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Jocelyn Davies

*Desert Knowledge Cooperative Research Centre, Australia*

Michael LaFlamme

*Desert Knowledge Cooperative Research Centre, Australia*

David Campbell

*Centre for Remote Health, Australia*

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## Health of people and land through sustainable Aboriginal livelihoods in rangeland Australia

Jocelyn Davies<sup>1,3</sup>, Michael LaFlamme<sup>1</sup>, David Campbell<sup>2</sup>

<sup>1</sup>Desert Knowledge Cooperative Research Centre and CSIRO Sustainable Ecosystems

<sup>2</sup>Centre for Remote Health and Desert Knowledge Cooperative Research Centre

<sup>3</sup>jocelyn.davies@csiro.au; PO Box 2111, Alice Springs NT 0871, Australia.

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**Introduction** Our research contributes to the engagement of global indigenous peoples with markets for environmental services and to improvements in their health and well being. We are developing principles and tools to support development of stronger livelihoods amongst Aboriginal peoples of Australian rangelands and we are quantifying associated economic outcomes. Indigenous people—Aboriginal people and Torres Strait Islanders—are only 2.3% of Australia's predominantly urban population. Twenty-four percent of them live in the 71% of the continent that is rangeland. Aboriginal peoples hold strong property rights to 27% of rangelands. Their lands are typically marginal for livestock grazing but often have high value for conservation. Sixty-nine percent of Australians consider that Aboriginal culture is an essential component of Australian society. They identify Aboriginal culture most strongly with the Aboriginal peoples of the rangelands. However rangeland Aboriginal people suffer poor health and life expectancy compared with mainstream society. This carries a social opportunity cost estimated at \$1.5 billion annually in one jurisdiction with extensive Aboriginal owned rangelands—the Northern Territory.

**Methods and materials** Ethnographic fieldwork in local case studies and participatory modelling are being applied in several situations where Aboriginal people are engaged in managing arid rangelands. We are mapping outcomes that Aboriginal people want from this engagement against those that governments are seeking from their investments in overcoming indigenous disadvantage and in natural resource management. Participatory modelling is being used to identify indicators that can effectively monitor for these various sets of outcomes. This is providing the basis for a set of design principles and tools to facilitate Aboriginal engagement with markets for environmental services, including social markets of governments, philanthropic and corporate social responsibility sectors. These methods are being complemented by economic analysis of health outcomes where robust biomedical data are accessible.

**Results** Australia's history of Aboriginal social exclusion and disadvantage combine to explain the current state of Aboriginal physical and mental health and socio-economic disparities. Aboriginal people are motivated to engage in land management in order to keep their culture strong and also to develop enterprise and employment opportunities for family members. Extensive testimony by Aboriginal people is that Aboriginal health is better when Aboriginal people are engaged in land management. This is due to the impact of land management activity on social and psychological determinants of health, as well as on diet and exercise regimes. Land management is a complementary input to health infrastructure: both inputs are necessary for health improvements amongst rangeland Aboriginal peoples and consequent economic outcomes.

**Discussion** Aboriginal land management in arid rangelands involves practices, such as harvesting, burning vegetation and cleaning water sources, founded in the spiritual and economic relationships that Aboriginal people have with their traditional lands. Aboriginal people are also engaged by government agencies, NGOs and private industry in partnership, grant funded or fee-for-service projects to restore natural resource condition and address threats to biodiversity. In arid rangelands this engagement is small scale, sporadic and dispersed. Cultural differences mean that the outcomes Aboriginal people are seeking from their land management efforts and those that purchasers of environmental services want are not the same although there is a degree of shared motivation and mutual benefit. However the benefits of Aboriginal land management for Aboriginal health and well-being extend far beyond the core concerns of environmental policy sectors into social policy sectors which have scant understanding of Aboriginal land management. These factors help to explain why Aboriginal land management struggles to demonstrate its actual and potential impact on overcoming Aboriginal disadvantage.

**Conclusions** The important role that Aboriginal land management plays in health and wellbeing needs to be better communicated between cultures and across policy sectors. Tools for establishing return from public investment in this area and for collaborative planning and evaluation of livelihood outcomes will help to do this by making the mix of outcomes from Aboriginal land management, and progress to achieving them, more explicit and more readily communicated.

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