

**CO-PRODUCTION OF LIVESTOCK AND KANGAROOS:  
A REVIEW OF IMPEDIMENTS AND OPPORTUNITIES TO COLLABORATIVE  
REGIONAL MANAGEMENT OF WILDLIFE RESOURCES**

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## **ABSTRACT**

Kangaroos have long competed with pastoral production systems on the rangelands. By cooperating across property boundaries, landholders should be able to manage the kangaroo component of total grazing pressure and convert a liability into an asset. They could earn income from kangaroos and collect carbon and biodiversity credits. Doing so would follow overseas precedents of private proprietorship of wildlife and co-production alongside conventional livestock.

This paper reviews trials of integrated regional management of wildlife. It compares the value of cattle, sheep and goats to more than 40 million kangaroos on pastoral lands. It proposes further investment in plant and equipment to improve the ability of harvesters to supply higher quality more valuable products and so bring benefit to producers. It advocates greater clarity of objectives for kangaroo populations, alternative legal and management structures, devolved responsibility, stronger coordinated leadership and involvement of corporate agriculture and Indigenous land agencies. It recommends research to measure the impacts of differing densities of kangaroos and livestock, and to monitor the costs, efficiencies and profits that create incentives.

**Keywords:** sustainable production, kangaroo, cattle, greenhouse gases, investment, agriculture.

## **INTRODUCTION**

Humans have used kangaroos since they first arrived in Australia over 40,000 years ago. In the earliest days at Sydney Cove kangaroo meat sustained the settlement until conventional pastoral industries were established (Jackson and Vernes, 2010). Today, perceived competition with kangaroos leads to demands to lower numbers of kangaroos, and in some cases, to eradicate them. An alternative is for kangaroos to again become a valued resource, integrated into production systems. The opportunity has been repeatedly advocated by wildlife conservation scientists, most publicly by Grigg (1988) but also (Wilson, 1974; Grigg, 1995; Archer, 2002; Flannery, 2004; Cooney *et al.* 2009; Ampt and Baumber, 2010). In 2012 the ANU Fenner School revisited the idea at a workshop (NIRRA, 2012). This paper considers why kangaroos continue to be simultaneously a pest, a revered national symbol, but not an asset to the landholders on whose properties they occur. It offers why sustainable use of kangaroos is still a clever idea; an assessment of impediments to successful integration; and suggests what might be done to try again to deliver change.

## **OVERSEAS EXPERIENCE**

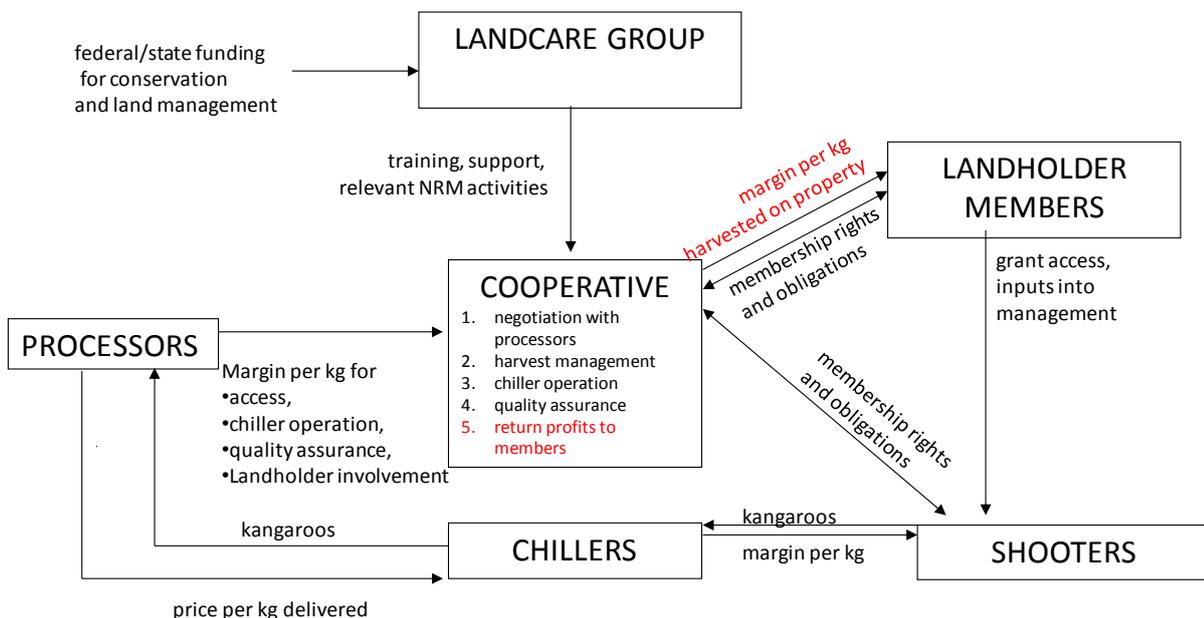
## Collaborative regional management of wildlife

Scottish deer management groups and southern African conservancies are two overseas models of collaborative wildlife management of relevance and potential precedence. In Scotland groups of estates form Deer Management Groups that share access to a herd of deer that is managed as a common resource. The objectives include the welfare of both deer and habitat while also seeking to protect the viability of rural communities where deer management is a major economic land use (Gordon, 2009).

In southern Africa, wildlife conservancies are formed from lands owned or occupied by one or more landholders. They are managed as an ecological unit to achieve common wildlife conservation goals. The planning and operational processes used by conservancies are set out by Du Toit (2016).

In Australia trials of collaborative wildlife management were established through three conservancies, one at Mitchell in Queensland, another at Wentworth in south-western New South Wales, and one north of Broken Hill. Landholders and harvesters came with the objective of generating income from the kangaroos on their properties without needing to muster and transport them live. Wilson and Mitchell (2005) described the goals and aspirations of the trials.

The Mitchell conservancy is still operating in a modest way as the Maranoa Kangaroo Harvesters and Growers Co-operative Ltd (MKHGC). It owns and operates chiller boxes, and takes kangaroos off properties of members. However, it has not established all the processes set out in Figure 1. (from Cooney *et al.* 2009). Nor has it delivered returns to its members including its major shareholder, the Maranoa and District Landcare Association.



**Figure 1.** Visual representation of the MKHGC links, functions and responsibilities.

The other conservancies, the Barkindji and BARG have closed. The key findings of the latter was that commercial kangaroo harvest is complex and the system resistant to change and innovation (Ampt and Baumber, 2010). This is a similar outcome to an attempt by the Tilpa Rangecare Group in the mid-1990s to involve pastoralists in kangaroo management. Notwithstanding these outcomes, the opportunity remains to take advantage of kangaroo adaptations to the Australian environment and to produce a unique product.

## OPPORTUNITY

### Environmentally friendly

Kangaroos have lower food and water requirements than conventional stock and produce a higher percentage of their live weight as meat, but they do it more slowly while drinking less water, having a lower impact on the atmosphere, soils and while eating complimentary parts of the pasture. The production attributes of kangaroos versus livestock are in Box 1. Those of red kangaroos (*Macropus rufus*) compared to cattle are well summarised by Newsome and Newsome (2016).

#### **Box 1. Comparative production attributes of kangaroos and livestock.**

Kangaroos metabolic rate is thirty percent lower, an attribute which also lowers growth rates (Munn *et al.* 2009). Their water consumption is 1.5 L/day, compared to cattle 80 L/day and sheep 11 L/day (Munn *et al.* 2014; NSW DPI, 2014<sup>1</sup>).

Kangaroos are relatively efficient meat producers. The parameters for making comparisons such as dry sheep equivalents (DSE), live weights at slaughter, carcass percentage, boning percentage, useable meat differ with a range of environmental and physiological variables. For the purposes of general analysis I have used the following. The figures are based on two years growth for steer and three years growth for a kangaroo (see Payne (2010), and Hardman (1997) for average yields). A 500 kg steer produces a 300 kg carcass and 180 kg yield of useable meat. A 35 kg kangaroo produces a 23 kg carcass and at least 13 kg useable meat. If a kangaroo is 0.5 DSE<sup>2</sup> (The DSE of a kangaroo is estimated to be somewhere between 0.2 and 0.7 of a non-lactating sheep (SOE Report, 2006)) and a steer is 8 DSE, 16 kangaroos equals one steer. 16 kangaroos produce 210 kg of useable meat compared to 180 kg from the steer.

Kangaroos are comparatively low carbon emitters. They have different digestive systems and convert pasture to meat with less methane as a by-product. Domestic livestock produce 11% of Australia's greenhouse gases. Cattle generate 1.7 tonnes CO<sub>2</sub>e/head/year. Sheep generate 0.142 tonnes CO<sub>2</sub>e/head/year. Kangaroos generate 0.003 tonnes CO<sub>2</sub>e/head/year (Wilson and Edwards, 2008). This converts to low emission meat, 0.75 kg CO<sub>2</sub>eq/kg of meat for kangaroos, compared to 25 kg CO<sub>2</sub>eq/kg of beef. These rates are for kilogram of usable meat, pre-processing.

The impact of kangaroos on soils, vegetation and especially riparian areas is lower. Qualitative evidence for this assertion is that golf courses throughout Australia tolerate the presence of many kangaroos. I doubt if they would tolerate a few sheep, let alone one cow. This not to say that high densities of kangaroos and consequent grazing pressure does not impact on biodiversity. It does (Howland *et al.* 2014). Nor does it deny the need for populations to be managed on golf courses.

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<sup>1</sup> These figures are for a predominantly dry pasture/saltbush diet in arid rangelands and are subject to variations in daily temperature, water salinity, feed quality, stock breed, weight, and age.

<sup>2</sup> Dry Sheep Equivalent is used in Australia to compare the feed requirements of different classes of stock or to assess the carrying capacity and potential productivity of a given farm or area of grazing land.

John Read and friends speculated around a campfire on the attributes of the most desirable production animal for the Australian rangelands. It had to provide the best food source for our ever-increasing population, be compatible with the environment, and be harvested with minimal use of energy and infrastructure. It had to be healthy, tasty and be acquired sustainably and without cruelty. They called it a 'genelope' and concluded that the design looked remarkably like a kangaroo (Read, 2012).

### **Unique product**

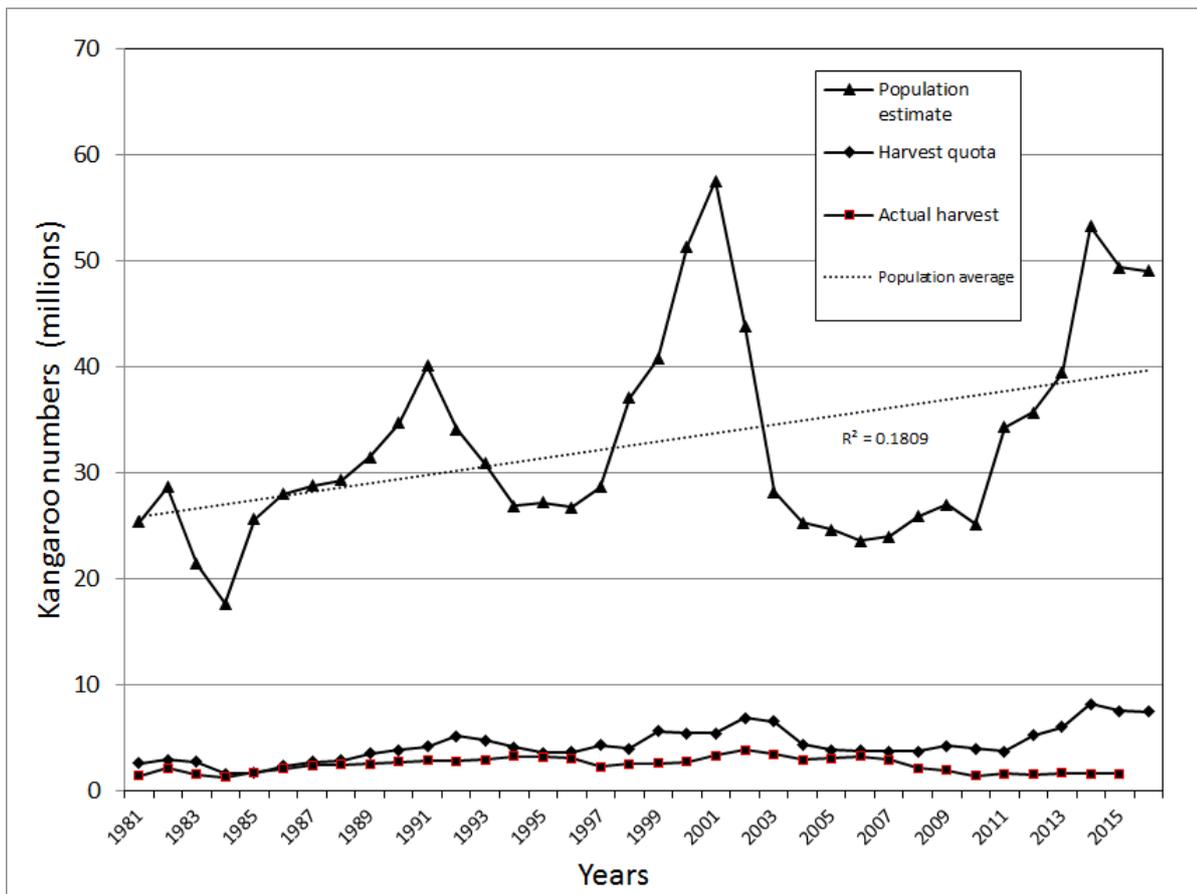
Kangaroos are a source of international competitive advantage for Australian 'livestock' production (Garnaut, 2008). The meat is healthy, being low in fat and cholesterol, high in conjugated linoleic acid and omega-3 fatty acids, iron and zinc. It is also high in protein. It is grass-fed without chemicals which should appeal to the organic market. In most instances consumers who try kangaroo meat like it, would eat it again, and perceive kangaroo to be a healthy meat (Ampt and Owen, 2008). Danish chef René Redzepi whose restaurant Noma was voted Best Restaurant in the world for three years, included kangaroo in his search for unique Australian flavours.

Kangaroo leather has high-strength-for-weight and is the preferred material for the high-quality running shoes and football boots.

## **IMPEDIMENTS**

### **Low price and lack of demand**

The main impediment to landholder integration of kangaroos into their production system is low price per kilogram. Figure 2 shows that the kangaroo harvest in recent years has been static at less than half the quota permitted by Government. If demand was stronger prices would probably be higher.



**Figure 2.** Kangaroo population estimates in the commercial zone over 35 years showing long term increase and the independence of actual harvest from population fluctuations (Department of Environment and Energy, 2016).

Reasons for lack of demand are numerous. Many members of the public are averse to using kangaroos. They have an ethical belief that the lives of animals, especially wild animals, should not be shortened by humans for economic reasons, nor even to conserve other biodiversity.

Some believe that it is culturally inappropriate to eat the National Icon. There are international precedents for the opposite view. The cockerel is the icon of France and yet features prominently in French cuisine; red deer in Scotland produce venison while being the 'monarch of the glen'. South Africans eat springbok and bison are consumed in North America. The latter are both a production species controlled by the Departments of Agriculture and iconic, featuring on the seal of the US Department of Interior.

Many believe that field shooting is cruel and should cease on animal welfare grounds. They are particularly concerned that joeys are orphaned and dispatched inhumanely (see Borda *this volume*; Finch *et al. this volume*). This perception however under-values the skill of trained professional marksmen taking animals with head shots and that the animals taken can be scrutinised at the chiller. It confuses unsupervised hunting of kangaroos by amateurs using low powered rifles and shotguns with professional harvesters complying to an industry code of conduct (NRMCC, 2008). It overlooks the animal welfare advantages that follow animals being slaughtered as close to their source as possible (VALE, 2016) rather than being trucked to abattoirs or feedlots.

Animal rights groups conduct campaigns such the one in 2015 that lead to a ban of kangaroo imports into California. Their objective is to shut down the kangaroo industry. Their success in reducing demand for kangaroo products, however, does not stop kangaroos being killed but leads to more unprofessional shooting and alternative control measures that inflict suffering. Gates are constructed that deny kangaroos water and high fences seek to permanently lower kangaroo populations, and in some cases, eliminate them from clusters of properties.

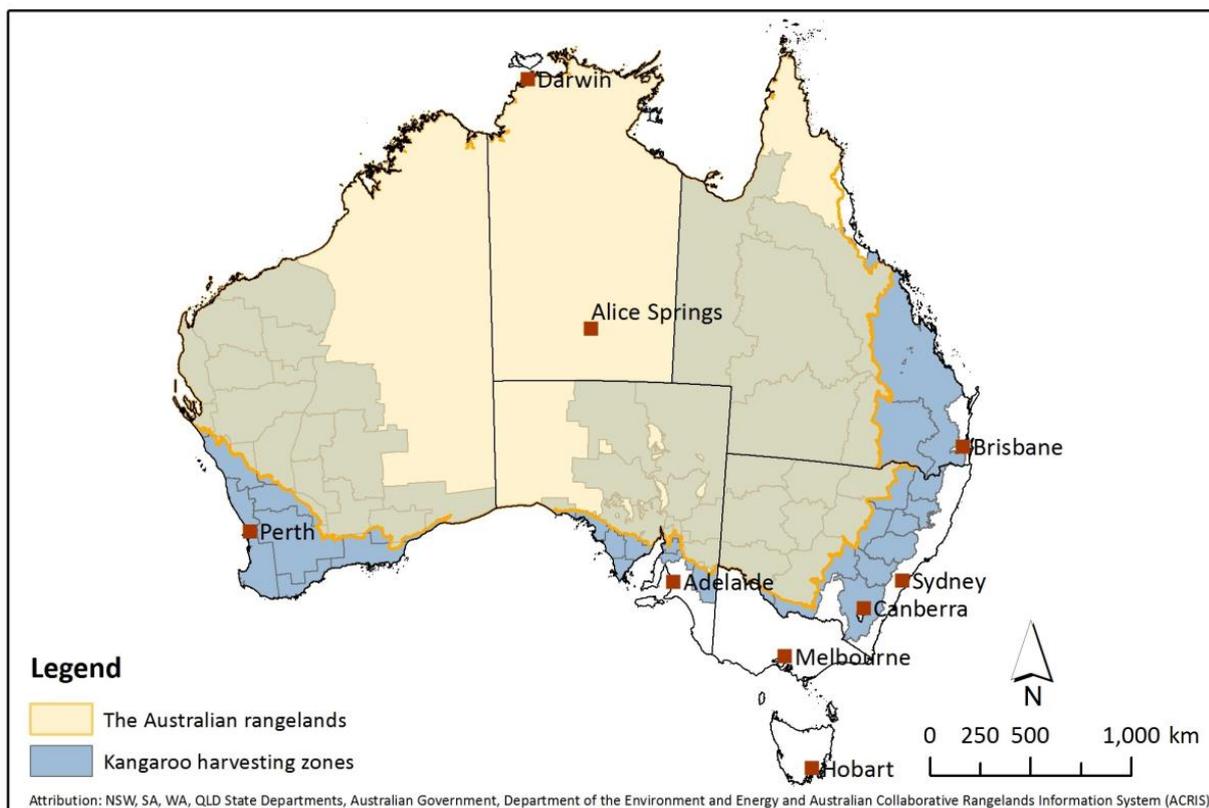
Many farmers and graziers are also averse to using kangaroos. They won't eat kangaroo meat themselves and do not want to be involved in the industry. They regard kangaroos as vermin and pet food compared to their much more valuable conventional livestock, cattle and sheep.

### Comparative value for livestock and kangaroos

Australia has 30 million cattle (ABS, 2014). Assuming approximately 7.5 million are on the rangelands where most of the commercial kangaroo industry operates (Wilson and Edwards, 2008), see Figure 3., and an average price of \$1,000 a head, the paddock value of these cattle is \$8,000 million.

Approximately 35 million of Australia's 75 million sheep (ABS, 2014) are on these rangelands. At \$100 a head these sheep have a paddock value of \$3,500 million.

In 2010, there were an estimated 3 million feral goats in the rangelands (Pople and Froese, 2012). Assuming a live weight of 30 kg producing a carcass weight of 13 kg at \$5.50 a kg carcass weight, each goat is valued at \$70 and the population is valued at \$230 million.



**Figure 3.** Proportion of the commercial kangaroo harvesting zone inside the Australian rangelands.

The average kangaroo population in the commercial harvesting zone in Figure 2 fluctuates widely due to seasonal conditions but with a long-term trend to 40 million. If an average 23 kg carcass is valued in the field at 0.60c a kg, each kangaroo is worth \$13 and the kangaroo stock on grazing lands would be worth \$500 million.

If kangaroos were valued as much as goats, (and they should be worth more because of meat quality, leather, and uniqueness of product) the asset value of kangaroos in the commercial harvesting zone would increase to \$5,000 million, which is more than sheep.

### **Under investment**

However, kangaroos remain undervalued, underutilised and the industry lacks investment in research and infrastructure. Investors are fearful of the lack of demand and further industry contraction. They appear to doubt the capacity of the industry, as it currently operates, to reliably and regularly supply high quality, accurately-described, clean product and meet animal welfare standards. Continuity of supply caused by variability in climate and seasons, both drought and floods is also a possible concern for investors.

Uncertainty over ownership of animals may be another impediment to investment. Well-defined, secure and transferable property rights help to establish and capture the value of resources, thereby providing an incentive for owners to efficiently use and maintain them (Demsetz, 1967). All these problems could be addressed with coordinated research and development.

## **A WAY FORWARD**

The 2015 Australian Government Agricultural Competitiveness White Paper emphasises value over volume as pivotal to the sustainability of Australia's agricultural sector. Expansion of the kangaroo industry and co-production on pastoral lands could be an innovative component with relatively low costs. The resource is already there and the industry is operating, albeit in a constrained form. There is a need to improve the quality and description of product, develop the necessary infrastructure, and monitor the value chain to increase the price of final product.

### **Clarify objectives to enable co-production**

Kangaroo management currently operates after governments set harvesting quotas as a proportion of existing (variable) populations. An alternative would be not to set harvest quotas but to set population targets based on total grazing pressure. Most of the lands grazed by kangaroos are private lands given over to pastoral production. Wildlife managers would nominate minimum number of animals for these lands and delegate authority to landholders to manage populations towards those objectives. The target populations would be set considering densities of other herbivores and co-production from kangaroos. This would be the reverse of the current situation where landholders are expected to carry an unstated number of animals that has no relationship to the carrying capacity of their properties or competing land uses.

### **Devolve management responsibility and proprietorship**

Thus, a form of proprietorship over kangaroos would pass to local companies, cooperatives or conservancies. Landholders, and especially corporate agriculture would join with

Landcare groups to form cooperatives or companies like the MKHGC, and seek to manage populations of kangaroos on their collective lands at a prescribed level to deliver high quality product. They would need to work together because kangaroos move from property to property.

They would be licensed to keep a nominated minimum number of animals. They would manage populations, including excess above those minima in accord with their own management objectives. Legislation changes proposed in 2016 in Queensland and New South Wales, where most of the kangaroo industry operates, could be an opportunity to incorporate some of these suggestions.

Under the proposed devolution, wildlife departments would monitor populations at the regional level just as they do now. Their aim would be to ensure kangaroos don't fall below agreed minima, of say 15 million for the national population. Agriculture departments and food safety authorities would regulate welfare and quality standards. The 'permits to carry' would create proprietorship and might be tradable. Indeed, they could be acquired by animal rights organisations and so enable them to contribute to their objective of allowing animals to live full lives unimpeded.

The proposed changes are like those that apply to animals on game ranches in southern Africa, bison in USA and deer in Scotland.

Devolution of responsibility for management would enable regional branding and quality improvement programs. The Paroo Roo campaign is the beginning of such initiatives (Macro Meats, 2016).

Cluster fences around properties or groups of properties which are being erected for dingo and kangaroo control could be a positive for these concepts as they would enable landholders to assert proprietorship within the fence and to manage populations towards the prescribed objective. On the negative side, they create barriers to migration for a range of wildlife. Such changes to wildlife management and the adoption of co-production would be experiments and should be run according to the standard rules of experimental design. Otherwise nothing is learned from them (MacNab, 1983).

### **Engage more effectively with landholders, industry and government**

Under co-production, kangaroo harvesting would become a mainstream agricultural activity integrated into other on-farm operations. Market information and research support would come from organisations such as Meat and Livestock Australia just as it does for other red meats. By taking advantage of the adaptations and success of kangaroos on the rangelands co-production could help address the falling sustainability of many rangeland production systems under traditional pastoralism. A recent situation analysis of the Australian beef industry found that many beef enterprises under current management regimes were economically unsustainable (Holmes, 2015).

Investment in the kangaroo industry could come from corporate agriculture, superannuation funds, venture capitalists, the big pastoral houses and listed companies. New participants, who are investing in agriculture, both from overseas and Australia do not appear to have considered incorporating the use of the kangaroo resource in their proposals.

Indigenous funding agencies have also failed to support the concept of sustainable use of kangaroos preferring to back the cattle industry. The opportunities for science to support

traditional Indigenous practice to deliver better economic, social, and employment outcomes through sustainable wildlife use are outlined in Wilson *et al.* (2010).

## **Marketing**

Kangaroo utilisation need champions to be taken more seriously, particularly food promoters and restaurateurs. Gordon (2009) observed that the most effective deer management groups have a strong chairperson and secretary and/or an executive committee. Support from the likes of Neil Perry, Jamie Oliver and René Redzepi would be helpful in changing the image of kangaroo meat from pet food to a valuable ingredient in high cuisine. There is a need to increase the visibility of the meat and decrease the visibility of the animal (Ampt and Owen, 2008). Marketing should emphasise land conservation and long-term sustainability of production systems using kangaroos.

## **Co-production of low emission meat**

If the existing population were harvested at 0.25 per year and managed to avoid the population peaks and subsequent crashes (Figure 2), which are an animal welfare and land degradation issues, the income to the industry and potentially landholders, even at current prices would be over \$1 billion per year. It would be more if some cattle or proposed increase in cattle numbers were substituted for an increase in kangaroos.

Nearly a decade ago we calculated how much methane could be saved by replacing some cattle and making greater use of kangaroos (Wilson and Edwards, 2008). On the rangelands where kangaroo harvesting currently occurs, we estimated that reducing cattle and sheep populations by 20% would lower Australia's greenhouse gases by 16.4 megatonnes or 3% of Australia's total emissions. We suggested that reducing the number of livestock could conservatively enable 175 million kangaroos to be carried with less total grazing pressure impact.

## **Further research**

Research should measure the impacts of differing densities of kangaroos and livestock and monitor the economics of comparative production to understand costs, efficiencies and profits that create incentives. There is also a need to further consider distribution and abundance of kangaroos and the factors that affect local migration. The impact of cluster fences would be incorporated. There is also a need to remeasure methane emissions from kangaroos and enhance innovations in tracking carcasses, monitoring meat quality, time temperature assessment and cold chain management.

## **CONCLUSIONS**

More sensible kangaroo management and better use of the kangaroo resources is an opportunity going begging. Current wastage needs to be minimised and the benefits of sustainable use of kangaroos realised to the benefit of both Indigenous and other landholders on whose properties they occur. Taking up the opportunity at scale is long overdue but changing the status of kangaroos is a paradigm shifting and complex undertaking. It involves not only activities which farmers can control, but also product management, marketing and public attitudes. It begins with the importance of animal welfare and greater respect for kangaroos.

If kangaroos were worth more money, pastoralists who are opposed to an expansion of the kangaroo industry would be more likely to change their position. To increase the value of kangaroos, partnerships are needed between landholders, corporate agriculture, venture capitalists, kangaroo processors, government, food marketers, research scientists and economists. A business case should guide further investment in plant and equipment. It would improve the ability of harvesters to supply higher quality products and market them as such.

Now is also the time to do this. There is notable change in both state and federal legislation trying to ensure Australian agriculture performs at its best. Kangaroo co-production should be part of this process. It would ensure that the more sustainable, innovative and improved land management practices are adopted, not business as usual which has seen significant erosion of natural capital and often is financially unsustainable.

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