Institution: Coventry University

Unit of Assessment: 7

Title of case study: The management and governance of land to enhance African livelihoods

1. Summary of the impact

This Unit's staff and associates have considerable expertise in land management, focussing on two issues faced in Africa; the management of communal rangelands and the management of native species for the benefit of local communities. Coventry University is a recognized centre of global knowledge on *Prosopis*, a series of economically and ecologically important tree species, but also widely-considered potentially serious weeds in many countries. Underpinning research carried out at Coventry was pivotal to the correct identification, evaluation and subsequent management and utilisation of the most common tropical species, *Prosopis juliflora* and *Prosopis pallid*a. Other research, on the management of common rangelands, has provided an understanding of the way common land rights are expressed in communal areas and the social, political and ecological factors which govern them.

The Unit's research has led to **economic impacts**, including for The Mesquite Company (Texas) who generate USD 150,000 each year from the sale of *Prosopis* products. The research has also had impact on **public policy and society** in Kenya and South Africa. In Kenya, the Government changed its approach towards *Prosopis* from eradication towards management and lifted a blanket-ban on the use of plant-based charcoal as a result of the Unit's research. This enabled the Green Power Station (currently employing 2000 people) to be established. In South Africa, policy debate has been informed by research on the governance of common land. The research has also had impact on **creativity, culture and society**, informing public and political debate in South Africa, Kenya and India. **Beneficiaries** include businesses developing new products and producing energy; local communities in South Africa and Kenya, and the South African and Kenyan Governments.

2. Underpinning research

Harris, Professor of Plant Science, has been leading the *Prosopis* research programme for over 20 years, supported by **Pasiecznik** (Research Associate, Henry Doubleday Research Association, now Garden Organic) since 1988 and **Trenchard** (Senior Research Fellow) since 2002. The impact of the *Prosopis* research has been achieved by a highly collaborative team of researchers, policymakers and regional officials, of whom **Harris** et al were an essential component. *Prosopis* consists of around 45 species of spiny trees and shrubs found in regions of the Americas, Africa, Western Asia, and South Asia. They often thrive in arid soil and are resistant to drought, positive characteristics that have led them rapidly to colonise large areas of grazing land. As such *Prosopis* is often considered an invasive weed in several countries where it has been introduced, including in Ethiopia, Sri Lanka, Jamaica, the Middle East, India, Nigeria, Sudan, Senegal and Southern Africa. Reports state that worldwide, millions of hectares have been invaded by the species, from both natural and artificial spread (through the grazing of animals that eat the seed pods). Eradication programmes have been tried in many countries, but with limited success. The fundamental research of **Harris** et al, in identifying two of the most common tropical species has led to programmes to manage and utilise, rather than eradicate the species.

Bennett (Senior Lecturer, at Coventry since 2002) and **Barrett** (submitted to UoA21) extended the research on land management in a different direction, examining the management and governance issues of common grazing land. This research has informed the development of effective institutional policies for the management of common land at both a local and national level in South Africa.

The following research, which occurred in parallel and in synergy, contributed to the research impact:

Field research confirming appropriate species for tropical arid conditions (1993-1998)

A DFID-funded project (1991-1995, £233,000) assessed the field performance of more than 100 seed sources of twelve *Prosopis* species in Cape Verde. This was supported by laboratory, greenhouse and nursery experiments in the UK and Oman, which provided an understanding of drought-tolerance, and assessed techniques for propagating improved material. A parallel DFID-funded project in India (1992-1995, £65,000) cross-tested the same material and techniques. *P. juliflora* and *P. pallida* were confirmed as the most suitable species for tropical arid conditions, though

this research also identified clear problems surrounding their taxonomy [b].

Taxonomic research resolving the identification and distribution of *Prosopis* (1998-2013)

Suitable molecular markers and foliar characters [3,4,5] were identified in collaboration with the Universidad Pública de Navarra, Spain, supported by grants from the Royal Society and British Council (1999-2002, £20,000). An important innovation was the additional use of chromosome numbers [2], leading to a breakthrough discovery that allowed the clear separation of *P. juliflora* and *P. pallida*. This led to the first comprehensive reporting of their distribution and the correction of important misidentifications in several countries including Brazil, Cape Verde and Senegal, contributing to much-needed advances in their management and use. Research continues with the recent application of new techniques to the *Prosopis* taxonomy [1].

Research on management and utilisation of *Prosopis* (1998-2013)

Early primary research results led to the development of the world's first training and demonstration courses on improving *Prosopis* utilisation and management, including evaluation of the resource value of *Prosopis* fruits as human food [h] and animal fodder (2005-2006, Kennington Overseas Aid, £15,000). Research into *Prosopis* as a bioenergy crop in water-scarce areas of India was included in an EPSRC-funded project (2007-2010, £1,600,000).

Collation and dissemination of knowledge (1998-2013)

Gaps in knowledge highlighted by the primary research were overcome with a DFID-funded project (1998-2005, £188,000) that collated global information on *Prosopis* into a monograph in 2001 [b], still the definitive and single most cited publication on *Prosopis*. A technical manual, database, field identification guide [a] and two series of policy briefs also resulted from this desk-based research. The Coventry University *Prosopis* programme including ten funded projects and five post-graduate theses (1993-2013) which have led to 35 peer-reviewed journal papers amongst 135 outputs.

Management of Communal Rangeland (2002-2013)

Extensive livestock production from natural rangeland areas is an important livelihood strategy for many rural communities. **Bennett** has identified a number of barriers to management of rangeland as a 'commons', including the inability to define and enforce rights to particular grazing resources in the face of competing claims from 'outsiders', as well as inadequate local institutions responsible for rangeland management [6]. His research has outlined the diversity of grazing management regimes currently in operation in communal areas and interpreted them in the context of local social and ecological factors and in terms of the broader debate on inequality associated with land ownership in Africa [6,7]. He has developed a generalised framework of current grazing management systems, with applicability both at a national level and beyond. The research is significant as it has built an empirical knowledge base upon which effective policy for the management of rangelands in communal areas of South Africa can be developed.

3. References to the research

1. Sherry, M., Smith, S., Patel, A., Harris, P., Hand, P., Trenchard, L.,& Henderson, J (2011). RAPD and microsatellite transferability studies in selected species of *Prosopis* (section Algarobia) with emphasis on *Prosopis juliflora* and *P. pallida*. *Journal of Genetics 90*(2): 251-264. (IF: 0.876) Citations 1.
2. Trenchard, L.J., Harris, P.J.C., Smith, S.J.,& Pasiecznik, N.M. (2008). A review of ploidy in the genus *Prosopis* (Leguminosae). *Botanical Journal of the Linnean Society 156* (3): 425-438. (IF: 2.589) Citations 5.
3. Landeras G, Alfonso M, Pasiecznik NM, Harris PJC, Ramírez L, 2006. Identification of *Prosopis juliflora* and *Prosopis pallida* accessions using molecular markers. Biodiversity and Conservation 15: 1829-1844. (IF: 2.264) Citations 10.
4. Harris, P.J.C., Pasiecznik, N.M., Smith, S.J., Billington, J.M.,& Ramírez, L. (2003). Differentiation of *Prosopis juliflora* (Sw.) DC. and *P. pallida* (H. & B. ex. Willd.) H.B.K. using foliar characters and ploidy. *Forest Ecology and Management, 180* (1-3): 153-164. (IF: 2.766) Citations 15.
5. Ramírez, L., de la Vega, A., Razkin, N., Luna, V., & Harris, P.J.C. (1999). Analysis of the relationships between species of the genus *Prosopis* revealed by the use of molecular markers. *Agronomie, 19* (1): 31-43. (IF: 3.573) Citations 15
6. Bennett, J. & Barrett, H. (2007). Rangeland as a common property resource: contrasting insights from communal areas of central Eastern Cape Province, South Africa. *Human*

Ecology, 35: 97-112. (IF 2.174) Citations 16.

7. Bennett, J.; Ainslie, A. & Davis, J. (2010). Fenced in: Common property struggles in the management of communal rangelands in central Eastern Cape Province, South Africa. *Land Use Policy* 27: 340-350. (IF 2.631) Citations 7.

4. Details of the impact

Economic impacts

Economic impacts include the genesis of The Mesquite Company (TMC) in Texas. Joe Prest, Director of TMC, confirmed that he *"used these reports [a,b] as a knowledge base in a commercial venture*" and found them *"a gold mine of information"*. The documents were influential in Prest setting up the success of his commercial venture. TMC now sells over USD25,000 of *Prosopis* wood monthly for flooring and furniture, and supplies barbeque restaurants with *Prosopis* charcoal worth USD150,000 per year [c].

In Kenya, the ability of the authorities to correctly distinguish between the species of *Prosopis* contributed to the overturning of a blanket ban on the use of plant-based charcoal and opened up the opportunity for a commercial venture in the Green Power Station, to be fuelled by *Prosopis* charcoal. Tower Power Baringo Ltd (TPB) are currently establishing this power station [e]. Saleem Ahmed of TPB confirmed that in order to stockpile the 70,000 tonnes of green material needed to run the power station, 97% will be from *Prosopis*. In order to generate this stockpile, the power station already employs 2,000 previously unemployed people [e]. This makes the power station the largest employer in the District, offering salaries of £125-130 per month, higher than the regional average. Dr Choge, Principal Research Officer from the Kenyan Forestry Research Institute (KEFRI) stated this has *"changed people's lives because they now have a livelihood."* Ahmed has stated that this *"wouldn't have happened without Harris's contribution via regional-level research".*

Impacts on public policy and services

In Kenya, *Prosopis* has spread over an estimated 41.5 million hectares severely affecting farming and grazing. Coventry, with the Kenyan Forestry Research Institute, ran a series of workshops during 2008 in Baringo, Garissa and Tana River Districts. Choge confirmed that at each locality, 50 people were trained in the utilisation and management of *Prosopis*, and that Kenyan government officers responsible for agriculture, livestock and environment also participated. The following two policy impacts in Kenya have resulted from the underpinning research, intermediate dissemination and subsequent workshops:-

1. In 2008, the Kenyan Government produced draft legislation proposing the control of *Prosopis* using a biological control insect. Choge confirmed that the Kenyan Government has recently changed its approach towards *Prosopis* from *"eradication towards management*", emphasising that this change in policy has been influenced by the Kenyan Forestry Research Institute and the Unit's research.
2. Until 2008, most use of trees for charcoal was illegal in Kenya. The classification and research knowledge on the utilization of *Prosopis* by Coventry contributed to the blanket ban being lifted, and permitted *Prosopis* being used as a charcoal source, allowing communities in Kenya to start commercial production. Official records of charcoal sales gathered from individual communities in all the three districts since the charcoal trade ban was lifted averaged £440,000 per year.

Bennett's research on rangeland management has stimulated policy debate in South Africa. Tshintsha Amakhaya, an alliance of rural people and NGOs in South Africa, invited **Bennett** to give a presentation at an expert workshop held by the Grassland Society in 2010 entitled: '*Mainstreaming new paradigms in communal rangelands: how can we influence policy in South Africa'*. The workshop brought together policymakers, practitioners and researchers working in the area of communal rangeland in South Africa, including senior representatives from the National Department of Agriculture. The workshop enabled a common understanding of rangeland problems between researchers and policymakers, and led to the National Department of Agriculture stating they would like a regular platform to discuss these issues with experts [g]. As a result, sessions have been allocated at Annual Grassland Congresses every year since 2010 and interest in the debate is growing (45 people were involved in the 2012 discussions).

In 2013 **Bennett** guest-edited a Special Issue of the African Journal of Range and Forage Science entitled 'Aligning policy with the socio-ecological dynamics of rangeland commons' [f]. This Special

issue has provided a pathway to research impact. It was launched in South Africa at the Grassland Society Annual Congress in July 2013, with two hundred people in attendance. A subsequent panel discussion at the Congress attracted the attention of senior figures, including the South African Deputy Director-Generals for Animal Production and Rangeland in the National Department of Agriculture (which is part of the larger Department of Agriculture, Horticulture and Fisheries). The launch re-emphasised the need for policy makers to incorporate the expertise of the Grassland Society (highlighted by **Bennett**'s Special Issue) in policy. Following the panel discussion the Grassland Society was approached in July 2013 to contribute to the "Policy for the sustainable management of veld (range) and forage resources in South Africa" [h].

Impacts on society, culture and creativity

The Unit ran a series of dissemination workshops on *Prosopis* in India, and subsequently Kenya. Beneficiaries included trainees from local farmer field schools, village chiefs and district officials. The first Unit-led *Prosopis* workshop ran in 1999. In 2001 workshops were held in three states of India, with more than 150 participants. In 2006 a workshop was held in Kenya, with 26 attendees, on the use of *Prosopis* flour and chainsaw milling for *Prosopis* timber. In addition, public forums were led by the Unit and the Kenyan Forestry Research Institute in Baringo, Garissa and Tana River localities each attracting over 200 participants. Since then, the Kenyan Forestry Research Institute have extended the training courses nationally across Kenya, and internationally in Djibouti.

Studies conducted in 2012 concluded that the sale of *Prosopis* products is now providing up to 46% of family income in Baringo, and approaching one million pounds per year of additional income in Baringo, Garissa and Tana River since 2008 [d]. Included in this was income earned from the sale of pods for animal feed and poles used in the construction of local huts, particularly in Garissa where they are used in the Dadaab refugee camp, the largest in the world. These huge benefits are considered self-sustaining and expected to increase. Choge [d] noted that "*there is an increasing use of processed Prosopis pods by many communities for feeding livestock as a positive impact of the awareness and training programmes in the recent years by the Government and other development partners*".

Conclusion

This case study demonstrates that the Unit's research had **economic impact** and enabled The Mesquite Company to diversify and enter into entirely new profitable markets. It has also opened up the opportunity for a *Prosopis*-fuelled power station. In addition, the research has an **impact on public policy and services** providing information to both South African and Kenyan government officials. The *Prosopis* research enabled the Kenyan government to lift a blanket ban on plant-based charcoal and change its policy approach to *Prosopis* from "eradication to management". The rangeland management research has informed South African policy debate.

5. Sources to corroborate the impact

a. Pasiecznik NM, Harris PJC, Smith SJ, 2004. Identifying Tropical *Prosopis* Species. A Field Guide. HDRA, Coventry, UK. 30pp. ISBN 0 905343 34 4.

b. Pasiecznik NM, Felker P, Harris PJC, Harsh LN, Cruz G, Tewari JC, Cadoret K, Maldonado LJ, 2001. The *Prosopis juliflora – Prosopis pallida* Complex: A Monograph. HDRA, Coventry, UK. 162pp. ISBN 0 905343 30 1.

c. Testimonial from the Director, Hill Country Mesquite and The Mesquite Company, USA

d. Choge S, Clement N, Gitonga M, Okuye J, 2012. Status report on commercialization of *Prosopis* tree resources in Kenya. Technical report for KEFRI/KFS Technical Forest Management and Research Liaison Committee. KEFRI, Nairobi, Kenya. (available from skchoge2002@yahoo.com)

e. Testimonial from the Manager, Tower Power Baringo Limited, Kenya

f. Bennett J.E. (2013) (Ed) Special Issue: Aligning policy with the socio-ecological dynamics of rangeland commons, *African Journal of Range and Forage Science* 30 (1-2), pages 1-97

g. Testimonial from the Coordinator, Tshintsha Amakhaya

h. Testimonial from the President of the Grassland Society, South Africa