in wages and equipment to process a small kangaroo as it does a large kangaroo. But smaller carcasses return less from the sale of meat and skin than large carcasses. However, some harvesters and landholders pointed out that demanding larger kangaroos may not necessarily be in the best interests of meat processors in the long term.

It's about what the industry wants. But if I was a consumer, I'd like to think that I was eating a younger kangaroo rather than an old one...Our younger yearling beef is worth much more than the bull beef. (Landholder)

Low number of harvesters in the state

South Australia has a low number of harvesters in comparison to other states. Currently there are 79 licensed harvesters in South Australia, over 1600 in Queensland, approximately 300 in Western Australia and almost 1000 in New South Wales. However, to get a true picture of the number of harvesters we must consider the size of the quota. Figure 2 shows the quota for each state for the years 2000 to 2004.

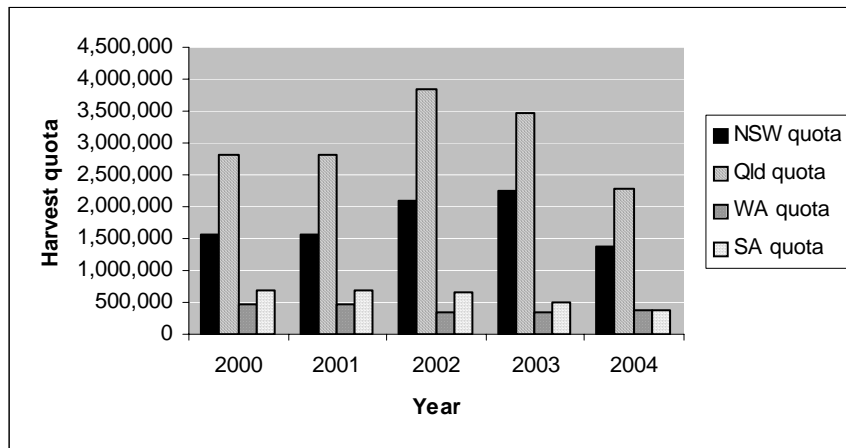


Figure 2. Kangaroo harvest quotas for NSW, QLD, WA and SA 2000 to 2004.

The much higher quotas of New South Wales and Queensland support many more harvesters. In contrast quotas between South Australia and Western Australia are comparable. However South Australia supports only one third of the harvesters that Western Australia supports.

At the commencement of this research in 2002 there were 126 harvesters in South Australia. Over the past four years we have noticed a decline in harvesters to the current total of 79 harvesters. Harvesters are aware of the decline and are concerned about the future of the South Australian industry. Although low harvester number means more properties (and quota) are available to existing harvesters, they recognise their financial viability must be balanced with management of total grazing pressure. This balance can only be maintained with an adequate number of harvesters.

Harvester recruitment in South Australia is low. Set-up costs are high, ranging from \$20,000 to \$80,000 depending on whether equipment is second hand or new. The greatest expense is the purchase of a 4WD vehicle (c \$50,000 new). The vehicle must be fitted with a tray and rack made of impervious material suitable for the transport of carcasses for human consumption. A stainless steel tray and rack is most commonly used at a cost of around \$5,000. Other items required range in price up to \$2,000. They include spotlights, firearms, accreditation fees, knives and steels, cleaning equipment and navigational equipment such as a GPS.

All harvesters must be accredited by TAFE in meat hygiene and firearms safety and accuracy. However, TAFE accreditation does not include practical components that teach newcomers to the industry the basic skills required for efficient harvest. A program that involves recognised training and mentoring is required to facilitate entry to the profession. Such a program is now in place in Queensland where people entering the industry go through the accreditation process with the support of full training and mentoring⁴. South Australia, and arguably other states also, need to implement similar training schemes.

However, more than training is needed to attract new people to the industry. Economic theory suggests that if there is enough money to be made from an activity there will be people to perform the task. With high set-up costs for new harvesters, there is a need for significant financial return. The price paid to harvesters is important to consider.

Low prices paid to harvesters

Young and Delforce (1986:44) noted in their study of commercial kangaroo harvesters in the 1980s that harvesters at that time were not “making excessive amounts of money from kangaroos”. Twenty years later, this is still the case. Harvesters in South Australia complain of low product prices and high running costs.

⁴ The program has been developed by the Qld Macropod and Wild Game Harvesters Association with the Qld Dept of Employment and Training and the Rural Industry Training and Extension Association. Further information is available from: www.rite.com.au or freecall: 1800 808 782.

People are dropping out because there is not enough money in it. (Kangaroo harvester)

The typical price being paid to South Australian harvesters is 80 cents per kg in contrast to other states where \$1.00 per kg is typical. Prices paid to harvesters vary slightly between different meat processors. Some meat processors pay an access fee to landholders of around \$1.00 per kangaroo and these meat processors usually pay a little less per kg to harvesters. Also, the amount paid to harvesters can fluctuate. For example, some meat processors offer incentives during winter months, with the price dropping again in summer when kangaroos are congregating around water points and are harvested with less effort. Some meat processors lower the price paid to harvesters due to poor quality. For example, a meat processor may 'dock' a harvester if the carcasses supplied have not been dressed cleanly and according to their requirements.

Why are South Australian harvesters paid less per kg?

The main reason that South Australian harvesters are paid on average 20 percent less than their interstate counterparts is a lack of competition between meat processors for product. In South Australia, harvesters are required to nominate the meat processor they will supply carcasses to in advance. They do not have the capacity to easily change meat processors.

Kangaroo harvest regulations in South Australia require landholders to nominate a harvester and meat processor annually in advance of harvest. The landholder usually nominates the same harvester each year and follows their instruction regarding which meat processor to nominate. If harvesters seek to change the meat processor they supply to, the landholder must agree to the change and forward the required paper work to SA DEH to enact the change. Because the process for changing meat processors is not straight forward and requires landholder involvement, harvesters tend to rarely change the meat processor to which they supply product.

In other states competition between meat processors exists because landholders nominate a number of harvesters to harvest on their property and they are not required to nominate meat processor. This means that harvesters are not tied to one meat processor and may supply product to different processors. Generally, harvesters deliver carcasses to a chiller depot post-harvest where there are a number of chillers run by different meat processors. Each meat processor employs a chiller box operator to weigh and accept carcasses. Harvesters may approach chiller box operators and find out the price per kg being paid before deciding which meat processor to sell to on that day. In this way harvesters are able to secure the best possible price.

6. KANGAROO MANAGEMENT SYSTEM REFORM

More kangaroo meat is consumed in South Australia than in other states. More people are familiar with product, more have tasted it and more have cooked it (Purtell and Associates 1997). Yet South Australia has lower harvest

rates, lower harvester numbers and its harvesters are paid a lower price than in other states. We have found that the South Australian kangaroo industry is in decline and this has implications for the sustainability of rangeland environments and communities.

The introduction of property level quota allocation ten years ago and the resulting system we see today has had adverse impacts on the South Australian kangaroo industry. The current system of one harvester and one meat processor per property is inflexible, constrains competition and has had a negative impact on harvester numbers and harvest rate.

The irony of the inflexible regulatory environment for management of kangaroo harvest in South Australia is that it evolved out of a reform that was intended to provide greater scope for market forces to influence harvest decisions. When property level quota was allocated to landholders in 1996 SA DEH envisaged that landholders would trade quota and that property level quota allocation would therefore be very flexible (Alexander 1997). The option of trading would have meant that landholders who had no need to harvest on their properties could sell quota to those who needed to harvest more. This need might arise because good kangaroo habitat on their properties sustained high kangaroo populations or because locally overabundant populations were impacting on land condition.

Such market based instruments have growing use in Australia and internationally as alternatives which can have substantial advantages over command and control systems (Tietenberg 2002; Whitten et al 2004). However in the case of the South Australian kangaroo quota, trading never became established amongst landholders. This is not surprising since landholders did not know about it and there was no 'market place', that is, no easy way for people who wanted to sell quota and those who might want to buy it to communicate and trade. Experience with market based instruments emphasises that good design, addressing these kinds of elements and many others, is critical to effective performance (Whitten and Young 2004).

The kangaroo industry is constrained in its capacity to deliver benefits to South Australian regional communities and rangeland environments. Building a stronger kangaroo industry in South Australia requires introducing flexibility into the quota allocation system and attention to factors that influence harvester numbers and harvest rate, most notably lack of competition. These issues are considered next. However, it is important to note, that reform of the South Australian kangaroo industry requires significant input from people 'on the ground'. Our suggestions for reform have been formulated as a result of discussions with landholders, harvesters and meat processors. Any industry reform must include detailed consultation with these groups, with particular emphasis on harvesters who have least economic power and are often under-represented in kangaroo management forums.

6.2 Introducing Competition

There is a need to remove the property level quota allocation system because the allocation of one tag to one property, one harvester and one meat processor

restricts competition. Commercial kangaroo harvest in other states operates under a regional quota allocation system. In South Australia quota should similarly be allocated to regions. Also, landholders should be encouraged to engage more than one harvester on the property. This would open up competition between harvesters for country and make it easier for new harvesters to enter the industry.

Competition between meat processors for product from harvesters needs to be encouraged. Such competition occurs in other states by harvesters selling product at a chiller 'depot' to the processor of their choice. There are a low number of regional towns in South Australia compared to other states which may hinder the establishment of the chiller depot system across the state. But it would be possible for chiller depots to operate in a few regional centres. Of course, not all harvesters would have access to a chiller depot and some would need to enter into an agreement with a meat processor. But the essential element in reform of the system must be to give harvesters the capacity to change processors easily. Removing the requirement for landholders to nominate a meat processor is critical.

Introducing competition to the meat processor's purchase of product from harvesters is very important to delivering better prices to harvesters. Furthermore, increased competition brings potential for harvesters to negotiate around the issue of minimum weight limits. Negotiation on this point will be important until meat processors introduce marketing of 'tender' kangaroo cuts which would increase demand for younger, smaller kangaroos.

6.2 Boosting Harvester Numbers

The decline in harvester number requires targeted effort and is of particular importance given that the trend is likely to continue as many harvesters are approaching retirement age. Incentives to attract new industry entrants could include apprenticeship schemes such as are in place in Queensland. Clear pathways and support for prospective industry entrants to plan their businesses and secure loans for start up costs would also assist. Mentoring and field training by established harvesters would increase the prospects of new industry entrants establishing successful businesses.

6.3 Incentives for Harvesters

While harvester numbers remain low it is important for individual harvesters to harvest a greater number of kangaroos. There is potential for targeted incentives to be used to encourage individual harvesters to put more effort into harvesting. If all currently licensed harvesters had harvested 6,000 kangaroos per year between 1997 and 2004, South Australia would have harvested 77 percent of the quota on average each year rather than 43 percent as actually occurred. SA DEH could introduce incentives for higher harvest rates such as by a rebate of permit fees or of part of the royalty paid through tag purchase when a harvester reaches a threshold level of annual harvest. For example, royalty/tag price could decrease at several thresholds such as 2000, 4000, 6000 and 8000 tags.

Such an incentive structure would encourage harvesters who may be operating 'part time' or who now supplement their income through other work to put more effort into harvesting. Incentives could be planned to be cost-neutral as there would be increased revenue to the kangaroo management program through the higher levels of harvest resulting from the incentives.

4. CONCLUSION

The South Australian kangaroo industry is in decline and reform is needed. The introduction of property level quota allocation in 1996 has coincided with a reduction in harvester number and decline in harvest rate. Research participants brought forward reasons for low harvest rate and the system that supports one harvester per property, that is property level quota allocation, was identified as a major factor. Other factors included geography, terrain and isolation and economic and human resource issues. Industry reform is required to address the problem of low harvest rate. Most importantly, quota should not be allocated at the property level. Kangaroo mobility necessitates a more flexible system of quota allocation to regions. Introducing competition, incentives and appropriate training for new harvesters are other important ways that the kangaroo management system can change. We believe that these changes are important to the sustainable development of the kangaroo industry in South Australia. Urgent attention is needed if the kangaroo industry is to deliver the full potential of environmental, social and economic benefits to South Australian regional communities.

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