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The interplay of knowledge, attitude and practice of livestock farmers' land management against desertification in the South African Kalahari

Taryn M. Kong [a,b,*], Diane E. Austin [c], Klaus Kellner [b], Barron J. Orr [a]

[a] School of Natural Resources and the Environment, University of Arizona, Office of Arid Lands Studies, 1955 East Sixth Street, Suite 205, Tucson, AZ 85719, USA
[b] School of Biological Sciences, North-West University, Private Bag X6001, Potchefstroom 2520, South Africa
[c] School of Anthropology, University of Arizona, Haury 316, P.O. Box 210030, Tucson, AZ 85721, USA

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ABSTRACT

Desertification is a major environmental problem in South Africa with serious socio-economic consequences. Despite enormous efforts made to understand its causes and best management to combat desertification, little is known about the relation between land users' perspectives on land management and their actual practice. This study used the types of land tenure and livestock production scale to develop a farmer typology to explore the relation between livestock farmers' knowledge about, attitude towards and practices of three land management actions in Mier and Molopo-Taung, South Africa. Semi-structured interviews and photo elicitations were used to capture their knowledge, attitude and practice status of rotational grazing, woody plant control with herbicide, and revegetation. We found that high level of knowledge and positive attitude alone did not always result in actual practice of a management action on a full-scale. Situational factors such as financial resources, farm infrastructure, farm size, and land tenure challenged or constrained farmers' land management practices. Socio-economic disparities created by past institutional factors still affect contemporary land management. A farmer's land tenure and livestock production scale elucidate the situational factors that are likely to be constraints and challenges to his/her land management practices.

1. Introduction

Desertification has been recognized as one of the most serious environmental problems confronting society (Reynolds and Stafford Smith, 2002). It is land degradation in drylands, which encompass arid, semi-arid, and dry sub-humid areas. Land degradation is a persistent reduction or loss of ecosystem goods and services that a land otherwise provides (Lal et al., 2012). This environment problem is often caused and perpetuated by natural and anthropogenic processes and events. Land degradation in South Africa is exemplary of this multifaceted nature in its causes and processes. Ninety-one percent of the lands in South Africa are classified as drylands, where variable precipitation and drought-prone climate increase their vulnerability to degradation (Hoffman and Ashwell, 2001; Meadows and Hoffman, 2002). Colonial and apartheid land legislation created distinct patterns of land tenure distribution, grazing density and governmental support for farmers (Hoffman and Ashwell, 2001; Meadows and Hoffman, 2002). Land reform has been implemented over the past two decades to negate the legacy of this historical legislation (e.g., Bernstein, 2005; Jacobs et al., 2003). The historical and contemporary institutional context makes South Africa an interesting case to examine the interplay of institutional factors and management practice in response to land degradation.

Research based on local knowledge and perspectives has generated insights into land users' perceptions about land degradation and knowledge of management practices to combat degradation. In this article we define local knowledge broadly to refer to knowledge that is integrally linked with the activities of people, and produced in dynamic interactions among humans and between humans and nature so that it encompasses indigenous knowledge and traditional ecological knowledge (Agrawal, 1995). Research in African countries such as Ethiopia, Botswana, Namibia, and Swaziland revealed local knowledge and perception relating to land degradation (e.g., Katjiua and Ward, 2007; Solomon et al., 2007;

* Corresponding author. School of Natural Resources and the Environment, University of Arizona, Office of Arid Lands Studies, 1955 East Sixth Street, Suite 205, Tucson, AZ 85719, USA. Tel.: +1 520 626 8063; fax: +1 520 621 3816.
E-mail addresses: tarynmkong@gmail.com (T.M. Kong), daustin@email.arizona.edu (D.E. Austin), klaus.kellner@nwu.ac.za (K. Kellner), barron@email.arizona.edu (B.J. Orr).

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Stringer and Reed, 2007). In the Kalahari, there has been research on local knowledge and perception relating to environmental changes, degradation causes and land management against degradation (e.g., Klintenberg et al., 2007; Reed et al., 2007; Thomas and Twyman, 2004). There has also been research in South Africa to investigate the ecological knowledge of commonage farmers (they use the public lands surrounding a settlement) by testing their knowledge about important forage plants (e.g., Atkinson, 2007). Despite the copious research on local knowledge and perspectives, there remains a knowledge gap about land users' attitudes towards and actual practices of recommended management actions, as well as how their attitudes toward and knowledge of land management are related to their actual management practices.

Knowledge has been thought to influence behavior according to a number of analytical frameworks, including the linear progression model. According to this model, environmental knowledge leads to environmental attitude, and that in turn leads to pro-environmental behavior (Kollmuss and Agyeman, 2002). Subsequent research has demonstrated the gaps between knowledge and attitude, and between attitude and behavior (e.g., Ajzen, 1991; Hines et al., 1987; Sheppard et al., 1988). For examples, the Theory of Reasoned Action and the Theory of Planned Behavior (an extension) show attitude, values, normative beliefs and perceived behavioral control as factors that influence behavioral intention, which then affects behavior (Ajzen, 1991; Ajzen and Fishbein, 1980). Two meta-analyses have yielded results that support the link between knowledge, attitude, normative beliefs and behavior (Hines et al., 1987; Sheppard et al., 1988). Within the field of conservation, research also shows that positive attitude alone does not translate into conservation behavior; social norms and institutional factors are important in shaping behavior (e.g., Infield and Namara, 2001; Waylen et al., 2009; Zubair and Garforth, 2006). Hines et al. (1987) explained that "situational factors" such as economic constraints and social pressure can influence behavior. Though these models cannot explain environmental behavior fully, they may provide a framework to study the relation between farmers' perspectives and management practices.

This research aimed at addressing the knowledge gap in desertification studies by examining the relation between livestock farmers' knowledge of, attitude toward and practices of three land management actions in two rural regions in South Africa. We focused on three actions that are frequently recommended in the literature as management to control soil and vegetation degradation: rotational grazing, woody plant control with herbicide, and revegetation (e.g., Tainton and Danckwerts, 1999; van den Berg, 2007). We explored the knowledge–attitude–practice connection in relation to land tenure and livestock production scale (production scale hereafter), both of which are linked to historical and contemporary land policies in South Africa (Hoffman and Ashwell, 2001; Ramutshindela, 1998). Historical land policies created a rather dichotomous farming sector and racially skewed pattern of land rights at the end of apartheid: communal subsistence farms, occupied primarily by the previously disadvantaged people, and white-owned commercial farms (e.g., Bernstein, 2005; Hoffman and Ashwell, 2001; Kirsten, 2012; Platzky and Walker, 1985). "Previously disadvantage people" refers to black, Coloured and Indian South Africans, and "Coloured" is still used to refer to descendants of interracial parents. Land reform resulted in new land tenure types and a growing number of the previously disadvantaged people transitioning into commercial farming with diverse profiles and means of production (resources, scale, etc.) (e.g., Atkinson and Büscher, 2006; Jacobs et al., 2003). Land tenure type encompasses land tenure arrangements and land use regimes. We believe that land tenure and production scale are relevant to understanding the knowledge-attitude-practice connection, because land tenure determines use and control rights and production scale is often linked to resources availability. Use and control rights dictate the extent to which farmers can decide how the land is managed, while resource availability influences what management is feasible.

Table 1
Land tenure types in South Africa.

Tribal communal – State lands that have been transferred to traditional local structures, in most areas are likely to be tribal chiefs or traditional councils set up in terms of the Traditional Leadership and Governance Framework Act of 2003 (Lahiff, 2008). Tribal chiefs and/or traditional councils control use allocation and management of the land, while state only maintains a nominal ownership. Individual communal farmers have use rights, but do not have land ownership, or decision-making power for management concerning the whole farm.
Commonage – Public lands surrounding residential settlements given to village or town councils historically (Atkinson and Büscher, 2006). Land reform opened the access to these lands to the previously disadvantaged people, and acquired additional lands for some municipalities through the Municipal Commonage Grants for use by the "poor and less privileged" (Anderson and Pienaar, 2003; Atkinson, 2007). Municipalities hold these lands in trust for public's use and benefits so they cannot sell the lands without state permission unless they acquired the lands with their own funds. Municipalities are tasked with establishing management committees with representation from land users and from provincial departments of agriculture. However, the legal arrangements in commonages are often unclear or inadequate so that farmers use the land communally with or without a fee, and have no decision-making power for management concerning the land (Atkinson, 2007; Atkinson and Büscher, 2006).
Private-collective – Two land redistribution programs, Settlement/Land Acquisition Grant (SLAG) and Land Redistribution for Agricultural Development (LRAD), helped to create this type of land tenure (Lahiff, 2008). SLAG was an older grant that targeted the poorest of the poor; it was replaced by LRAD in 2001 to create a class of commercial farmers of previously disadvantaged people (Jacobs et al., 2003). Both grants were set up to help eligible applicants to purchase or lease (could be combined with option to buy) farms. Most projects from these two redistribution programs tend to involve multiple applicants pooling their grants, because of the small size of usual grant amount relative to the cost of typical commercial holdings (Jacobs et al., 2003; Lahiff, 2008). Therefore, many LRAD farms are owned privately by a group of individuals, who elect a committee to manage the farm collectively. This tenure type also includes private lands held by a group entity (e.g., corporation, cooperative, and trust), but we did not explore these lands in this study.
Private-individual – Private tenure held by an individual farmer, who can manage the farm independently.
Lease-collective – Private, public, or state lands that are rented to a group of farmers or a group entity. Programs such as LRAD and Proactive Land Acquisition Strategy of 2006 (PLAS) grave grants to previously disadvantaged individuals to lease farms as a group (Lahiff, 2008). The farmers do not have land ownership, but have use rights and can manage the farm collectively.
Lease-individual – Same as Lease-Collective, except that the lease is held by an individual farmer, who can manage the farm independently.

To establish the context for the development of a farmer typology, we provide a brief background on the most relevant historical land policies and land reform in South Africa. We then describe the types of land tenure and production scale in South Africa that we used to construct the farmer typology. Finally, we explore the relationship between knowledge, attitude and land management practices of each participant and category in the farmer typology.

1.1. Land policies and land tenure types

The Natives Land Act of 1913 was instrumental in establishing a racially skewed pattern of land rights and distribution in South Africa. It restricted black South Africans, the majority population, to settle on only 7% of lands; this percentage was increased to 14% in 1936 (Hoffman and Ashwell, 2001; Ramutshindela, 1998).