"On Non-Equilibrium and Nomadism: Knowledge, Diversity and Global Modernity in Drylands (and Beyond…)"

S Sullivan and K Homewood

CSGR Working Paper No. 122/03

September 2003

Centre for the Study of Globalisation and Regionalisation (CSGR), University of Warwick, Coventry, CV4 7AL, United Kingdom. URL: http://www.csgr.org

On Non-Equilibrium and Nomadism: Knowledge, Diversity and Global Modernity in Drylands (and Beyond …)[1]

Sian Sullivan[a] and Katherine Homewood[b]
a: Research Fellow, CSGR, University of Warwick; b: Professor and Head of Dept., Anthropology, University College London

CSGR Working paper No. 122/03
September 2003

Abstract

Drylands worldwide, together with the variously nomadic peoples who live there, are associated with the incidence of poverty and environmental degradation. Corresponding assertions of pending social and ecological collapse have paved the way for hegemonic development and policy interventions focusing on the settlement of formerly mobile populations, reductions of livestock numbers, land privatisation and shifts towards commercial and tightly regulated production. Despite the wealth of expertise and monetary resources involved, however, these initiatives have rarely been successful, either in socio-economic or environmental terms. Our aim in this paper is to engage critically with the conceptual underpinnings and empirical consequences of a globalising modernity as these have played out in dryland environments, and in relation to practices of mobility amongst the peoples with whom such environments are associated. We draw on a debate that exists in ecology regarding the sources and types of dynamic behaviour driving ecological systems. Drylands have become a particular focus of this debate. In these environments extreme and unpredictable variability in rainfall are considered (by some) to confer non-equilibrium dynamics by continually disrupting the tight consumer-resource relations that otherwise would pull the components of the system towards equilibrium. This implies that livestock grazing in drylands, widely thought to cause degradation and 'desertification' through detrimental management practices including mobility and the maximising of herd reproductive rates, in fact might not be causing irreversible ecological change. Or at least not through exceeding a density-dependent equilibrial relationship with forage availability. We attempt to extend discussion by thinking through the cultural and historical contexts leading to a particular 'shoehorning' of the dynamics associated with non-equilibrium and nomadism into a conceptual framework that emphasises the desirability of stability, equilibrium and predictability. In doing so, we draw on the explanatory power of theories of conceptual and ritual purification (associated with anthropologist Mary Douglas); of the empowered panopticon society with its requirements for diffuse and minutely controlled surveillance and regulation (cf. Foucault), and of the ideological differences between State and Nomad science as considered by philosophers Gilles Deleuze and Félix Guattari.

Keywords:- non-equilibrium, nomadism, globalisation, modernity, purification (Douglas), panopticon society (Foucault) State and Nomad science (Deleuze and Guattari), policy, gender, patriarchy, resistance

Address for correspondence:
Sian Sullivan
CSGR, University of Warwick
Coventry CV4 7AL, United Kingdom
Tel.: +44 (0)24 7657 4420 Fax.: +44 (0)24 7657 2548
Email: s.sullivan@warwick.ac.uk

[1] Draft book chapter for Pimbert, M. (ed.) forthcoming 2004, *Reclaiming Knowledge for Diversity*, Earthscan, London. Formatting follows the Earthscan guidelines.

Introduction

> [I]mages of poverty and … pastoralism have in recent years become inextricably bound up together in apocalyptic scenes of drought, famine and warfare. Media representations of swollen-bellied children, skeletal figures in drought-stricken landscapes and pitiful refugee camps are so powerful that, rather than stimulating critical examination of the complex causes of the crisis, they have circumvented it and urged upon planners the simplest of diagnoses and cures … *There is the profoundest possible opposition between the diagnoses and perceptions of the planners and the perceptions of the pastoralists themselves.* While planners see the reduction of livestock and moves towards sedentarization and cultivation as the ways to prosperity, pastoralists tend to see these as the very definition of poverty itself (Broch-Due and Anderson, 1999, pxi, emphasis added).

The quote above describes widespread views regarding pastoral nomads and drylands. In popular perceptions, these are localities and peoples that have been distinguished by their poverty, their environmental fragility, the scourge of degradation and 'encroaching deserts', the irruption of disorder, conflict and banditry, and the apparent need for a civilising intervention that favours settlement, land privatisation and planning (e.g. Hardin, 1968; Lamprey, 1983; Sinclair and Fryxell, 1984; Timberlake, 1988; Grainger, 1992).

In the 1980s and 1990s an alternative discourse emerged, that situated the construction of these negative views in historical context, considered the power relationships and often marginalizing policies they support, and challenged the evidence and assumptions on which they are based (for the African context see Anderson, 1984; Homewood and Rodgers, 1987; Brockington and Homewood, 1996; Sullivan, 1996a, 1999a, 2000a; Mortimore, 1998; Oba *et al*., 2000; Brockington, 2002; Sullivan and Rohde, 2002). For example, studies increasingly question assumptions of agro/pastoralist induced degradation, whether of rangeland habitat (Homewood *et al*., 2001), soil fertility (Mortimore, 1998; Ramisch, 1999; Hilhorst and Muchena, 2000; Osbahr, 2001) soil erosion/redeposition (e.g. Abel, 1993; Homewood, 1994), deforestation (Leach and Fairhead, 2000) or biodiversity (Homewood and Brockington, 1999; Maddox, 2002, Western and Gichohi, 1993; Homewood *et al.*, 2001). Instead, debate and dialogue between range ecologists, development workers, policymakers and practitioners since the 1980s have emphasised the ecological and economic rationales behind mobile livestock production systems in drylands (Sandford 1983; Behnke *et* al., 1993; Solbrig and Young 1993, Niamir-Fuller 1999a and b).

Beinart (2000, p270) has described recent analyses as attempts to build a 'corrective and anti-colonial' discourse that might say as much about the paradigmatic postcolonial framework that these scholars have been working within as about the 'out there' or empirical legitimacy of their views. Elsewhere, critique of 'new' thinking and a defence of 'conventional' natural science

analyses regarding dryland dynamics indicate the contentious nature of views involved in these debates (e.g. Illius and O'Connor, 1999, 2000; Attwell and Cotterill, 2000; Cowling, 2000). Recently published natural science analyses of long-term climate patterns add further complexity (e.g. Rohde, 1997a and b; Nicholson *et al.*, 1998; Parmesan and Yohe, 2003). For example, contrary to popular assumptions about contemporary Sahelian desertification (Nachtergaele, 2002), and to models linking agro/pastoral land use with rising albedo and falling rainfall (Charney *et al* , 1975), Nicholson *et al*. (1998) indicate that there has been no recent progressive change in the boundary of the Sahara, in the vegetation cover of the Sahel, nor in productivity (as defined by water-use efficiency of vegetation cover).

In this paper we aim to extend discussion *not* by asking who's 'right' or 'wrong' and why in these debates, but instead by interrogating *why* views regarding the dynamics of drylands, and the knowledge and practices of pastoral nomads, are so contested and seemingly irreconcilable. We focus on existing and emerging debates signified by the two key terms of our title, namely 'non-equilibrium' and 'nomadism'. In a sense, these terms represent all that is and has been problematic for scholars and policy makers regarding both drylands and the mobility and diverse livelihood practices of the variously nomadic peoples who live there. As such, we explore ways in which differences in values and assumptions regarding environmental phenomena in drylands affect the ways in which 'the environment' is used, managed and perceived by people.

A significant dimension of these interrelationships relates to how particular environmental discourses can become reified as 'truth', and thereby inform modern policy and planning in ways that may disenfranchise those with different – but perhaps no less 'true' – perceptions about the same phenomena. This is not only an outcome of a Foucauldian power/knowledge nexus (e.g. Foucault, 1981). It is also related to ways in which *ignorance*, conscious or otherwise, sustains exclusionary discourses, policies and practices (cf. Gordon, 1998; Sullivan, 2000a). Thus a 'fettering of the imagination' (cf. Habermas), and an everyday unwillingness to engage with the complex, constructed and contingent nature of ways of knowing (e.g. Belenky *et al*., 1986), translates into the occlusion of alternative knowledges along axes of difference supported by current power structures (e.g. Richards 1985; Nader 1996; Leach and Fairhead 1998).

We complement this analysis by taking the classic anthropological concepts of purity and danger (e.g. Douglas, 1966) as central to understanding both the current situation and long-term

trajectories in drylands. Mary Douglas argued that rituals of purity and impurity among cultures and religions are central for the maintenance of unifying categories used to classify, conceptualise and construct 'reality', and required the avoidance and purification of phenomena representing danger and disorder in relation to these categories. The elimination of sources of disorder thus becomes '… a positive effort to organise the environment', such that '… separating, purifying, demarcating and punishing transgressions' are enacted 'by exaggerating the difference between within and without' so as 'to impose system on an inherently untidy experience' (Douglas, 1966, p2, 4). We extend these ideas in considering the ways in which socio-political processes of purification – of knowledges, peoples, spaces, and practices – have structured encounters with modernity for drylands and their inhabitants. We argue that this has manifested as the exclusion of phenomena that run counter to the normative frame of reference of a powerful, colonising and now globalising *culture* of modernity.

Three interrelated dimensions in particular constrain understanding of contexts positioned as peripheral to this culture. First, the reduction of complex and diverse phenomena to bounded and reified categories, i.e. that act as homogenising reference points, transferable across time and space (Latour 1987; Smith 2001). Second, the construction of a rationalist and positivist procedure for knowledge acquisition which, through separating and abstracting phenomena from their social and moral contexts, makes possible their use in technological, industrial and militaristic arenas with negative and/or inappropriate social and ecological consequences (cf. Nader, 1996). And third, the particular and constraining gender constructs embodied by modern patriarchy (Belenky *et al*., 1986; Hodgson, 1999, 2000). Organically and pragmatically, these have underscored a number of familiar and globalising phenomena, including:

- centralised state-planning and the ordering of spatial contexts (e.g. Corbin, 1986; Smith, 2001), building on the codification, via surveying and mapping, of territories and peoples (cf. Peluso, 1995; Hodgson and Schroeder, 1999; Hughes, 1999; Abramson, 2000). To use Foucault's words (1977 (1975): 195, 196), space thus is managed and controlled by becoming 'segmented, immobile and frozen', making possible the 'constantly centralized' surveillance, registration and regulation of the dangerous, contaminating 'other' – the 'pathological';
- the instrumentalisation, militarisation and commodification of a reified western 'technoscience' (Nader, 1996) with the ability to 'act at a distance' from the locales of its formalisation (Latour, 1987, 1993; Murdoch and Clark, 1994);

- the standardising and commercialising of production practices, coupled with prescriptive regulation of both production and reproduction (e.g. Greer, 1984);
- and an inflexible gendering of public and private domains coupled with the 'othering' of woman by a normative frame that takes man as the human generic (e.g. Irigary, 1997 (1996)).

Thus the *power* of state science, planning and regulation over the last 2,000 years – from Greek antiquity and the Roman Empire which forms the basis for modern legislative structures – has been maintained precisely by the delegitimising and dehumanising of concepts, practices and peoples that, in Mary Douglas' terms (1966), pose *danger* to emerging hegemonic structures and categories. As Foucault writes of the extensive disciplinary power over all individual bodies desired in 'the utopia of the perfectly governed city', it effects 'a whole set of techniques and institutions for measuring, supervising and correcting the abnormal', including 'people who appear and disappear', i.e. nomads ((Foucault, 1977 (1975): 198, 199). It is this empowered conceptual process, together with the technological phenomena utilised in its support, that enables the acts of assimilation and colonisation, and of purification and eradication, of 'the other' that we know only too well from history.

Clearly, the 'edge' (cf. Jacobs 1996) of the meeting between the modern colonial imperative and the colonised 'periphery' has manifested differently in the geographically distant drylands that form the focus of this paper. We distinguish here between 'Old World' drylands of the Middle East, Africa, Asia and Europe, and a pastoral 'New World' of the Americas, Australia and southern Africa (cf. Behnke, 1983). In the former, pastoralism has existed for millennia and, in relative terms, modern (European) colonialism was based on resource extraction and labour administration as opposed to large-scale European settlement. In the pastoral 'New World' of the Americas, Australia and Southern Africa, European settlers unrolled a cattle ranching system and a cowboy culture harking back to medieval Spain during the 11th and 12th centuries when the Christian Reconquista frontier forced back the Moors (Behnke, 1983, citing Bishko, 1952). European colonists displaced earlier inhabitants across the vast part of the 'New World' drylands through genocidal dispossession at the colonising frontier (17th century in South America; 19th century in North America, Australia and South Africa), and by eventual incorporation of indigenes as landless stockmen/herders, labourers and servants. In these drylands a European settler imperative focusing on commercial livestock production based on

introduced species thus generated the continual requirement for new land, becoming associated with the extreme violence and 'genocidal moment' of the frontier (Dirk Moses, 2000)[2].

Although these dryland contexts represent major differences in the specificities of how the modern colonial encounter played out, in simple terms we maintain that the rationality underscoring these processes has been the same, contributing to broadly similar outcomes in terms of the management and administration of both environment and people. Thus landscapes have been carved into fenced holdings with defined livestock carrying capacities, while people have been encouraged and coerced to settle, often in bounded reservations and following ethnicide (e.g. Trafzer, 2000) or as an underclass and labour pool (Behnke, 1983; Holmes, 1993; Gordon and Sholto Douglas, 2000). 'Wild lands' have been purified of undesirable beasts – from wild dog to tsetse fly - only to later become the desired and imagined spaces of 'untouched Edenic Nature', or the locales of various 'community-based conservation' schemes designed to 'upfront' wildlife and wild landscapes over, or as well as, other livelihood practices (e.g. Duffy, 2000; Brockington, 2002, Alexander and MacGregor, 2000). Women have been excluded from decision-making processes (e.g. Sullivan, 2000b) and undermined by the commercialisation and formalisation of production practices (Hodgson, 1999). As Smith (2001, p31) argues in commenting on the (anti-)social space of modernity, '[t]his repetitively patterned space consumes and regulates the differences between places and people: it encapsulates a normalizing morality that seeks to reduce all differences to an economic order of the Same'.

In extending discussion we also attempt to draw into debate insights from the brilliant (if sometimes frustratingly obscuring) work of philosophers Gilles Deleuze and Félix Guattari (1988 (1980)), particularly their conceptions of the differences and relationships between 'State' and 'Nomad' science. We argue that these correspond well to expositions and arguments regarding equilibrium and non-equilibrium ecological dynamics respectively (discussed further below), as well as to the similar distinctions drawn between modern/commercial/privatised/settled systems of production on the one hand, and traditional(customary)/subsistence/communal(common property)/mobile production practices on the other. Work by Deleuze and Guattari among others can extend our frame of reference and analysis beyond the somewhat crude and even environmentally deterministic equilibrium/non-

[2] This typology is somewhat problematic for the southern African context where livestock have been herded nomadically for at least 2,000 years (Kinahan, 1991). We group southern Africa with the Americas and Australia, however, because of the shared experiences of these territories in terms of European settlement and the ensuing dislocation of indigenous peoples from the land via processes of genocide and proletarianisation. For dryland southern Africa see Bley (1996), Skotnes (1996), Gordon and Sholto Douglas (2000) and Suzman (2000).

equilibrium divide that has dogged recent debate regarding drylands and pastoral production practices. In particular, this work can contribute to understanding that non-equilibrium thinking and pastoral/nomadic practices are problematic precisely *because* they are qualitatively and conceptually different to the cross-cutting phenomena of formal science, the categorising rationality of modernity, and centralised state-planning and governance.

From this perspective, non-equilibrium thinking and nomadic practices can be seen as comprising conceptual and pragmatic challenges to the norms delineated and required by the *logos* of state-centrism and rationality. In resisting what amounts to a paradigmatic contestation of a colonising, hegemonic and state-centric modernity that is supported by a mechanistic, linear and equilibrium-oriented technoscience, these categories have been physically and/or conceptually suppressed (purified), incorporated and transformed (colonised), or peripheralised (marginalized). In other words, the problems of legitimacy faced by drylands, pastoral nomads and perhaps even by scientists adhering to a non-equilibrial conception of dynamics (see below), attain sharper relief when set within a broader socio-political and historical context: namely, a context associated with an emerging and global hegemony of a particular and constructed humanity – from which difference is erased, whether by persuasion, suppression, coercion or violence[3].

We are coming to a view that these differing views may never be reconciled. This is because in many ways the binary oppositions on which they are built – equilibrium/non-equilibrium thinking, state/nomad science, settled/mobile practices, modernity/postmodernity - are ideological in nature, extending from fundamentally different ways of imagining, conceptualising and being in the world, as well as from different ways of realising power. As Saner (1999, p3) states, even for the empirical sciences, '… a scientific question cannot be completely separated from the question of *values*' (emphasis added). Further, natural science data themselves can be construed as inference-laden signifiers that represent choice, perception, interpretation and scientific *habitus* in the building of an empirically verifiable and variously

[3] This is not to deny that throughout history there have been long periods when settled peoples and places have lived under the hegemony of mobile, pastoralist groups, who have dominated and manipulated resources, production and social norms according to their own ideologies, whether religious, political, economic or military. For example, in the 19th century Tuareg and Fulani States dominated large areas of west Africa, with pastoralist nobles depending on the farm production and domestic labour of enslaved cultivating peoples. Maasai controlled much of East Africa and the Tusi dominated present day Ruanda and Burundi. Similarly, herders may have a tradition of maintaining others in positions of subservience as labourers, as currently is the case with Herero in south-west Africa (Namibia and Botswana) in their hiring of 'Bushman' (i.e. Sān-speaking) workers (Suzman, 2000). Nevertheless, our focus here is on the ways in which pastoralists have met with, been incorporated within, and been accommodated by the modern state, and our position is that this encounter has been systematically problematic for indigenous herders and nomads.

technologically useful world 'out there' (Orestes *et al*., 1994, in Baumann, 2000, p4). Thus, if it is indeed the case that an adherence to equilibrium/linear or non-equilibrium/non-linear thinking speaks more of ideology than 'reality', then how might we be able to take debate forward? In particular, how do we find ways of engendering a conversation across this ideological divide?

One possible path might be to move towards an explicit view that these categories do not exist in isolation from each other, but *in relationship with* each other (cf. Nader, 1996, p.xi). To paraphrase Deleuze and Guattari (1988 (1980), p352), they function as pairs. Further, equilibrium and non-equilibrium thinking, state-centric (settled) and nomadic practice, each contain the seed or definition of the other (cf. Kumar, 2002), in the same way that yang contains yin and vice versa in the familiar and powerful symbol of Chinese Taoist thought (e.g. Hooker, 1996). Conceptually this represents a movement away from entrenched and static either/or dichotomies and binary oppositions towards an understanding that accepts the empirical reality of dualities, but sees dualistic categories as relational, dynamic *and essential for each other's existence*. It also opens up greater possibilities for thinking beyond linear framings of the equilibrium/non-equilibrium dynamical relationship as being located on a continuum from one extreme to the other (e.g. Wiens, 1984; Illius and O'Connor, 1999; Sullivan and Rohde, 2002). For example, a more explicitly relational view might be better able to embrace the cross-cutting interrelationships of temporal and spatial scale with those biological and abiotic dynamics that have become known as equilibrium and non-equilibrium dynamics respectively (also see Briske *et al*., 2003; Oba *et al*., 2003). In this sense, the empirical variability and complexity of dryland environments and pastoral practices – associated with temporal and spatial scale, varied species and suites of species, and diverse socio-cultural practices – might be more critically and effectively conceptualised and analysed in ways that move beyond and reflect back on simple defenses of entrenched positions.

In terms of the empirical issues and knowledge debates that form the focus of this chapter, the question therefore is not whether equilibrium or non-equilibrium thinking, settlement and nomadism, are 'right' or 'wrong', true or false. Instead, both intellectually and pragmatically the relevant questions relate more to distinguishing in what contexts and under what conditions might these different dynamics and practices arise, and what might be learned or elucidated by their relationships to each other in these contexts. Nevertheless, hegemony of one component of an oppositional pair, and purification or marginalisation of the other, denotes a relationship that is out of balance. With exceptions, we maintain that this is precisely what can be observed for

the linear, equilibrium thinking underscoring the conceptualisation and management of drylands and pastoral peoples under modernity, and the ways in which these environments and peoples have been systematically perceived and (mis)understood by 'outsiders'. If this is the case, then engagement with non-linear and non-equilibrium concepts may be critical if we are to understand the processes that generate the misunderstandings and detrimental outcomes described in section three below and summarised in the quotation with which we began this chapter.

The chapter proceeds in three sections. In the first two sections we review debates regarding knowledge production and policy intervention in dryland environments and in relation to pastoralist/nomadic peoples. For ease of organisation and readership we focus first on ecological debates, and second on socio-cultural aspects with the important *proviso* that these domains are overlapping and cross-cutting in all areas of discussion and 'reality'. In our third and final section we focus on policy and intervention and on some ways in which these are influenced by the conceptual frameworks we discuss in the previous sections. We refer to case material throughout the chapter, with a particular emphasis on African contexts, which is where we both have primary fieldwork experience.

Non-equilibrium and drylands

The term 'non-equilibrium' has fast become shorthand for ways of thinking in dryland ecology that emphasise the abiotically-driven, variable productivity of arid and semi-arid environments. As such, this 'new rangeland ecology' challenges conceptual 'norms' in ecology, population biology and rangeland science, i.e. that emphasise the emergence of density-dependent dynamics from the producer-consumer relations that exist between species, and particularly between plants and herbivores. What this means in practice is a growing scepticism towards statements of irreversible environmental degradation caused by the herding practices of pastoralists, specifically the impacts of livestock on soils and vegetation (see references below). Non-equilibrium views affirm instead that tight links between variable rainfall and primary productivity, particularly in more arid environments, may mitigate degradation processes (caused by the impacts of livestock on vegetation) by weakening and/or disrupting the relationship between herbivores and forage.

In order to avoid duplication, we do not intend here either an extensive review of the ecological specificities of equilibrium and non-equilibrium conceptions of dynamics and ecological functioning in drylands, or a detailed critique of the arguments for and against each aspect of these conceptions. Table 1, however, presents a brief typology of both, with the *proviso* (as above) that the descriptions noted in each column are each defined by, and exist in dynamic relationship with, the other. Readers who wish to access in more detail the specific components of recent debate are advised to turn to the excellent overview by Oba *et al.,* (2000), as well as to recent in-depth reviews in Illius and O'Connor (1999), Scoones (1999) and Sullivan and Rohde (2002). The latter paper is a detailed response to Illius and O'Connor (1999): as such, these two papers go some way to presenting equilibrial (Illius and O'Connor) and non-equilibrial (Sullivan and Rohde) views respectively. A particular technical focus of debate has been on whether or not sporadic and weak density dependent effects (Scoones, 1993), or density dependent effects operating in restricted but key resource parts of ecosystems (Homewood, 1994) are (a) of such significance that 'a system' can effectively be better understood as an equilibrium system or (b) allow survival/maintenance of enough grazers to *exceed* the 'carrying capacity' of surrounding wet season dispersal areas, thereby causing degradation (as argued in Illius and O'Connor, 1999, 2000). Contained within the synthesis papers above, as well as elsewhere in this chapter, are references to specific aspects of the debate and to detailed and location-specific case-studies.

Instead, our aims in this section are threefold. First, we consider some of the ways in which non-equilibrium approaches have been, and are being, discredited by proponents of what we might frame as 'mainstream' or 'orthodox' approaches in ecology, population biology and rangeland science. Second, we describe some ways in which key general assumptions in equilibrium and non-equilibrium conceptions of ecology dynamics differ. And finally, we indicate some reasons as to why non-equilibrial approaches are actively discredited, suggesting (as above) that this to some extent is a logical outcome of the cultural, ideological and institutional contexts within which each position is located, as well as of the policies and power relationships they legitimate.

Table 1. An overview of ecological dynamics associated with equilibrium and non-equilibrium conceptions of rangelands, together with related policy and economics outcomes. Drawing extensively on Oba et al. (2000, p37).

Equilibrium	Non-equilibrium
Ecology:	
Climate stability	Unpredictable climatic variability
Stable interannual primary productivity	Unpredictably variable primary productivity (tightly linked to rainfall)
Livestock population strongly coupled with vegetation (density-dependent)	Livestock population density-independent
Change in stocking density creates predictable changes in plant assemblages	Livestock track unpredictable forage production
Policy and economics:	
Potential carrying capacity can be predicted	Calculations of carrying capacity not useful
Stocking density can be regulated according to carrying capacity	Opportunistic grazing practices employing mobility are more appropriate
Land and resources under private/freehold tenure	Land and resources held and managed as common property, and/or under communal tenure regimes in southern African reservations
Goals:	***Goals:***
strongly commercial/financial; benefits/profit vested in cash and capital	subsistence; reproduction of herd; profit vested in social relationships (although nb. prevention of cash/capital accumulation and of participation with emerging economies in southern Africa because of long history of marginalisation under apartheid (cf. Bollig, 1998a and b)).

Having to some extent ridden the crest of a wave of paradigmatic change over the last fifteen years, non-equilibrium ideas in dryland ecology now are undergoing intense scrutiny by ecologists, particularly in southern Africa (e.g. Illius and O'Connor, 1999, 2000; Campbell *et al*., 2000). As a result, it has been asserted that many of the tenets and precepts of nonequilibrium ideas have been 'falsified' and 'challenged' (Cowling, 2000, pp303-304). As noted above, many of these challenges are themselves disputed (cf. Sullivan and Rohde, 2002). What is of interest to us here is that beyond the playing out of this academic debate through discussion and critique of theory, empirical analyses and interpretation, there has been a noticeable attempt to discredit non-equilibrium concepts and analyses on the basis that these are somehow focused in publications that do not comprise 'rigorous', 'real' or 'primary' science. Take, for example, a recent review by South African ecologist Cowling (2000, p303-304), in which he asserts his scepticism for all things nonequilibrial by stating that '…very little of this "new" science has appeared in the primary literature' or '… been subjected to rigorous peer-review'. This seems to us to be an easily demonstrable misrepresentation of the situation.

To illustrate our point, let's take a closer look at these statements in relation to a selection of contributions to a non-equilibrial framing of dynamics in ecology, and particularly African dryland ecology, over the last three decades. Notwithstanding the pecking order of academic journals, among these references (see Table 2) are a score of articles that have appeared in major peer-reviewed journals, including the three highest-impact general science periodicals (*Nature*, *Science* and *Proceedings of the National Academy of Sciences* (of the USA)) as well as specialist publications. Are all these to be dismissed as academically and scientifically irrelevant, along with contributions made by these and other authors as peer-reviewed chapters in edited volumes brought out by academic presses?

Journal	Author/date
Annual Review of Ecology and Systematics	Holling, 1973; Noy-Meir, 1973
Journal of Ecology	Noy-Meir, 1975
Science	Coughenour *et al*., 1985
The Journal of Applied Ecology	Belsky *et al.*, 1989, 1993a
The Journal of Arid Environments	Belsky, 1989; Coughenour *et al*., 1990; Scoones, 1995; Ward *et al*., 1998; Turner, 1999
The Journal of Range Management	Ellis and Swift, 1988
The Journal of Animal Ecology	Dublin *et al.*, 1990
Forest and Conservation History	Dublin, 1991
Nature	Mace, 1991
Land Degradation and Rehabilitation	Scoones, 1992
Agroforestry Systems	Belsky *et al.*, 1993b
Ecology	Belsky, 1994
BioScience	Belsky and Canman, 1994; Oba *et al*., 2000
The Journal of Biogeography	Sullivan, 1996a; Turner, 1998a and b; Sullivan and Rohde, 2002
The Geographical Journal	Scoones, 1997
Conservation Ecology	Holling, 1998
Global Ecology and Biogeography	Sullivan, 1999a
Proceedings of the National Academy of Sciences	Homewood *et al*., 2001
Global Environmental Change	Lambin *et al*., 2001.
	For chapters in edited volumes published by academic presses see also Wiens, 1984; Caughley *et al*., 1987; Homewood and Rodgers, 1987; Belsky, 1995; Scoones, 1993; Behnke *et al*., 1993; Ellis *et al*., 1993; Ellis, 1994; Sullivan, 2000; Turner, 1999.

Table 2. Recent publications regarding African rangeland dynamics and drawing on non-equilibrium ideas in ecology, listed by journal of publication. For full references see bibliography.

It seems to us pertinent to consider what is signalled by Cowling's (inaccurate) dismissal of non-equilibrium perspectives as not having received the credentials conferred by appearance in the primary, and rigorously peer-reviewed, literature. The word *primary* here says a lot about the assumed and imputed relationship between non-equilibrium and equilibrium concepts in dryland ecology (and beyond): namely, that non-equilibrial analyses and approaches are somehow

secondary; that they exist in a peripheral relationship to a *hardcore* of conventional (equilibrial) rangeland science; that this core retains its functions as providing the key conceptual reference points against which all else is measured and revealed; and that these relationships make work drawing on 'eccentric' (cf. Deleuze and Guattari, 1988 (1980), p361) non-equilibrium ideas somehow less rigorous, less accurate, less *hard*. If this is the case, then what are the underlying differences between this core and the periphery in ecology, and what is gained by the entrenching of these positions, and by the defending of ecological orthodoxy?

Classical ecology (like classical economics) emerged in a particular historical, cultural and environmental context. In the simplest of terms, this was fuelled by the imperatives and assumptions of European, and particularly British, imperialism. It acted to entrench on a global scale the situations of inequality arising from a particular mode of economic behaviour, i.e. associated with the mechanisation and homogenisation of production, the mining of resources, the desirability of continual growth, the monopolisation of profit, the dehumanisation of people as labour, and lucrative collaboration between government and business. In both general and systematic terms, a further empire-building assumption was of the possibility and desirability of the distribution of sameness – namely, of what were considered to be superior Christian-European, patriarchal, modern and scientific values and practices (cf. Nader, 1996, pxiv). These desires were pursued variously through processes of assimilation, colonisation, or extermination of local peoples, assisted by the surveying and mapping, and hence control, of geographical spaces (not to mention the rationalisation and measurement of time-keeping (Corbett, in press), as well as the measurement and purification of smell (Corbin, (1996 (1982)). Anker (2002) has argued cogently that ecology, a new science, expanded rapidly in this context to provide expertise in establishing tools for the extraction and management of natural resources, and for informing the planning and management of human settlement and land use practices.

Significantly, these desires and assumptions emerged within, and are/were influenced by, a temperate environmental context. This is relevant because it meant that the academic discipline of ecology, and its practical application in terms of resource management, emerged where abiotic conditions and productivity were relatively constant within the timescales (interannual and over several decades) of relevance to economic productivity and decision-making. This is not to say that variability in productivity and unpredictable abiotic and biotic events were or are unimportant in these contexts – in Britain the low temperatures of the mini-Ice Age in the 19th century, the extreme drought of 1976, and the recent devastations of foot and mouth disease (the

latter exacerbated by administrative and political reactions over and above biophysical processes) demonstrate that this is not the case. What it does suggest, however, is that this relatively predictable and even stable environmental context supported a particular *modus operandi* in the natural sciences that operated from core values and assumptions about the nature of nature, and was fuelled by the successful delineation of laws and models to describe the dynamics of physical systems at particular scales of observation and in experimental contexts abstracted from the 'real world'. This further supported a particular and instrumental relationship with nature (cf. Merchant, 1980), and was entangled with the structuring and maintaining of a range of power relationships and of processes of territorial expansion through the rationalisation of landscapes (cf. Mukerji, 1997). As hypothetically posed by several authors (e.g. Seddon, 1997, pp73-82; Stott, 1997, 1998), if the science of ecology had emerged in a different environmental context - the more explicitly variable environments of drylands, for example - its key norms and signifiers might have been very different.

We outline below some key assumptions underlying the core principle of equilibrium, and indicate some ways in which non-equilibrium ecology departs from these assumptions. Table 3 summarises these differences and indicates some correspondences with the concepts of equilibrium dynamics and state science on the one hand, and non-equilibrium dynamics and nomad science on the other.

Equilibrium community state

All 'systems', whether ecological, social or economic, are assumed to have a natural and fundamental state or stable 'equilibrium'. In classical ecology, this is the original, primary or climax community (*synusiae*), i.e. the stable community that exists in the context of its abiotic environment (comprised of edaphic (or soil), climatic, topographic and fire factors). For analytical purposes, these are treated as stable, and as exogenous to biotic community factors. Thus community equilibrium exists when all else is equal, with each species - or member of the community – functioning as part of the whole to maintain this equilibrium state. In anthropology and sociology, an analogous framing of human communities and societies is that of structural functionalism, whereby all socio-cultural phenomena are interpreted as performing a function in maintaining the stable structure of (a) society (as noted by Richards, 1996, and discussed in Fairhead, 2000, p611). In ecology, the equilibrium community state frequently has been delineated with respect to vegetation parameters (cf. Richards, 1996): a tendency thus has been

to analyse animals and people in terms of their *impacts on* this primary community, rather than their *contributions to* the emergence of observed and desired communities.

From a non-equilibrial perspective, key understandings are that biotic and abiotic phenomena are integrated in their dynamical behaviour (i.e. making the delineation of endogenous and exogenous variables problematic if not impossible). As framed in ancient times by the Greek philosopher Heraclitus (cf. Stott, 1998) - not to mention throughout Oriental/eastern philosophy - flows and flux are considered 'reality itself' (Deleuze and Guattari, 1988 (1980), p361), such that change is the only consistency and it is impossible for all else ever to be equal. Thus, 'the system itself is a moving target' (Holling, 1998, p3), with surprise, uncertainty and unpredictability emerging from both biotic and abiotic sources and with effects that differ according to scale of observation. This is not to say that patterns and order do not emerge, but that in living systems phenomena are never absolutely repeatable – exactly the same - through time and space. Patterns and persistence are better imagined as system trajectories in n-dimensional phase space, drawn to basins of attraction but sometimes shifting from these, and always pursuing pathways that differ through time to varying degrees. Analytically and dynamically a state of equilibrium in a living system (or *complex*) can signify only one thing, namely, death (cf. Jantsch, 1980; Waldrop, 1992; Cilliers, 1998). Thus, Waldrop (1992, p147, following computer scientist John Holland, e.g. 1992, 1998, 2000), states that, 'it's essentially meaningless to talk about a complex adaptive system being in equilibrium: the system can never get there. It is always unfolding, always in transition. In fact, if the system ever does reach equilibrium, it isn't just stable. It's dead'. Similarly, Cilliers (1998, p122) asserts that '… to yearn for a state of complete equilibrium is to yearn for a sarcophagus'.

State science	Nomad science	Key references
Science practice		
Analyst	Synthesist	Baumann, 2000, p3
Atomism/reductionism – a science of parts	Holism – a science of wholes	Rosenberg, 1995
Mechanistic	Living	
Rationalist/materialist	Spiritualist/existential	
Equilibrium	Non-equilibrium	
Quantitative	Qualitative	
Extraction of constants/laws/absolutes – universalist and globalising	Engagement with continuous variation of variables	Deleuze and Guattari, 1988, pp372, 382
Focus on solid forms and linear analytics	Focus on flows, vortices and sprirals and nonlinear analytics	Deleuze and Guattari, 1988, pp361
Manifestations		
Technoscience (associated with instrumental outcomes; commodification and militarisation of knowledge)	Ethnoscience science,	
a science of ends/goals and of experts	a science of means/processes and of folk/citizens	
City and Polis (government)	Outskirts/country and Nomos (governance)	
Planning from the centre	Knowledge distributed through networks	
Managerial/state centric	Devolved/distributed decision-making	
Engineering	Bricolage	Levi-Strauss, 1966, in Nader, 1996, p6
Reproduction of sameness	Following/tracking of variability and change	Deleuze and Guattari, 1988, pp372
Static/settled	Moving/mobile/mobilising	Deleuze and Guattari, 1988, pp80
Knowledge		
Information-based	Practice-based, *habitus*	Bourdieu, 1990 (1980)
Doctrinal	Gnostic (self-knowledge; intuitive wisdom)	Pagels, 1979
Symbolically conservative/impoverished	Symbolically imaginative/rich	
Models of organisation		
Top-down, strong hierarchies	Bottom-up, agent-based, loose/temporary hierarchies or nodes	Baumann, 2000, p3
Tree	Rhizome	Deleuze and Guattari, 1988
Formal	Informal/'underground'/dissident/'illegitimate'	De Certeau, 1984

Contd.

Contd.		
State science	**Nomad science**	**Key references**
Geographies		
Space (abstract and homogenous)	Place (differentiated meaning, heterogeneity, diversity)	Tilley 1994
Land =parcelled/enclosed/delimited/privatised/ allocated/striated	Land = open/unenclosed/managed in common/distributed/smooth	Deleuze and Guattari, 1988, p380, 557
Power		
Power over	Power to	Holloway, 2002 (after Nietzsche)
Orthodox (apostolic)	Heretic (gnostic) = persecuted and purified	Pagels, 1979
	Acentred	
Centred		
Associated gender		
Male	Female	

Table 3. Table of correspondences for the intertwined notions of equilibrium dynamics and state science on the one hand, and non-equilibrium dynamics and nomad science on the other.

Disturbance (from equilibrium)

In equilibrium thinking, movement or perturbation away from the predetermined and functional equilibrium indicates disturbance and generally is framed as negative, i.e. as degradation. Disturbance in ecology might be seen as something akin to a falling from grace as framed in the Christian apostolic tradition. The conceptual acceptance of a baseline or original condition, tends to frame analyses of species assemblages in terms of what they may have been in the past, with present and future circumstances seen as deviations from this. In classical ecology this has manifested in some key organising ideas. The concept of ecological succession (primarily associated with Clements, 1916), for example, analyses changes in assemblages occurring due to disturbance in terms of their repeatable (and predictable) recovery or return to the baseline or 'climax' assemblage via a number of stages, which may themselves attain some temporal and/or spatial stability before succeeding to the next stage (cf. as predicted by state and transition, and multiple equilibria models, May, 1977).

This has since been challenged and reformulated by models that affirm the possibilities for contingency, indeterminacy and irreversibility. These are introduced, for example, by:

- path-dependency (i.e. history, cf. de Rosnay, 1979, in Saner, 1999) and the possibility of there being a multiplicity of possible paths (e.g. Turner, 1998a and b, 1999);
- patch dynamics conferred by location-specific events and interactions (e.g. Belsky *et al*., 1993a);
- the impacts of biotic ecosystem components on abiotic factors, as, for example, with the influence of tree canopies on physical and chemical soil properties (Belsky *et al*., 1989, 1993a and b) and the long-term effects of animals on substrate factors (e.g. Turner 1998a and b, 1999);
- and the possibility for positive (non-linear) feedback relationships between species (i.e. biotic-biotic relationships), as observed by Belsky *et al*. (1989) who found changes in the nutrient content of understorey grasses occurring under the tree canopies of selected species.

All of these types of interrelationships contribute to the dynamic mosaics of species observed empirically (cf. Aubréville, 1938). Ingersell (n.d., p2) notes, therefore, that ecology in the latter part of the twentieth century has shifted '… from seeing nature as composed of stable, self-perpetuating and self-balancing ("equilibrium") natural communities or systems, to

seeing nature as always in flux, and studying natural systems and landscapes as the products of unique events and histories'.

Successional dynamics nevertheless remain an important conceptual organising principle in the design and interpretations of ecological field studies, and in driving conservation goals and policies. For example, a frequent feature of ecology case-studies in drylands interpret species assemblages, and the presence or absence of particular 'indicator species', as evidence for degradation from, or closeness to, a desired ecosystem state, i.e. one that is conceived of as relatively undisturbed and therefore undegraded (for a range of references in relation to the southern African context, see Sullivan and Rohde, 2002, p1603).

Underlying the somewhat Edenic notion of an equilibrial baseline community or ecological 'deep structure', is a dominant organising and philosophical metaphor in western thought, namely, that of the *tree* (Deleuze and Guattari, 1988 (1980), pp3-25). This refers to a tendency to think in terms of the primary legitimacy of a root or foundation of things from which all else is distinguished or separated following the logic of dichotomies and binary splitting (one to two to four, etc.). With regard to knowledge production across disciplines this supports a view that 'truth/reality' – first principles - can be uncovered, revealed and reduced through processes of excavation and experimentation, through a reductionist analytics (Holling, 1998, p2), and by the tracing back of genealogies and lineages. In terms of organisation, the metaphor of the tree is well-known to us in the establishment of hierarchical (or 'arborescent') structures in which authority is invested. Arguably, the assumption that there is always a 'deep' structure, with a 'right', 'true' or 'primary' baseline that can be traced given the appropriate tools and conceptual framework, is what legitimates both the assumption of 'expert' knowledge on the part of ecologists, planners, policymakers, and untold other professionals, as well as the hierarchical organisational structures from which they are able to divulge their expertise. In other words, it legitimates the hegemonic relationships at the receiving end of which pastoralists frequently find themselves.

Equilibrium and economics

The acceptance that system behaviour is underlain by a condition of equilibrium makes tractable the building of economic predictions and models in relation to resource and environmental productivity. For example, the maximum sustainable yield of a product can be defined, thereby theoretically marrying the desires for maximum income on the part of a

harvester or farmer with the need to maintain environmental integrity so as to sustain further harvests. Similarly, the carrying capacity – i.e. the number of animals that can be sustained through time by a particular area of land - can be calculated, and used as a benchmark from which to regulate and enforce production and land use practices, and to decide who might be free-riding in relation to these calculations. In other words, there are instrumental reasons for assuming equilibrium dynamics in that they make elegant analyses possible (always good for academic prestige and publication in the 'primary' literature), enable harvesting rates to be set and profits to be predicted, justify policy, planning and intervention from the centre, and empower the expert by generating an impression of being able to provide solutions to pressing issues. As Levins and Lewontin (1985, in Baumann, 2000, p4) assert, however, a tautologous situation can arise such that analyses are constrained to the problems and methods that are amenable to analysis. In Holling's terms (1998, p3), the use of equilibrium acts to 'narrow uncertainty' in both conceptual and applied domains. We might say that it thereby contributes to a 'normal science' framework (cf. Kuhn, 1970 (1962)) that dictates possibilities for the types of questions asked and the analytical methods applied, and that enables scientists to maintain an aura of certainty and expertise – both of which are important in sustaining positions in '… today's institutional(ized) science regime' (Baumann, 2000, p4). Further, the naturalising of a dominant normal science and the perspectives arising therefrom, makes possible the maintenance of expert opinions *in the absence of natural science data*, as frequently has been the case where pastoralists have been accused of degrading pastures (see, for example, Brockington and Homewood 1996; Sullivan, 2000a; Brockington and Homewood 2001, Brockington, 2002, Homewood et al 2001).

***

These debates are significant because they carry with them political currency and as such translate into impacts on peoples' lives. As we have indicated, non-equilibrium ideas are resisted in some scientific quarters, and also pose challenges and problems for the developing and implementation of appropriate policy. But let's be honest about some underlying reasons as to why non-equilibrium generates such resistance. Non-equilibrium ideas demote the expert, superior positioning of the scientist by emphasising unknowability in terms of predicting the behaviour of complex systems. They create problems for conservationists wishing to clear (purify) landscapes of people and livestock in order to return these spaces to a desired, imagined original undisturbed state of nature. And by emphasising the significance of local and historical specificities they affirm devolved land use and management as the most

appropriate match between people and environment, thus reducing the legitimacy of state-centric, expert-led, top-down policy and planning.

Nomadism: 'not all those who wander are lost'[4]

This brings us to the second key term of our title, i.e. 'nomadism', and to the ways in which mobile lifestyles and livelihood practices have been denigrated and displaced by modernity. In this nexus of interrelations - between peoples, cultures, ideas and practices – pastoralists are misunderstood and marginalised *because* of the different practices and freedoms they represent as mobile peoples in contrast to the settled and more easily administered (and controlled) peoples of the city and of settled agriculture. Such circumstances are heightened when mobile pastoralists require access to land areas that also support natural resources critical to colonial and current empire-building, capital accumulation and profit in recent times – as has been the case for Bedouin pastoralists throughout the oil-rich drylands of the Middle east (e.g. Rae, 1999; Chatty, 2003). As Deleuze and Guattari (1988 (1980), p362) describe in their juxtaposing of nomad science with state or royal science, '[a]ll of this movement is what royal science is striving to limit. … nomad science is continually "barred," inhibited, or banned by the demands and conditions of State science'. Moreover, nomad science is variously submitted '… to civil and metric rules that strictly limit, control, localize' (Deleuze and Guattari, 1988 (1980), p363); under what Paul Virilio refers to as the 'geometrical imperialism of the West' (1975, p120, *in* Deleuze and Guattari, 1988 (1980), p554).

The corresponding suppression of pastoral knowledges that has occurred with the imposition of state-centric and/or modern administrative and production practices thus is understandable as part of a broader hegemonic process of social and spatial rationalisation. Given the legislative and assumed primacy or interiority (i.e. 'habit') of the state (cf. Deleuze and Guattari, 1988 (1980), p354), those on the margins are either gradually or forcibly brought into its fold, or pushed more and more into the frontier and into the lifestyle of the outlaw – literally of someone outside the rule of law. In combination with the constricting and fragmenting effects of imposed nation state frontiers (e.g. Galaty and Bonte, 1992; Oba, 2000) these peoples have been both marginalized and placed at the frontlines of international

[4] Tolkien, 1954, p260.

conflicts between neighbouring states and in relation to more global geopolitical tensions. Combined with customary expressions of conflict and power within and between pastoralist peoples (Kurimoto and Simonse 1998), and the exponential spread of automatic weapons (Hogg 1997), this has acted to make whole regions vulnerable to escalating banditry and warlord rule (see, for example, Markakis, 1966, 1993; Lewis 2001).

In this section we attempt to distinguish some key elements constituting the sciences/knowledges of nomadism that inform pastoralist practice in drylands, and to clarify why these pose a challenge to the rationality of 'state science', making them subject to modification, constraint and processes of purification. Again, refer to Table 3 for an overview of relevant components and correspondences of both 'state' and 'nomad' science. Here we focus on three overlapping domains of practices and the knowledges by which they are informed: first, the material realities of herd and livelihood management strategies, incorporating geographical mobility and the maintenance of diversity in both knowledge and practice; second, the significance of socio-cultural networks in contributing to the maintenance of both physical and social well-being; and third, an overview of customary arrangements in facilitating access to, and management of, land and other resources.

Making a living and nomad knowledges

In perhaps idealised terms, pastoral/nomadic living affirms, manages and responds to the variable productivity of drylands through maintaining heterogeneity and diversity in socio-economic practices. Herds are managed for species, breed and production diversity rather than for single products with value on commercial commodity markets (e.g. Sandford, 1983; Coughenour *et al*., 1985). Members of livestock-keeping 'households' distinguish multiple and different rights to animal products with individuals, households and families deployed in varying productive capacities across social groups through time and animals distributed and dispersed throughout herding kinship networks (e.g. Talle, 1987, 1988, 1990). Depending on opportunities and constraints, individuals and families may move between different livelihood practices and knowledges, complementing livestock-herding with various combinations of 'wild' product gathering and hunting (e.g. Sullivan, 1999b, 2000b, in press and references therein; Sullivan and Homewood, 2004), cultivation (Thompson and Homewood, 2002), trade (e.g. Zaal and Dietz, 1999), and remittances from wage labour (eg. Pantuliano, 2002). And women, contrary to assumptions of the 'patriarchal pastoralist' (cf. as critiqued in Hodgson, 2000), frequently hold positions of authority and responsibility as managers and decision-

makers. This is in relation to the milking of animals and the distribution of this primary subsistence item; the means by which women have ownership over animals; and their authority, as 'heads of houses', over consumption, production and social and biological reproduction (e.g. Broch-Due and Anderson, 1999; Grandin, 1988; Dahl, 1987; Talle, 1987, 1990; Joekes and Pointing, 1991; Jowkar *et al*., 1991; and chapters in the volume edited by Hodgson, 2000).

Underpinning this dynamism and flexibility in livelihood practices is both a conceptual acceptance (and practice) of the validity and necessity of physical movement through time and space, and the maintenance of a diversity of relevant knowledges to support and make possible such practices. Numerous studies document the mobility practices of pastoralist societies and these will not be described in-depth here (for recent detailed case studies, see Niamir-Fuller, 1999a and b; Hampshire and Randall, 1999 and in press). What arises from these studies is an appreciation of the ways in which the physical mobility of herds through time and space is essential to enable livestock to access forage resources whose availability varies according to abiotic conditions. It is through these practices that herders access the full range of available herding opportunities (from wet season grasslands to browse and leguminous pods as well as swamps or vleis/dambos in dry seasons (e.g. Scoones, 1991)).

The material necessity of mobility practices means that in many circumstances nomadism is maintained through disobedience in relation to state rules and across landscapes that now are demarcated into fenced holdings under various forms of individual or private tenure (see below). In the former 'homeland' of Damaraland, north-west Namibia, for example, and despite a rather static geography of delineated and fenced farms plus an administrative and apartheid context that was not amenable to movement by local people, migration histories for indigenous herders indicate that complex movements of people, livestock and other traded commodities across farm boundaries have characterised the area since its demarcated farms were redistributed to indigenous herders in the 1970s (Sullivan, 1996b). In fact, even in contexts where European settler livestock farmers have exclusive use of huge ranches under freehold tenure (such as in this area prior to the 1970s), it is apparent that herders need to move livestock across ranch boundaries, and sometimes over large distances, in order to maintain herd numbers in the face of variable forage productivity (Sullivan, 1996b; Beinart, 2003). Similarly, several case studies suggest that herd mobility remains essential where pastoralists have been settled on delineated group ranches, as is the case for group ranches in

Kenya (Grandin and Lembuya, 1987). These studies suggest that where access to extensively distributed resources is important, as is the case for dryland environments, it might be inappropriate to assume that individualised land tenure holdings are essential for increased economic productivity.

But as well as this, and as framed by authors as varied as Bruce Chatwin (in his bestseller *The Songlines* (1987)) and Deleuze and Guattari (1988 (1980)), abiding in a *habitus* of nomadism carries with it 'its' own rationality and 'pool' of collective subjectivities. It is partly this that positions mobile pastoralists, those accessing and using the dispersed resources of drylands, as counter or peripheral to the centre-oriented interiority of the state. As Chatwin (1987) describes:

> To survive at all, the desert dweller – Tuareg or Aboriginal – must develop a prodigious sense of orientation. He [or she] must forever be naming, sifting, comparing a thousand different 'signs' – the tracks of a dung beetle or the ripple of a dune – to tell him where he is; where the others are; where the rain has fallen; where the next meal is coming from; whether if plant X is in flower, plant Y will be in berry, and so forth (Chatwin, 1987, pp222-223).

Chatwin's 'desert dwellers' in the above quote again are somewhat idealised. Depending on wealth and other opportunities (and constraints), today's pastoralists are as likely to make livelihood decisions via their mobile 'phones, or to have been drawn into 'food for work' programmes established for those dropping out of the system due to varying combinations of drought, land appropriation and warfare. But what he does convey is a sense of the importance of retaining openness in the *process* of enacting knowledge. Knowledge thus is called upon as and when necessary - in relation to the flow of changes in circumstances that occurs through time – such that we might think of nomad knowledge, or of 'citizen science' or ethnoscience more generally, as integrative through its potential and practice of collating and using multiple sources of knowledge/evidence/information (Holling 1998, p2). The phenomenologist Edmund Husserl describes this as a 'vagabond nomadism', for which knowledge is 'essentially and not accidentally inexact' (Deleuze and Guattari, 1988 (1980), p367). Thus, classificatory categories have loose boundaries, names (e.g. for species) vary through time and space and according to the lineage and history of the person doing the naming (Sullivan 1998), and knowledge expertise and specialisation, in relative terms, is distributed throughout collectives of people. This way of knowing is flexible and open, produced via interpretation, and is inseparable from heterogeneity and inexactness because 'it' also is inseparable from the unique experience, ideology and power of the knowledge-holder/producer (cf. Negri, 2002).

Networking

Pastoralist welfare is bound intimately with concepts and practices of exchange and reciprocity between and within 'groups', which thereby facilitate broader social networks that are activated and maintained by these practices. In eastern Africa, for example, pastoralists engage in complex 'cross-sectional and cross-ethnic bond-friendships' (Lind, 2003, p7, following Sobania, 1991) which act to 'sort-out' the particular attributes and niches of different 'groups', to help minimise conflict, and to act as the 'glue' that binds groups into broader regional and societal networks. Malleable and ambiguous ethnic identities also have enabled people to move in and out of 'groups' and to accommodate others when appropriate (e.g. Waller, 1985).

Negotiation, between groups and individuals, is critical in making exchange and reciprocity happen, as is the ability to recognise potential alliances through the process of reckoning relationships. The key to negotiation is kinship; in particular, a conception of kin relationships as reciprocal networks that can be continually modified or reorganized on the strength of new interactions between individuals (e.g. Lancaster and Lancaster, 1986). To take a regional example, kinship among Khoesān 'groups' inhabiting southern Africa drylands provides what Fuller (1993, p120) describes as a superbly enabling framework '… for the expansion and contraction of the network of relatives with whom one maintains reciprocal obligations'. This occurs primarily through parallelism in parents and same-sex cousins, a high incidence of fostering and adoption, and flexible definitions of those constituting family. Of particular significance is the potential for network expansion, embodied by a kinship frame that is '… constituted by relations of incorporation rather than exclusion, by virtue of which others are "drawn in" and not "parcelled out"' (Ingold, 1992, p208). Fuller (1993, pp114, 128) further maintains that this is linked with the exigencies of an uncertain environment: thus, '[t]he intimate connection between kin and the social imperatives of economic survival leads to an imprecision in the definitions of who and who is not kin because the imperatives of economic survival are themselves constantly changing. ... A wide net of kin increases the area over which one could utilize resources thus counterbalancing the periodic localized droughts that occur' (also see Gordon, 1972, pp77-78). It is this in-built flexibility that confers buoyancy to any network. In this instance it means that the potential inherent within the social network for future linkages and reciprocity is not limited to the connections between individuals (and/or groups) that are activated at any one time. Viewed in this way, it is easy to conceptualise the multi-layering of social and kin networks, and the 'contractual alliances' on which they are

based (cf. Knight, 1990, p14), as literally providing a 'safety net' for the individuals and families constituting its 'members' (although by the same token, 'extended family relationships' also may be '… fraught with conflicting demands and opportunities' (Rohde, 1997a, p177; also see Fuller, 1993, pp147-150)).

The colonial administrative imperative ushered in an era that fetishised the ordering of land allocation and the registration of individuals within localities for administrative purposes. By fragmenting both land and social groupings and extending the arm of the state over both, this arguably has undermined local and autonomous welfare and livelihood practices. Nevertheless, kin relationships and the dynamic and fuzzy logic of kin and social networks retain significance in guiding the negotiations that make herd mobility and other welfare decisions possible, again frequently in contexts where such mobilisations occur through disobedience against imposed administrative constraints. A problematic ramification, however, has been a tendency for wealthier individuals and families to draw both on their position within local kin and social networks, and their access to and influence over formal processes of land registration, to consolidate ownership of land and resources while poorer land-users are excluded (e.g. Thompson and Homewood, 2002, discussed further below).

Customary tenure arrangements[5]

As a general rule, and especially pre-colonialism, the more arid and infertile the land, and the more seasonally and annually variable its productivity and ensuing use, the more likely it is that the area and its resources will be under communal control rather than individualised tenure. This makes common property regimes typical of pre-colonial drylands where movement is essential in order to access forage and other resources**.**

Inset 1 provides a detailed case example of the workings of the overlapping forms of tenure that may comprise common property regimes in dryland environments. Common components include:

- management of a dry season grazing area, often with a committee of elders who decide when and where to reserve, or allow access, to dry season grazing (for a detailed case example regarding Tanzanian Maasai, see Potkanski (1994), Brockington (2002) and Brockington and Homewood (1998));

[5] This subsection draws heavily on material developed for Sullivan and Homewood (2004).

- sophisticated collaborative management, of both the timing of herd access and the coordination of labour, to enable group access to shared water sources (as among Borana pastoralists of southern Ethiopia (Cossins and Upton, 1987));
- negotiation of group access to other 'key resources' such as local 'hotspots' of productive potential (for example, access to, and inheritance of, riverine tree resources for dry season forage managed by Turkana pastoralists in north Kenya (Barrow, 1988, 1990)).
- cultivated fields allocated as a common property resource such that plots are designated to be worked by particular individuals or households for one or more farming seasons, or until the household head has died, after which it reverts to the pool of common land for reallocation (Birley, 1982).

Inset 1. Overlapping forms of resource tenure and tenure change under agropastoralism in semi-arid north-central Namibia

Land tenure: settled and private, unsettled and communal
For oshiWambo-speaking peoples of north-central Namibia, land can be divided between a wetter central floodplain area, which is permanently settled and allocated under relatively secure tenure, and a peripheral unsettled area which is used and managed communally as wet season pasture for livestock.

In the *wetter, permanently settled central area*, land has been cleared for fields and kraals, and is divided into plots with recognised boundaries. These traditionally are allocated on a lifetime tenure basis to a household head (usually male) following payment of a fee to the chief/headman. The boundaries of these plots remained fixed so that, should a farmer wish to augment the size of his or her holdings, they would either be allocated a second plot in addition to that already inhabited, or would move to a completely different but larger plot. While the 'tenant/owner' did not have the right to alienate his (or occasionally her) allocation of land in the inhabited area, they could consider it as essentially theirs for the duration of their life, as long as it remained suitably productive and was improved during their 'tenancy'. Following their death, or the termination of tenure for any other reason, the farmland would return to the traditional land allocator, i.e. the King, chief or headman. Women did not normally 'own' land but had greater rights to the fields allocated her by her husband and to the produce from these fields. Since independence in 1990 the Namibian government has recognised this as discriminatory against women and formal policy now makes provision for the ownership of land by women and the inheritance of land by widows.

The *drier unsettled peripheral* areas are used primarily as wet season pastures allowing a pattern of transhumance, i.e. annual livestock movement, between the two categories of land. In the past, fees were not required from users of the uninhabited area. Here, established boundaries for plots did not exist and the only constraints to expansion were labour (for herding) and water availability. The land and its resources were loosely divided between the different Owambo-speaking communities. They were managed by the local 'community' with rights to a particular area, but flexibility in tenurial rights allowed the opportunistic and reciprocal use of pastures by different communities in response to rainfall-driven variability in pasture availability. In periods of severe drought, herds were driven to the sparsely populated pastures of eastern Kaokoland and southern Angola. Since the mid-20th century, increasing control by local headmen is indicated by records of payments being made for the establishment of kraals in the uninhabited zone, and the declaration and removal of 'illegal' settlement in this zone.

Water tenure
While the unsettled areas were communally managed, access to water occurring in these areas, without which the pastures could not be utilised, was controlled by those with recognised rights to an area. This could be an official leader, or if a waterpoint was constructed on the initiative of an individual it would be managed by them and inherited by their family as private property. Other farmers who wished to draw from these wells essentially became the clients of the presiding occupant.

Tree tenure and management
The distinction between land allocated to individuals and land open to access and utilisation by others in the community is complicated by common property rules governing the use and protection of key resources occurring in particular areas. Under traditional communal ownership of land important tree species, especially those which provide edible fruits, were protected by making the cutting of trees without the permission of the local king or his councillors a punishable offence. The marula (*Sclerocarya birrea*), important for its nutritious fruits from which a nourishing beer is made, for example, was among the most valued of tree species and individuals of this species were considered the property of the king regardless of where they were located. For this and other highly regarded species chiefs had partial first rights to the fruits. Often rules concerning usufructuary (i.e. use) rights to trees were supported by symbolic values attached to different species and different areas of land. For example, at the edge of each Owambo tribal area was located a sacred portion of land from where tree removal was thought to result in various physical afflictions such as blindness or paralysis.

Traditionally, tree tenure and land tenure thus were separate entities, and allocation of farmland did not necessarily confer 'ownership' of the trees on this land. This was particularly true of fruit trees, to which rights may be preserved by the traditional leader even when they occurred on allocated farmland. Rights to a plot of land within the inhabited areas, however, generally confers rights of first access to other resources on the plot to kraalheads and their families, the most important of these being waterholes and trees bearing edible fruits. Further complicating the system of rights accruing to individual trees are instances where several individuals may have access to different products of a single tree. So, while fruits maybe harvested by women, with some distilled into saleable liquor for their own profit, the rest are consumed by the whole household. Cutting of the tree for firewood or other wood products generally requires permission from the (normally male) household head and neighbours may request permission to harvest excess fruits and/or use the branches for livestock forage.

Traditional practices whereby particular tree species were protected have been complicated by the recommendation for several species occurring in north-central Namibia to be officially protected under colonial forestry legislation. The palm *Hyphaene petersiana* and various fig species, for example, were identified in 1927 as requiring protection by the forestry officer at the Union of South Africa Forestry Department, and the 'birdplum' *Berchemia discolor* has been protected since 1975. Protected status meant that permits were required before these trees could be felled by local inhabitants. An unfortunate consequence is that these rules have effectively removed responsibility for trees from local farmers and village headmen and, as with animal wildlife throughout Namibia, has eroded incentives among local farmers to manage these resources for sustained utilisation by themselves. The legislated restoration of limited ownership rights and management responsibility for natural resources by local farmers and village leaders currently is viewed as a way of encouraging appropriate resource management in post-independence Namibia and elsewhere.

Source: Sullivan, 1996c: 79-84 and references therein.

For so-called 'hunter-gatherers', and despite conventional stereotypes of their relentless mobility and their inability to recognise land and natural resources as belonging to any individual or group, a number of anthropological studies indicate complex conceptualisations

of land access and tenure rights (see Inset 2). Again, these are mediated via kin relations and rules guiding inheritance.

Inset 2. Traditional concepts of land ownership among Ju'|hoansi 'Bushmen'

Although conventionally thought to have little concept of land tenure or resource ownership, a consideration which has undermined their formal claims to land throughout Southern and East Africa, 'hunter-gatherer' populations conceptualise land and natural resources in terms of socially defined access rights determined through kin relatedness and inheritance. Here we review categories of land among the Ju'|hoansi, speakers of a central !Kung language who inhabit the Nyae Nyae area of west Botswana and east Namibia. The Ju'|hoansi recognise two types of communal land; the broad category of the **gxa|kxo** and the named places of the **n!oresi**. These are discussed separately below.

1. Gxa|kxo
This term translates literally as 'face of the earth' and refers to all the land and its resources in Nyae Nyae, to which all Ju'|hoansi have use and habitation rights as individual members by descent. The **gxa|kxo** thus is not the property of any corporate body within the Ju'|hoansi. The rights of individuals within the **gxa|kho** include the following:

- the right to use major plant-food resources such as the **tsi** or **morama** bean (*Tylosema esculentum*) and **g|kaa** or **mangetti** nuts (*Schinziophyton rautanenii*, formerly *Ricinodendron rautanenii*);
- the right to hunt and track animal wildlife, such that a hunted animal belongs to the hunter who strikes it, and not to the owners of the recognised territory or **n!ore** (see below) in which it was hit or in which it dies from the effects of arrow poison;
- the freedom to travel;
- the right to live at a permanent source of water during drought periods.

2. N!oresi
The **n!oresi** are named territories without fixed boundaries, usually with important focal resources such as permanent or semi-permanent water-holes and concentrations of valued plant-food species. Individual rights to residence within a **n!ore**, and to use its resources are inherited directly from both parents and ownership of a **n!ore** is only recognised if this traceable descent can be demonstrated. As such, 'ownership' of a **n!ore** is exclusive to a group related through kin alliances who manage its resources communally. 'Ownership' cannot be conferred on outsiders, even though they may reside within a **n!ore** for a prolonged period of time with permission of its recognised owners. An individual chooses in adulthood which of their parents' **n!ore** they wish to claim as their own and, through marriage to someone from outside that **n!ore**, gain rights of access and resource use to a second **n!ore**. In this sense, kinship networks underpin in a fundamental way an individual's rights to land and resources.

Sources: Ritchie, 1987; Botelle and Rohde, 1995.

In other words, tenure and the regulation of access to resources in drylands have tended to be based on the customary bond rather than the legislated pact/contract, i.e. on 'collective mechanisms of inhibition' (Deleuze and Guattari, 1988 (1980), p358). As noted above, these are maintained by the diffuse regulatory understandings and practices found in relatively acephalous (or non-state) societies, which often continue to operate despite the imposition of a codified state and administrative apparatus and power (Deleuze and Guattari, 1988 (1980),

p357). Thus, mechanisms of constraint are embodied in the 'fabric of immanent relations' (Deleuze and Guattari, 1988 (1980), p358) characterising such societies, i.e. in the flexible and rhizomous (horizontally-spreading) networks of kin and social solidarity, in genealogies and the processes of classificatory kinship reckoning (Fuller, 1993; Knight, 1990; Sullivan, in press), in sharing and in widely observed mechanisms for diffusion of wealth. Together, these represent 'another kind of justice' (Deleuze and Guattari, 1988 (1980), p351, 352): i.e. that is relatively distributed throughout the 'system' (cf. Sullivan forthcoming) rather than meted out from centres of power that are removed from the localities and individuals concerned; and that is relatively *processual* in relying on the prediction and tracking of opportunities and constraints rather than the rigid codification of rules of access and ownership (e.g. Sandford, 1983; Gordon, 1991; Roe *et al*., 1998).

Early analyses of land access and management under common property regimes tended to represent these complex understandings of 'right' use, allocation and management, as situations of 'open access', i.e. with resources used on an *ad hoc* and 'free-for-all' basis until 'degradation' occurred and people were forced to move or turn to alternative resources. The most famous exposition of this scenario is Hardin's (1968) 'Tragedy of the Commons'. This model alleges that environmental degradation is inevitable since pastoralists 'free-ride' by benefiting from the profits of individual herd accumulation while bearing none of the costs of communal range use and possible degradation. Although still often invoked, this analysis is misleading. It discounts the reality of the possibility for *communal* management and restraint, in favour of an emphasis on individual profit maximizing behaviour necessitating freehold title to land. As discussed further below, this has had some significant socio-economic and environmental impacts.

***

Arising from the above overview is an appreciation that the flexible mobility and other practices employed by pastoralists indeed may be better equipped to capitalise on the opportunities presented by variable environmental productivity, than are the various livestock development initiatives introduced to stabilise production in settled locations and thereby reduce the perceived poverty and insecurity of pastoralist livelihoods (see below). We might say that the flexibility they embody permits an unfolding of lifestyles and livelihood practices that reflects becoming rather than being; flowing rather than stasis; and following/tracking rather than stability/settlement/constancy (cf. Sandford, 1983; Deleuze and Guattari, 1988 (1980), p361; Rohde, 1994). Regarding organisation, pastoralists and other dryland dwellers,

relatively speaking, are characterised metaphorically by the horizontally spreading rhizome rather than the hierarchical tree (Deleuze and Guattari, 1988 (1980)), and their livelihood practices by multiplicity, diversity, and heterogeneity, rather than specialisation regarding products and skills. All of this has implications for analytics. For example, and as Waldrop (1992, p147, following computer scientist John Holland, e.g. 1992, 1998, 2000) describes: '… there's no point in imagining that the agents in the system can ever "optimise" their fitness, or their utility, or whatever. The space of possibilities is too vast; they have no practical way of finding the optimum. The most they can ever do is to change and improve themselves relative to what the other agents are doing. In short, complex adaptive systems are characterised by perpetual novelty.' Given that '[t]he concern of the state is to conserve' (Deleuze and Guattari, 1988 (1980), p357), i.e. to protect its institutions and organs of power, and to conserve desirable environments and lifestyles, it is not surprising that from the standpoint of the State, 'nomads' – mobile peoples - are portrayed in terms that convey 'illegitimacy' *vis à vis* all that the state stands for (Deleuze and Guattari, 1988 (1980), p384).

In the next section we outline trends in policy and intervention and their impacts in relation to dryland dwellers and environments.

Policy and interventions in pastoral drylands: herding, agriculture and wildlife conservation

The assumptions of a colonising and globalising modernity has had particular ramifications in terms of state policy and development interventions in drylands, Here we focus on focus on how the rationality underscoring indigenous land use practices has been marginalized in the processes of change associated with colonialism and globalisation. The conventional wisdom that rangelands are undergoing environmental degradation and desertification, due to climate change combined with overgrazing, overstocking, and damaging soil management practices (including nutrient mining), is a strong current running through the international development literature (discussed in Niamir-Fuller, 1999a and b; Platteau, 2000; Nachtergaele, 2002). As a result, the techniques associated with state science and the central control of natural resource management frequently have been emphasised at the expense of local practices and social institutions, with 'western' systems of management and production imported at the expense of institutions for customary control (e.g. Leach and Mearns, 1996; Mortimore, 1998; Carswell, 2002). Outside expertise consistently has been ranked above indigenous knowledge.

Commercialised production, benefiting national élites, has tended to be subsidised and to take priority over local livelihoods that sustain the majority of the population (Klink *et al*., 1993; Morena and Silva 1993). Associated with this has been repressive regulation of natural resource use by indigenous smallholders, tenant farmers or landless peoples, while environmentally problematic large scale commercial land uses, whether of crops or livestock, have been favoured (eg Lane and Pretty, 1990; Solbrig and Young, 1993; Government of Tanzania, 1997). On the latest frontier, post-Soviet steppe drylands seem to be following other 'Old World' common property drylands down the rhetorical pathways of overgrazing and pastoralist-induced degradation into the realities of rapid and inequitable privatisation (Debaine and Jaubert, 2002; Arab World Geographer, 2002).

Below, we focus in more detail on the broad trajectory of policies and interventions in drylands livestock, agriculture and wildlife conservation initiatives. We maintain that four interrelated and globalising contextual trends have guided these interventions:

- the increasing commercialisation, commoditisation and monetarisation of production practices (e.g. Zaal and Dietz, 1999);
- the rationalisation of both people and landscapes for administrative purposes;
- increasing statism, i.e. the consolidation of the nation-state and state-centric systems of government and management (of production and reproduction);
- and the interaction of political economies with ideologies of ecological 'truth', which tend to assume that degradation follows from pastoral land-use, and which emphasise the need for the conservation of landscapes from which people either are removed or constrained in terms of their access to, and use of, such landscapes.

As discussed below, these contextual trends have tended to support particular interventions with a now well-known litany of problematic outcomes.

Development trends in drylands

Commercialising production

Development intervention in drylands has taken as its normative framework a model of livestock production for commercial markets established in 'New World' drylands: i.e. based on extensive and fenced ranches under freehold tenure, with production focused on single marketable products, and management drawing on predictive models assuming equilibrium

dynamics. Up to the 1980s, the emphasis of development in the 'Old World' drylands of the Middle East, Africa, Asia and European systems thus was on introducing high-tech, capital intensive, exotic systems and breeds to revolutionise agricultural and livestock production. The aims were to generate wealth and kickstart health, education and infrastructural improvements, while also bringing greater numbers of citizens into the monetary economy. A number of comprehensive reviews highlight the failure of these attempts in Africa, in terms of wealth generation, livelihood security and environmental impacts (e.g. Horowitz, 1979; Adams, 1982; Haldermann, 1985; see summary in Cross, 1986). In Indian drylands, the nominally State controlled but *de facto* open access regime allowed an 'iron triangle' of politicians, bureaucrats and commercial entrepreneurs to manipulate subsidies and corner the benefits of development during the same period (Gadgil, 1993). In particular, massive subsidies channelling artificially cheap raw materials to woodland-based timber and pulp industries to supply urban markets passed the costs of environmental degradation on to the rural poor. Tribal and landless people, dependent on the commons for subsistence grazing, fuel, fibres, construction needs and also for income from selling these products on to urban and industrial consumers, have been progressively marginalised. Similarly, in the Brazilian *cerrados* heavily subsidised inputs have favoured commercial enterprises and mechanised farming by wealthy landowners in less arid savannas (Klink *et al*., 1993), while Silva and Moreno (1993) note for the Orinoco Basin *llanos* of Venezuela the incidence of environmental pollution due to heavy fertiliser and pesticide use - driven by petrochemical supply rather than agroecological considerations.

Rationalising land tenure

In the pastoral 'New World', European or Euro-American settlers established private ownership of large ranches on land alienated from indigenes to support commercial enterprises characterised by extensive cattle ranching, and based on low stocking rates per unit area of land and the regular harvest of a surplus 'crop' of young heifers for meat. As noted above, this has become the model for rangeland development interventions worldwide, requiring the codification of land tenure to facilitate the rationalisation of livestock management (based on the setting of carrying capacities, the monitoring of veterinary controls, and the administration of people). Fencing thus became a key management tool throughout the settler economies of 'New World' drylands[6].

[6] Following Behnke (1983), it is intriguing to note that ranchers in these areas in many cases did not fence themselves in by choice as a means of enhancing production. If anything, fencing initially led to livestock losses.

In 'Old World' drylands, the imposition of private forms of land tenure, usually accompanied by the delineation of land areas using fencing, has since become a norm guiding development interventions. Further, by assuming that land is not occupied in times when it is not being used by mobile peoples, this view has paved the way for land dispossession due to pressures from elsewhere (e.g. Lane and Pretty, 1990, p7; Birch, 1996). This also is occurring through the *de facto* privatisation of land through fencing by wealthy and frequently absentee herders, accompanied by *de facto* private control over key or focal resources such as boreholes and other water points, access to which is crucial in enabling use of the wider landscape (e.g. Graham, 1988; Berkes, 1989; Bromley and Cernea, 1989; Prior 1994). As capitalist relations of production and the demands of a global 'free' market increasingly penetrate African farming sectors, this land privatising trajectory becomes ever more likely, even in contexts where land redistribution to poorer farmers on communal land is a stated objective (as, for example, in the post-apartheid contexts of Zimbabwe, South Africa and Namibia). A systematic outcome has been the impoverishment of those (e.g. women, poorer individuals/families, and sometimes particular ethnic groupings) not able to access and capitalise on these opportunities (as documented in Talle, 1988; Galaty, 1999; Igoe and Brockington, 1999).

Currently, formal land tenure reform at the level of national policy, tends also to be based on assumptions guiding farming practices for commercial export markets (e.g. Birley, 1982; Rohde *et al.*, 2001). The assumption here is that inalienable title to land will increase investment in agriculture and thereby increase commercial productivity (although this is not necessarily what does ensue, cf. Haugerud, 1989). For example, the Government of Tanzania's Livestock and Agriculture policy specifically stresses that 'shifting agriculture and nomadism will be discouraged' (Government of Tanzania, 1997, p67); transhumant movements are to be 'modernised' and regulated; 'pastoralists and agriculturalists … will be educated on good land management'; and free movement of pastoralists with their cattle is to be regulated to limit conflict and degradation. This is a clearly stated policy to convert an indigenous livestock production system to western style commercial ranching by means of demarcation of land, fencing, pasture improvement, breed improvement, intensification of fodder production and veterinary inputs (although little of this has been evident in practice). Similar tenets structure the

In North America, ranchers fenced the range so as to keep out land hungry farmers and other ranchers. In Australia, they fenced in response to a crisis in labour availability when the 1850s gold rush drew away their sheep herders.

Nigerian Agriculture and livestock development policies (Fraser, 2003). Overgrazing, overstocking and environmental degradation myths remain central to these policy documents, as does the persistent assumption that local dryland agricultural practice in Africa is detrimental to soil structure, soil fertility, water relations and productivity generally (critiqued by Mortimore, 1998). The demarcation, subdivision and privatisation of formerly communally held and managed lands is a consistent feature of these policies, as is the pressure to move from more mobile to more settled lifestyles. At the same time, herders who are unable to qualify for, or otherwise maintain access to, privatised pastures and the other natural resources occurring on these lands, tend to experience disproportionately adverse effects due to privatisation and the application of monetarist macro-economic policy. This has been noted, for example, in Venezuela where the outcome of 'land reform' was in fact to concentrate private land in the hands of the wealthiest owners and further reduce the commons (Silva and Moreno, 1993; also Galaty, 1999; Toulmin and Quan, 2000; Thompson and Homewood, 2002; Thompson and Homewood, 2001, Homewood *et al*., in press).

In many 'New World' drylands, land reform also is occurring in response to the challenge to reinstate land rights to indigenous inhabitants. Again, problems emerge due to the radically different conceptions of, and relationship with, land associated with a settler European farming culture and indigenous people respectively. Broadly speaking, this can be summarised as the difference between 'people owning the land' and 'the land owning people'; corresponding to the difference between an economic and affective relationship with environment respectively (for further elaboration see Bender, 1993; Tilley, 1994; Abramson and Theodossopoulos, 2000; Ingold 2000). For example, Australia has a major programme of restoring Aboriginal land rights, but this has come under criticism from numerous quarters precisely because it seems impossible to genuinely bridge and accommodate this ideological divide in terms of relating with the landscape. The root of the difficulty lies in the different cultural significance with which land and landscape are imbued: thus, '…to Aborigines, land is not merely a "factor of production…(but) …a factor of existence…(providing) …religious significance, cultural integrity and social identification…" as well as a resource base for traditional activities' (Coombes *et al*, 1990, cited in Holmes and Mott, 1993, p297). Non transferable, freehold, communal land titles which attempt to deal with these differing conceptions of land have to be radically different to forms of land title which treat land as a commodity and as transferable property: shifting between these two forms is unlikely to be seamless. Thus, as Holmes and Mott (1993, p308) note:

> [A]ward of lands is constrained by the historical accident of land availability, either as Aboriginal reserve or as vacant public land or national park, rather than through any informed appraisal of the balance between Aboriginal and other interests…the outcome is often very inequitable. ….the title being issued is simultaneously more powerful and more restrictive than those available to non-Aboriginal people…[reinforcing] …the dualism between Aboriginal and non-Aboriginal lands and the associated social divisions….[and strengthening] …resistance towards recognition of further Aboriginal land claims….Accordingly it may reinforce and perpetuate inequitable outcomes for Aboriginals, and preclude multiple or joint land use options that require shared decision-making between Aboriginal and non-Aboriginals representatives (also see Morphy, 1993; Jacobs, 1996).

Trends in wildlife conservation

In 'Old World' drylands the drive to substitute commercial ranching on private land for indigenous livestock production on communal rangelands, and to fence, exclude, and destock, has been mirrored by a drive to substitute wildlife-based systems for agropastoralism through establishing protected areas on otherwise agropastoral land (Simpson and Evangelou, 1984; Alexander and MacGregor, 2000; Kristjansen *et al*., 2002). This perhaps has been most marked in African drylands, which retain a spectacular large mammal wildlife, but also is clear in the Middle East (Chatty 2003; also see Debaine and Jaubert, 2002), in Mongolia, and in India (the latter dominated by forest 'conservation' which is in practice tied to commercial exploitation, e.g. Gadgil, 1993; Rangan, 1996).

Biodiversity is perceived widely as declining in drylands (e.g. Grainger, 1999), although this perception is not always well supported (Shackleton, 1999; Homewood and Brockington, 1999; Maddox, 2002). The dominant explanatory model underlying biodiversity conservation policies has been that local land use practices are detrimental to soil, water, vegetation and habitat in general (Grainger, 1999; Hartmann, 2002). This is seen as an accelerating threat due to a growing human population and, particularly in sub-Saharan rangelands, in relation to expanding agropastoral land use leading to habitat conversion (Grainger, 1999). Mammal species survival is viewed as threatened by increases in local hunting, especially where urban demand gives rise to trade in valued species (Campbell, 1995; Caro 1999). Ironically, the erosion of land management practices bound with culturally-informed and praxis-oriented knowledges of the landscape also has been noted to have had undesirable ecological effects. This is the case, for example, with the restrictions placed on 'traditional' early dry season fire management practices in Australia, which has increased the incidence of late, frequently destructive and uncontrollable burns (e.g. as noted by CSIRO researcher Cheney, cited in Pockley, 2002; Dennis, 2003).

However, narratives of biodiversity (and particularly large mammal) decline arose in a context where a colonial European culture, identifying hunting using firearms with the leisure pursuits of the aristocracy, had enormous impacts on animal wildlife, while criminalizing local hunting for subsistence as poaching (MacKenzie, 1987; Escobar, 1996; Neumann, 1996). The associated narrative has been so strong that in some cases it has distorted interpretation of contemporary data on biodiversity and on landscape processes that are contradictory, requiring quite different ecological models in the explanation of landscape and species population change (Western and Gichohi, 1993; Brockington and Homewood, 1996; Leach and Mearns, 1996; Fairhead and Leach, 1997; Shackleton, 1999). The qualitative social and ecological character of drylands is inextricably intertwined with processes of continual disturbance through patchy and unpredictable rainfall, fire, grazing, browsing as well as through a range of abiotic-biotic-anthropogenic relationships (e.g. Ellis and Swift, 1988; Dublin, 1995; Behnke and Scoones, 1993; Homewood and Brockington, 1999). Dryland biodiversity, for example, is based less on local endemism and more on the ability of dryland species to disperse, colonise and persist in a patchy, unpredictably fluctuating and continually 'disturbed' environment. In such landscapes habitat disturbance thus is not *per se* detrimental to species survival (Davis *et al*., 1994; Stattersfield *et al*., 1998; Homewood and Brockington, 1999). Dryland biodiversity increases with the extent of the landscape throughout which mobile species are able to disperse with seasonal and annual fluctuations, rather than on the formal administrative boundaries defining the spatial extent of the protected area (Western and Ssemakula 1981, Western and Gichohi 1993). Large mammal density, frequency and abundance is at least as great in unfenced protected-area buffer zones (Maddox 2002) and can indeed be greater (Norton Griffiths 1998). Local hunting of species with high reproductive rate (e.g. ungulates/rodents) appears sustainable across much dryland/cropland mosaic, reflected recently in an Australian legal precedent which ruled that Aboriginal hunting of protected species was deemed not to be 'poaching' but to be a legal and sustainable resource use activity (Davies *et al*., 1994).

Nevertheless, conservation policy has sought first to protect as spatially extensive a set of areas as possible (e.g. Soulé and Sanjayan (1998) argue for 50% land surface area globally and nationally to be protected), as well as targeting biodiversity hotspots for special protection (Myers *et al*., 2000; Balmford *et al.,* 2001). Throughout 'Old World' drylands, protection has been based primarily on 'fortress conservation', i.e. requiring the exclusion of local users through fencing and legislation (e.g. Brockington, 2002), enforcement through paramilitary

style ranger forces (Leader Williams and Albon, 1988; Campbell *et al*., 1995; Clynes 2002; Sullivan 2002), and the retention of tourism/scientific research as appropriate uses within protected areas where consumptive use of natural resources for income generating activities supporting local livelihoods is banned. There also are extensive networks of protected forest lands, which in practice are more or less open to various degrees of encroachment, subsistence use and/or commercial exploitation (for India, see Gadgil, 1993)

A number of challenges to this overall policy have now emerged, on the grounds of flawed theory (Bell, 1987), poor conservation outcomes (Western and Ssemakula, 1981) and problematic development implications (Bell, 1987; Escobar, 1996). In its place, an ideology of community-based conservation (CBC) has assumed ascendancy, based on the potentially conservation-compatible and positive role of local land uses, the growing urgency of a universal human right to improved livelihoods and welfare, and the realisation that state resources cannot maintain the levels of enforcement needed for fortress conservation. In Australia, there have been complex interactions (including some synergy) between CBC (or Community Wildlife Management, CWM) and changing Aboriginal land rights (Davies *et al*., 1999; Roe *et al*., 2000), and some associated unease over the extent to which Aboriginal land management is and may continue to be conservation-compatible (Holmes and Mott, 1993, p308). In Old World drylands, particularly sub-Saharan Africa, IMF-led structural adjustment policies (and the associated reduction in public expenditure) have made it necessary to enlist the support of reserve-adjacent dwellers, rather than simply excluding them (IIED, 1994, Homewood, 2001). Community based conservation thus has been conceived and marketed by development agencies and donors as a people-friendly alternative to fortress conservation. CBC benefit-sharing schemes seek to compensate local people for the resources they forgo to protected areas by distributing income, employment and other benefits from wildlife tourism. In other cases, communities are contracted to manage part of their land for conservation purposes (Roe *et al*., 2000; Hulme and Murphree, 2001; Davies *et al*., 1999). However, the conservation goal commonly if not invariably is externally defined and supported (Holmes and Mott, 1993; Brockington, 2002). The overall outcome has been less to involve local people in protected area conservation, than to extend conservation control from the centre over their use of local resources outside protected areas (e.g. as in the case of Wildlife Management Areas in Tanzania, and the retaining of conservation control over areas ceded to Aboriginals in Australia (Holmes and Mott, 1993; Davies *et al*., 1999)).

CBC has been problematic from a development point of view, inspiring local protest in several contexts (Patel, 1998; Sullivan 1999b, 2000b, 2002, 2003a; Alexander and MacGregor, 2000). Nevertheless, there are recurrent pressures to cast community based wildlife management as having potential to produce win/win outcomes favourable to development and to wildlife conservation (e.g. LWAG, 2002). As with agriculture and livestock developments, community based wildlife management systems depend on demarcating boundaries and registering community membership within these boundaries, and can require the setting aside of areas of village land for conservation purposes. For local people this can mean curtailing through passage, land use options, and mobility, and actually further extends the arm of the state over rural (and otherwise 'peripheral') populations (e.g. Fairhead, 2000; Sullivan, 2002). Increasingly these arrangements involve private title made over on a leasehold or freehold basis to private entrepreneurs (Wøien and Lama, 1999). In many cases, this process is managed by central government and bypasses the local rural population altogether. Within the cooperative 'community based' wildlife associations established on Kenya's Group Ranches, small subsets of well placed individuals identified and secured title to key areas of high tourist potential, and then moved rapidly to exclude other members from sharing the potential benefits (Thompson and Homewood, 2002). In Zimbabwe's CAMPFIRE programme, initiatives hailed as successful for the 'community', marginalized gatherer-hunters who were excluded by the dominant settled participating villages, effectively becoming refugees and criminalized poachers in their own land (Marindo-Ranganai and Zaba, 1994).

[c] (En)gendering modernity in drylands

While cognisant of the problems of essentialising catgories, a view is emerging that an expanding frontier of modernity in drylands has tended towards a particularly disempowering impact on women. Thus patriarchal colonial and donor assumptions that emphasise working through male heads of household, assigning land title to men, and attributing ownership of livestock to men, have created and exacerbated gender inequalities in drylands (e.g. volume edited by Hodgson, 2000). Women's workloads, and their loss of control over their own labour, have been exacerbated by sedentarisation and tenure changes, male labour migration, changes in livestock entitlements and by a compromised access to natural resources due to reductions in common land area and transformations of landscapes under commercial agriculture. Women's dependence in some cases has increased due to the common passing to men of formal title to land. Those whose husbands have mismanaged their land and their herd,

or who are divorced or widowed, find themselves dispossessed and excluded in circumstances where their access, use of resources, and livelihoods previously might have been safeguarded under customary forms of tenure and entitlement (e.g. Talle, 1988; Joekes and Pointing, 1991). Conversely, even where formal tenure allows women to own land, the clash between imposed national legal frameworks which state this right, and the realities of customary practice and local hierarchies of power within and between households, can mean that women do not in fact benefit from their supposed legal right (e.g. Agarwal, 1999).

The growing ascendance of market pressures over social obligations also make it increasingly common for livestock to be disposed of by men without consulting their wives (Talle, 1988). This can extend to the production and management of milk, an item conventionally associated with pastoralist women as heads of houses. The social redistribution of milk among pastoralists is important not only for poorer individuals who benefit from the milk as food, but also in establishing those women who manage milk as centrally responsible for matters of importance to the household and therefore to the broader social grouping. As urban agglomerations grow in semi-arid and arid areas, however, and with the associated increase in sales of milk and other pastoral products, urban dairying activities by pastoralist women become increasingly common (Waters Bayer, 1985; Herren, 1990; Little, 1994). When this shift occurs men often gain control of the actual marketing and of the revenue, engendering a corresponding deterioration in women's autonomy and income that can have a knock-on effect on the food and health of dependants (Salih, 1985; Talle, 1990). Progressively greater diversion of milk to market outlets thus affects the fabric of social relations (e.g. Grandin, 1988; Ndagala, 1990, 1992), the commoditisation and commercialisation of milk precipitating a loss of control by women of both the management and the proceeds of milk sales. This is particularly likely to happen where there is the possibility of establishing larger scale dairying enterprises.

Sedentarisation, codification and commercialisation have impacted on another component of rural women's economic security, namely their use of gathered resources. With the rapid spread of private and exclusive ownership throughout drylands, with the spread of fencing and with increasing concentration round population centres, access to areas where women can gather wild plants for fuels, foods, fibres, medicines, and other products is becoming increasingly difficult (e.g. Gadgil, 1993; Konstant *et al.*, 1995; Sullivan *et al.*, 1995; Schreckenberg, 1996). This affects women and their dependents at every level of income,

workloads and food security (Anon, 1990). Spending more time seeking fuel or other plant resources, or having to find the money to purchase fuel, means restructuring domestic activities, for example, by spending more time on producing items that can be sold to finance alternative purchases. These activities and gendered areas of environmental knowledge may be further masked by a tendency to focus on a masculinised wildlife of large mammals in conservation initiatives (cf. Sullivan 2000b).

***

These problematic outcomes of development initiatives, coupled with the current poverty focus of major donors, mean that statements regarding 'development' in drylands (whether oriented towards agriculture, livestock or wildlife) today are couched in explicitly participatory, inclusive and 'pro-poor' terms. The extent to which these translate into significant reorientation of action on the ground, however, is debatable. On the face of it there has been progressive recognition that tackling indigenous problems, locally identified and prioritised, addressed through low-capital, low-tech, indigenous systems, offers more chance of 'sustainable development' than expensive interventions transplanted from western systems. There also has been general recognition that the development goal is not to maximise profits but to optimise livelihood security, health, education and political representation. The participatory (and 'pro-poor') rhetoric, and the low-profile inputs, ostensibly may minimise opportunities for élites and middlemen to benefit from the development process at the expense of target groups. Nevertheless bureaucracies administering dryland areas, both Old and New World, have been quick to respond to changing official priorities and development fashions. In some cases, bureaucracies (and their inevitable alliances with politicians and commercial entrepreneurs) have shown compliance and restructured themselves to attract and retain funding flows while ensuring limited implementation so that in practice little changes. In African drylands this is expressed in policy documents that are contradictory both internally and in their outcomes. They pay lipservice to establishing and addressing local priorities with local means, while at the same time maintaining a hard line on replacing indigenous dryland production systems with imported western-style enterprises, supported by conventional equilibrium narratives of ecosystem processes. Comparable contradictions have been evident in 'New World' drylands (Young and Solbrig, 1993). Even where the aim is to devolve decision-making responsibility this, unsurprisingly, tends to be heavily circumscribed in practice; as élites seek to protect their privileged positions, and recipients experience the socio-economic problematic of attempting to break from historical circumstances that locate

them in prior positions of inferiority (*vis à* vis the centre) and marginalisation (e.g. Little, 1989; IIED, 1994; Brockington, 2002).

To summarise then, development trends in drylands have emphasised interventions that are capital intensive and frequently subsidised, amounting to hi-tech inputs that require reliance on exogenously produced petrochemicals, and emphasising production for single product external markets. They have necessitated the rationalisation of land tenure into static, fenced and privately owned land-holdings, and they have supported conservation initiatives that fetishise a spectacular animal wildlife and 'wilderness' landscapes and effect control over landscapes and biodiversity by distantly located consumers. Their problematic outcomes have included:

- increasing wealth differentials, landlessness and the disruption of reciprocal welfare safety nets;
- severe transformation of landscapes through the establishing of capital intensive agricultural land-use schemes;
- erosion and loss of local environmental knowledge;
- and erosion of rights to productive resources and decision-making arenas held by women.

But the key point is that these processes and their outcomes are understandable, and even predictable, if they are considered as part and parcel of the suite of hegemonic rationalising and ideological assumptions underscoring modernity (see introductory section), i.e. which emphasises regulation and management from the centre, the fixing of people to places, and the purification of difference and apparent disorder.

Concluding remarks

In this chapter we have attempted to add to current debate regarding equilibrium and non-equilibrium dynamics, and the implications of these conceptual principles to drylands and their inhabitants, by asking a number of questions. In what relationship do these concepts exist with each other? Why have equilibrium concepts been so overwhelmingly naturalised within both science and policy communities, to the detriment both of the understanding of drylands, and the possibilities for self-determination by the peoples who live in these environments? And why are non-equilibrial framings of dynamics apparently so threatening

to states and experts? While clarification of different positions is important and necessary (cf. Illius and O'Connor, 1999; Sullivan and Rohde, 2002), we feel that it can become problematic if it entrenches positions and promotes defensive attitudes in relation to these. Thus we have tried here to move beyond our own positions to date, and to write with the intention of promoting conversations across dualisms.

In trying to think about how we think about things and why, however, we have not been able to avoid considering the devastating associations between equilibrium thinking, state science, the assumed superiority of the core, and the corresponding justification of top-down policies of control over landscapes and people. Again we should ask who benefits: ecologists as purveyors of a higher understanding? bureaucracies as regulators of land use? enforcers as having their role and control legitimised?

One element of the debate relates to an urgent need to shift from a perspective that maintains that 'reality' can be satisfactorily measured and predicted through the separation and abstracting of parameters from the contexts in which they occur. With prescience of currently emerging complex systems theories, De Rosnay (1979, in Saner, 1999, p2) argues that we need to take a macroscopic as opposed to a microscopic view of phenomena; an approach that is trans-disciplinary, accepts the hybrid nature of knowledge production (cf. Latour, 1987, 1993), and that responds to the need to integrate '[b]oth the science of parts and the science of the integration of parts' (Holling, 1998, p4). Such a shift would underscore a rebalancing between policies that facilitate opportunistic tracking as well as a dependence on the accuracy of forecasting and predictive models, and a relinquishing of decision-making and administrative power from the centre to the periphery. Given the inherently conservative nature of states and institutions, however, it is perhaps wishful thinking that such a shift will occur in meaningful terms.

Further, we are unwilling to avoid what we feel are the broader historical and contemporary processes of purification with which an adherence to the linear, equilibrium thinking of state science is entwined. Thus we ask ourselves if the processes we describe in this chapter for drylands are qualitatively distinct from the spectacular and violent power driven by desire for purification of the dehumanised Other throughout the last two millennia? We think not. In attempts to bring pastoralists into the fold of the settled state; to constrain perceptions of drylands to the filter of a constructed dynamical norm; to demonise drylands as degraded

through the equally demonic land use practices of their dwellers; and to impose static boundaries over both landscapes and people, we feel that we can see the seeds of some of the worst excesses of purification occurring through history. Dehumanisation, purification, and instrumentalist attitudes towards landscapes and natural resources drove the ethnicide of peoples in peripheral and frontier contexts – frequently drylands (Brown, 1970; Bley, 1996; Trafzer, 2000), as well as the restricting of peoples of colour and difference to reservations and 'homelands' in Southern Africa, Australia, North America and Israel. Notably, reserve boundaries in the latter two 'first world' contexts are today those that are the more deeply fetishised and entrenched. The persecution and holocausts of Gnostics in the first two centuries AD (Pagels, 1979), of women and 'witches' in 15th-17th century Europe and North America (Sergeant, 1996 (1936); Merchant, 1980), and of Jews and Roma in Nazi Germany and East Europe, amounted to extraordinary processes of social purification, entailing the blatant and hysterical dehumanisation of the different Other and, in the latter case, employing the rationalising techniques of a state-supported technoscience. Arguably, the desire for social and spatial purifications also lies behind the contemporary social panic that seems to be induced by those attempting to live differently to the mainstream (as, for example, in the denial of the legitimacy of travellers' and 'counter-cultural' lifestyles in the west, cf. Bender, 1998; No Borders, 2004). It is also apparent in the increasingly legislated and frequently violent suppression of dissent and difference we are witnessing today in the face of American imperialism and a hegemonic neoliberal capitalism (Independent Media Centre 2001; Neale, 2002; Starhawk, 2003), and perhaps in the discounting of citizen opinion in opposition to the recent US and UK-led war on Iraq (Sullivan, 2003b).

Where to now? How to feel optimistic or confident enough to make recommendations? - other than to say that it is critical for all who place themselves in the position of writing about, acting on behalf of, or drawing up policy for others to consider where ideas and views about environmental dynamics and best professional practice come from, what conceptions of reality they uphold, and what outcomes they are likely to support. And following Hardt and Negri (2000), perhaps to not be surprised by an increase in fragmented and dispersed forms of resistance to interventions that emerge as the further surveillance, codification, rationalisation and control of peoples' lifestyles and landscapes.

REFERENCES

Abramson, A and Theodossopoulos, D. (eds.) (2000) *Land, Law and Environment: Mythical Land, Legal Boundaries*, Pluto Press, London

Adams, W (1992) *Wasting the Rain: Rivers, People and Planning in Africa*, Earthscan, London

Agarwal, B (1999) *A Field of One's Own: Gender and Land Rights in South Asia*, Cambridge University Press, Cambridge

Alexander, J and MacGregor, J (2000) 'Wildlife and politics: CAMPFIRE in Zimbabwe', *Development and Change*, vol 31, pp605-62

Anderson, D (1984) 'Depression, dust bowl, demography and drought: the colonial state and soil conservation in East Africa during the 1930s', *African Affairs*, vol 83, pp321-343

Anderson, D.M and Broch-Due, V (eds.) (1999) *The Poor Are Not Us: Poverty and Pastoralism in Eastern Africa*, James Currey, East African Educational Publishing, Ohio University Press, Oxford, Nairobi, Ohio

Anker, P. (2002) *Imperial ecology: environmental order in the British Empire*, Massachusetts Harvard University Press, Cambridge

Anon (1990-1991) The impact of fuelwood scarcity on dietary patterns: hypotheses for research. *Unasylva*, vol 41(160), pp29-34

Arab World Geographer (2002) vol 5(2)

Attwell, C.A.M and Cotterill, F.P.D (2000) 'Postmodernism and African conservation science', *Biodiversity and Conservation*, vol 9, pp559-577

Aubréville, A (1938) *La Forêt Coloniale: Les Forêts de L'Afrique Occidentale Française. Annales d'Academie des Sciences Coloniales* IX. Societé d'Editions Géographiques, Maritimes et Coloniales.

Barrow, E (1988) 'Trees and pastoralists: the case of the Pokot and Turkana', *ODI Social Forestry Network Paper* 6b, Overseas Development Institute, London

Barrow, E (1990) 'Usufruct rights to trees: the role of Ekwar in dryland central Turkana, Kenya', *Human Ecology*, vol 18(2) pp163-176

Baumann, M (2000) 'On nature, models, and simplicity', *Conservation Ecology*, http://www.consecol.org/vol4/iss/2/resp4/

Behnke R (1983) 'Production Rationales: The Commercialisation of Subsistence Pastoralism', *Nomadic Peoples*, vol 14, pp3-34

Behnke, R and Scoones, I (1993) 'Rethinking Range Ecology: Implications for Rangeland Management in Africa', pp1-30 in Behnke, R, Scoones, I and Kerven C (eds) *Range Ecology at Disequilibrium: New Models of Natural Variability and Pastoral Adaptation in African Savannas*, Overseas Development Institute, International Institute of Environment and Development, Commonwealth Secretariat, London

Behnke, R.H, Scoones, I and Kerven, C (eds) (1993) *Range Ecology at Disequilibrium: New Models of Natural Variability and Pastoral Adaptation in African Savannas*, Overseas Development Institute, International Institute of Environment and Development, Commonwealth Secretariat, London

Beinart, W (2000) 'African history and environmental history', *African Affairs*, vol 99, pp69-302

Beinart, W (2003) *The Rise of Conservation in South Africa: Settlers, Livestock, and the Environment 1770-1950*, Oxford University Press, Oxford

Belenky, M. F, Clinchy, B.M, Goldberger, N.R and Tarule, J.M (1986) *Women's Ways of Knowing: The Development of Self, Voice and Mind*, Basic Books, USA

Bell, R (1987) 'Conservation with a Human Face', pp79-102 in Anderson, D and Grove, R (eds) *Conservation in Africa: People, Policies and Practice*, Cambridge University Press, Cambridge

Belsky, A.J (1989) 'Landscape patterns in a semi-arid ecosystem in East Africa', *Journal of Arid Environments*, vol 17, pp265-270

Belsky, A.J (1994) 'Influences of trees on savanna productivity: tests of shade, nutrients and tree-grass competition', *Ecology*, vol 75(4), pp922-932

Belsky, A.J (1995) 'Spatial and Temporal Patterns in Arid and Semi-Arid African Savannas', pp31-56 in Hansson, L, Fahrig, L and Merriam, G (eds) *Mosaic landscapes and ecological processes*, Chapman and Hall, London

Belsky, A.J, Amundson, R.G, Riha, S.J, Ali, A.R and Mwonga, S.M (1989) 'The effect of trees on their physical, chemical and biological environment in a semi-arid savanna (Tsavo) Kenya', *Journal of Applied Ecology*, vol 26, pp1005-1024

Belsky, A.J and Canham, C.D (1994) 'Forest gaps and isolated savanna trees: an application of patch dynamics in two ecosystems', *Bioscience*, vol 44(2), pp77-84

Belsky, A.J, Mwonga, S.M, Amundson, R.G, Duxbury, J.M and Ali, A.R (1993a) 'Comparative effects of isolated trees on their understory environments in high and low rainfall savannas', *Journal of Applied Ecology*, vol 30, pp143-155

Belsky, A.J, Mwonga, S.M and Duxbury, J.M (1993b) 'Effects of widely spaced trees and livestock grazing on the understory environments in tropical savannas', *Agroforestry Systems*, vol 24, pp1-20

Bender, B (1998) *Stonehenge: Making Space*, Berg, Oxford

Berkes, F (1989) *Common Property Resources: Ecological and Community Based Sustainable Development*, Belhaven Press, London

Birch, T (1996) '"A Land so Inviting and Still Without Inhabitants"': Erasing Koori Culture From (Post-)colonial Landscapes', pp173-188 in Darian-Smith, K, Gunner, L and Nuttall, S (eds) *Text, Theory and Space: Land, Literature and History in South Africa and Australia*, Routledge, London

Birley, M.H (1982) 'Resource management in Sukumaland, Tanzania', *Africa*, vol 52(2), pp1-29

Bley, H (1996) *Namibia Under German Rule*, Germany Lit Verlag, Hamburg

Bollig, M (1998a) 'The colonial encapsulation of the north-western Namibian pastoral economy', *Africa*, vol 68(4), pp506-536

Bollig, M (1998b) 'Power & Trade in Precolonial & Early Colonial Northern Kaokoland 1860s-1940s', pp175-193 in Hayes, P, Silvester, J, Wallace, M and Hartmann, W (eds) *Namibia Under South Africa Rule: Mobility and Containment 1915-1946*, James Currey, Out of Africa, Ohio University, London, Windhoek, Athens

Botelle, A and Rohde, R (1995) *Those Who Live on the Land: A Socio-economic Baseline Survey for Land Use Planning in the Communal Areas of Eastern Otjozondjupa*, Land Use Planning Series, Report 1, Windhoek

Bourdieu, P (1977) *Outline of a Theory of Practice*, Cambridge University Press, Cambridge

Briske, D.D, Fuhlendorf, S.D and Smeins, F.E (2003) 'Vegetation dynamics on rangelands: a critique of the current paradigms', *Journal of Applied Ecology*, vol 40, pp601-614

Broch-Due, V and Anderson, D.M (1999) 'Preface', ppix-xi in Anderson, D.M and Broch-Due, V (eds) *The Poor Are Not Us: Poverty and Pastoralism in Eastern Africa*, James Currey, East African Educational Publishing, Ohio University Press, Oxford, Nairobi, Ohio

Brockington, D (2002) *Fortress Conservation: The Preservation of the Mkomazi Game Reserve, Tanzania*, James Currey, Oxford

Brockington, D and Homewood, K (1996) 'Wildlife, Pastoralists and Science: Debates Concerning Mkomazi Game Reserve, Tanzania', pp91-104 in Leach, M and Mearns, R (eds) *The Lie of the Land: Challenging Received Wisdom on the African Environment*, The International African Institute, James Currey, Heinemann, London, Oxford and Portsmouth

Brockington, D and Homewood, K (1998) 'Pastoralism Around Mkomazi Game Reserve: The Interaction of Conservation and Development', pp? in Coe, M, McWilliam, N, Stone, G and Packer, M (eds) *Mkomazi: The Ecology, Biodiversity and Conservation of a Tanzanian Savanna*, RoyalGeographical Society (with the Institute of British Geographers), London

Brockington, D and Homewood, K (2001) 'Degradation debates and data deficiencies. The case of the Mkomazi Game Reserve, Tanzania', *Africa*, vol 71, pp179-227

Bromley, D and Cernea, W (1989) *The Management of Common Property Resources: Some Conceptual and Operational Fallacies*, World Bank, Washington

Brown, D (1970) *Bury My Heart at Wounded Knee: An Indian History of the American West*, Vintage, London

Campbell, K and Borner, M (1995) 'Population Trends and Distribution of Serengeti Herbivores: Implications for Management', pp117-145, in Sinclair, A.R.E and Arcese, P (eds) *Serengeti II. Dynamics, Management and Conservation of an Ecosystem*, University of Chicago Press, Chicago

Campbell, K and Hofer, H (1995) 'People and Wildlife: Spatial Dynamics and Zones of Interaction', pp534-570 in Sinclair, A.R.E and Arcese, P (eds) *Serengeti II. Dynamics, Management and Conservation of an Ecosystem*, University of Chicago Press, Chicago

Campbell, B.M, Costanza, R and van den Belt, M (2000) 'Special section: land use options in dry tropical woodland ecosystems in Zimbabwe: introduction, overview and synthesis', *Ecological Economics*, vol 33 pp341-351

Caro, T (1999a) 'Densities of mammals in partially protected areas: the Katavi ecosystem of western Tanzania', *Journal of Applied Ecology*, vol 36, pp205-217

Caro, T (1999b) 'Demography and behaviour of African mammals subject to exploitation', *Biological Conservation*, vol 91, pp91-97

Carswell, G (2002) 'Farmers and fallowing: agricultural change in Kigezi District, Uganda', *The Geographical Journal*, vol 168(2), pp130-140

Carter, A.J and O'Connor, T.G (1990) 'A Two-Phase Mosaic in a Savanna Grassland', *Journal of Vegetation Science*, vol2, pp231-236

Caughley, G, Shepherd, N and Short, J (eds) (1987) *Kangaroos: Their Ecology and Management in the Sheep Rangelands of Australia*, Cambridge University Press, Cambridge

Charney, J, Stone, P and Quirk, W (1975) 'Drought in the Sahara: a biogeophysical feedback mechanism', *Science*, vol 187, pp434-435

Chatty, D (2003) 'Environmentalism in the Syrian Badia: the Assumptions of Degradation, Protection and Bedouin Misuse', pp 87-99 in Anderson, D.G and Berglund, E. (eds) *Ethnographies of Conservation: Environmentalism and the Distribution of Privilege*, Berghahn Books, Oxford

Chatwin, B (1987) *The Songlines*, Picador, London

Cilliers, P (1998) *Complexity and Postmodernism: Understanding Complex Systems*, Routledge, London

Clements, F.E (1916) *Plant Succession: an Analysis of the Development of Vegetation*, Carnegie Institute Publications 242, Washington

Clynes, T (2002) 'They shoot poachers, don't they?' *The Observer* 24 November 2002, *OM Dispatches* pp35-47

Corbett, M. (in press) 'Sound organisation: a brief history of psychosonic management', *ephemera: critical dialogues on organization*, vol 3(4)

Corbin, A (1996 (1982)) *The Foul and the Fragrant: Odour and the Social Imagination*, Papermac, London

Cossins, N and Upton, M (1987) 'The Borana pastoral system of Southern Ethiopia', *Agricultural Systems*, vol 25, pp199-218

Coughenour, M.B, Coppock, D.L and Ellis, J.E (1990) 'Herbaceous forage variability in an arid pastoral region of Kenya: importance of topographic and rainfall gradients', *Journal of Arid Environments* vol 19, pp147-159

Coughenour, M.B, Ellis, J.E, Swift, D.M, Coppock, D.L, Galvin, K, McCabe, J.T and Hart, T.C (1985) 'Energy extraction and use in a nomadic pastoral ecosystem', *Science*, vol 230, pp619-624

Cowling, R (2000) 'Challenges to the 'new' rangeland science', *Trends in Ecology and Evolution (TREE)*, vol 15, pp303-304

Cross, M (1985) 'Waiting for a green revolution', *New Scientist*, vol 105, pp36-40

Dahl, G. (1987) 'Women in pastoral production: some theoretical notes on roles and resources', *Ethnos*, vol 52(1-2), pp246-279

Davies J, Higginbottom, K, Noack, D, Ross, H and Young, E (1999) 'Sustaining Eden: indigenous community wildlife management in Australia', *Evaluating Eden Series* No.1, International Institute of Environment and Development, London

Davis S, Heywood, V and Hamilton, A (eds) (1994) *Centres of Plant Diversity*, WWF/IUCN, Gland, Switzerland

Debaine, F and Jaubert, R (2002) 'The degradation of the steppe, hypotheses and realities', *The Arab World Geographer* 5 (2) 124-140

De Certeau, M. (1984) *The Practice of Everyday Life*, University of California Press, Berkeley

Deleuze, G and Guattari, F (1988 (1980)) *A Thousand Plateaus: Capitalism and Schizophrenia* (translation and foreword by Brain Massumi), The Athlone Press, London

Dennis, C (2003) 'Burning issues', *Nature* vol 421, pp204-206

De Rosnay, J (1979 (1975)) *The Macroscope: A New World Scientific System* (Translated by Robert Edwards), Harper and Row, New York

Dirk Moses, A (2000) 'An antipodean genocide? The origins of the genocidal moment in the colonization of Australia', *Journal of Genocide Research*, vol 2(1), pp89-106

Douglas, M (1966) *Purity and Danger*, Routledge and Kegan Paul, London

Dublin, H.T (1991) 'Dynamics of the Serengeti-Mara woodlands: an historic perspective', *Forest and Conservation History*, vol 35, pp169-178

Dublin, H.T, Sinclair, A.R.E and McGlade, J (1990) 'Elephants and fire as causes of multiple states in the Serengeti-Mara woodlands', *Journal of Animal Ecology* vol 59, pp1147-1164

Dublin, H (1995) 'Vegetation Dynamics in the Serengeti-Mara Ecosystem: The Role of Elephants, Fire and Other Factors', pp71-90 in Sinclair, A.R.E and Arcese, P (eds) *Serengeti II. Dynamics, Management and Conservation of an Ecosystem*, University of Chicago Press, Chicago

Duffy, R (2000) *Killing for Conservation: Wildlife Policy in Zimbabwe*, The International African Institute, James Currey, Indiana University Press and Weaver, London, Oxford, Indianapolis and Harare

Ellis, J. E (1994) 'Climate Variability and Complex Ecosystem Dynamics: Implications for Pastoral Development', pp37-46 in Scoones, I (ed) *Living With Uncertainty*, Intermediate Technology Publications, London

Ellis, J.E, Coughenour, M.B and Swift, D.M (1993) 'Climate variability, ecosystem stability, and the implications for range and livestock development', pp31-41 in Behnke, R.H, Scoones, I and Kerven, C (eds) *Range Ecology at Disequilibrium: New Models of Natural Variability and Pastoral Adaptation in African Savannas*, Overseas Development Institute, International Institute of Environment and

Development, Commonwealth Secretariat, London

Ellis, J.E and Swift, D.M (1988) 'Stability of African pastoral ecosystems: alternative paradigms and implications for development', *Journal of Range Management*, vol 41, pp450-459

Escobar, A (1996) *Encountering Development*, Princeton University Press, Princeton

Fairhead, J (2000) Book review article of Richards, P.W (1996) *The Tropical Rain Forest*(2nd edition), Cambridge University Press, Cambridge', *Progress in Physical Geography*, vol 24, pp609-613

Foucault, M (1981) *Power/knowledge: selected interviews and other writings, 1972-1977* (edited by Gordon, C) Harvester Wheatsheaf, Hemel Hempstead

Fraser, S (2003) *Parks, Pastoralists & Development Policy In The Nigerian Savanna: A Situated Study of the Politics of Land and Land-Use Reform in Relation to Migratory Pastoralists*, Ph.D. Thesis, University of London

Fuller, Ben B. Jnr (1993) *Institutional Appropriation and Social Change Among Agropastoralists in Central Namibia 1916-1988,* Ph.D. Dissertation, Boston Graduate School, Boston

Galaty, J.G (1999) *Double-voiced Violence in Kenya*, Paper presented at the Workshop on 'Conflict's fruit: poverty, violence and the politics of identity in African arenas,' 21-24 October 1999, Sophienburg Castle, Denmark

Galaty, J.G and Bonte, P (1992) *Herders, Warriors and Traders: Pastoralism in Africa*, Westview Press, Boulder, Colorado

Gadgil, M (1993) 'Restoring the Productivity of Indian Savannas', pp221-238 in Young, M.D and Solbrig, O (eds) *The World's Savannas: Economic Driving Forces, Ecological Constraints and Policy Options for Sustainable Land Use*, Vol 12, Man and Biosphere Series, UNESCO and Parthenon Publishing Group, Carnforth and New York

Gordon, R.J (1972) 'Towards an ethnography of Bergdama gossip', *Namib und Meer*, vol 2, pp45-47

Gordon, R.J (1991) 'Vernacular law and the future of human rights in Namibia', *NISER Discussion Paper* 11, Namibian Institute for Socio-economic Research, Windhoek, Namibia

Gordon, R.J (1998) 'Vagrancy, Law and 'Shadow Knowledge': Internal Pacification 1915-1939', pp 51-75 in Hayes, P, Silvester, J, Wallace, M and Hartmann, W (eds) *Namibia Under South African Rule: Mobility and Containment 1915-1946*, James Currey, Out of Africa Publishers and Ohio University Oxford, Windhoek, Ohio

Gordon, R.J and Sholto Douglas, S (2000) *The Bushman Myth: The Making of a Namibian Underclass* (2nd edition), Westview Press, Boulder, Colorado

Government of Tanzania (1997) 'Livestock and Agriculture Policy', pp 55-68 Section 3 Soil conservation and Land use planning, and Section 4: Range Management pp127-131 Policy statements. Dar es Salaam, Tanzania

Graham, O (1988) 'Enclosure of the East African rangelands: recent trends and their impact', *ODI Pastoral Development Network Paper* 25a, Overseas Development Institute, London.

Grandin, B (1988) 'Wealth and dairy production: a case study from Maasailand', *Human Ecology,* vol 16, pp1-21

Grandin, B and Lembuya, P (1987) 'The impact of 1984 drought at Olkarkar Group Ranch, Kajiado, Kenya', *ODI Pastoral Development network Paper* 23e, Overseas Development Institute, London

Grainger, A (1992) 'Characterization and Assessment of Desertification Processes', pp17-33 in Chapman, G.P (ed) *Desertified Grasslands: Their Biology and Management*, Academic Press, London

Greer, G (1984) *Sex and Destiny: The Politics of Human Fertility*, Secker and Warburg, London

Haldermann J.M (1985) 'Problems of pastoral development in East Africa', *Agricultural Administration*, vol 18, pp199-216

Hampshire, K and Randall, S (1999) 'Seasonal labour migration strategies in the Sahel: coping with poverty or optimizing security?' *International Journal of Population Geography*, vol5, pp367-385

Hampshire, K and Randall, S (in press) 'People Are a Resource: Demography and Livelihoods in Sahelian Fulbe of Burkina Faso', Chapter 6 in Homewood K (ed) *Rural Resources and Local Livelihoods in Africa*, James Currey, Oxford

Hardin, G (1968) 'The tragedy of the commons', *Science*, vol 162, pp1234-1248

Hardt, M and Negri, A (2000) *Empire*, Harvard University Press, Cambridge, Massachusetts

Hilhorst, T and Muchena, F (2000) *Nutrients on the Move: Soil Fertility Dynamics in African Farming Systems*, Drylands Programme, International Institute of Environment and Development, London

Hodgson, D (ed) (2000) *Rethinking Pastoralism in Africa: Gender, Culture and the Myth of the Patriarchal Pastoralist*, James Currey, Fountain Publishers, EAEP, Ohio University Press, Oxford, Kampala, Nairobi, Athens

Hodgson, D (1999) 'Images and Interventions: The Problems of Pastoralist Development', pp221-239, in Anderson, D.M and Broch-Due, V (eds.) (1999) *The Poor Are Not Us: Poverty and Pastoralism in Eastern Africa*, James Currey, East African Educational Publishing, Ohio University Press, Oxford, Nairobi, Ohio

Hodgson, D.L and Schroeder, R.A (1999) *Mapping the Maasai: Dilemmas of Counter-mapping Community Resources in Tanzania*, Paper presented at conference on 'African environments - past and present', St. Anthony's College, University of Oxford, July 5-8, 1999.

Hogg R (ed) (1997) *Pastoralists, Ethnicity and the State in Ethiopia*, HAAN/Institute for African Alternatives, London

Holland, J.H (1992) *Adaptation in Natural and Artificial Systems*, MIT Press, Cambridge, Massachusetts

Holland, J.H (1998) *Emergence: From Chaos to Order*, Oxford University Press, Oxford

Holland, J.H (2000) *Hidden Order: How Adaption Builds Complexity*, Addison-Wesley Longman, Boston

Holling, C.S (1973) 'Resilience and stability of ecological systems', *Annual Review of Ecology and Systematics*, vol 4, pp1-23

Holling, C.S (1998) 'Two cultures of ecology', *Conservation Ecology*, vol 2(2), http://www.consecol.org/vol2/iss2/art4

Holloway, J (2002) *Change the World Without Taking Power: The Meaning of Revolution Today*, Pluto Press, London

Holmes, J and Mott J (1993) 'Towards the Diversified Use of Australia's Savannas', pp 283-320 in Young, M.D and Solbrig, O (eds) *The World's Savannas: Economic Driving Forces, Ecological Constraints and Policy Options for Sustainable Land Use*, Vol 12, Man and Biosphere series. UNESCO and Parthenon Publishing Group, Carnforth and New York

Homewood, K, Coast, E and Thompson, M (submitted) 'In migrants and exclusion in East African rangelands', *Africa*

Homewood, K (1994) 'Pastoralists, Environment and Development in East African Rangelands, pp311-324 in Zaba, B and Clarke, J (eds) *Environment and Population Change*, Ordina Editions, Belgium IUSSP

Homewood, K, Lambin, E.F, Coast, E, Kariuki, A, Kikula, I, Kivelia, J, Said, M, Serneels, S, and Thompson, M (2001) 'Long-term changes in Serengeti-Mara wildebeest and land cover: pastoralism, population or policies?' *Proceedings of the National Academy of Sciences*, vol 98, pp12544-12549

Homewood, K and Rodgers, W.A (1987) 'Pastoralism, Conservation and the Overgrazing Controversy', 111-128 in Anderson, D and Grove, R (eds) *Conservation in Africa: People, Policies*

and Practice, Cambridge University Press, Cambridge

Hooker, R. (1996) *Yin and Yang*, On-line, http://www.wsu.edu:8080/~dee/CHPHIL/YINYANG.HTM (15 May 2003)

Horowitz, M (1979) *The sociology of pastoralism and African livestock projects*, AID Programme Evaluation Discussion Paper 6, USAID Washington DC

Hughes, D.M (1999) 'Mapping the Mozambican hinterlands: land rights, timber, and territorial politics in Chief Gogoi's area', Paper presented at conference on 'African environments - past and present', St. Anthony's College, University of Oxford, July 5-8, 1999

Igoe, J and Brockington, D (1999) 'Pastoral land tenure and community conservation in East African rangelands: a case study from northeastern Tanzania', *Pastoral Land Tenure Series,* 11, International Institute of Environment and Development, London

Illius, A and O'Connor, T (1999) 'On the relevance of nonequilibrium concepts to arid and semiarid grazing systems', *Ecological Applications*, vol 9(3), pp798-813

Illius, A.W and O'Connor, T.G (2000) 'Resource heterogeneity and ungulate population dynamics', *Oikos*, vol 89, pp283-294

Independent Media Centre (2001) *Genoa - Red Zone* (video) Independent Media Centre, London

Ingersell, A.E (n.d.) *A Critical User's Guide to Ecosystem and Related Concepts in Ecology*, Institute for Cultural Landscape Studies, Harvard University, http://www.icls.harvard.edu/ecology/ecology.html

Ingold, T (1992) 'Culture and the Perception of the Environment', pp? in Croll, E. and Parkin, D (eds) *Bush base: forest farm*, Routledge, London

Irigaray, L (1997 (1996)) 'The other: woman' pp. 308-315 in Kemp, S and Squires, J (eds) *Feminisms*, Oxford University Press, Oxford

Jacobs, J.M (1996) *Edge of Empire: Postcolonialism and the City*, Routledge, London

Jantsch, E (1980) *The Self-Organising Universe: Scientific and Human Implications of the Emerging Paradigm of Evolution*, Pergamon Press, Oxford

Joekes S and Pointing, J (1991) *Women in Pastoral Societies in East and West Africa*, Drylands Programme, Issues paper 28, International Institute of Environment and Development, London

Jowkar, F, Horowitz, M.H, Naslund, C and Horowitz, S (1991) *Gender Relations of Pastoralist and Agropastoralist Production: a Bibliography with Annotations*, Prepared for UNIFEM and UNDP, Institute of Development Anthropology, New York

Klink, C, Moreira, A and Solbrig, O (1993) 'Ecological Impact of Agricultural Development in the Brazilian Cerrados', pp 259-282 in MD Young and O Solbrig (eds) *The World's Savannas: Economic Driving Forces, Ecological Constraints and Policy Options for Sustainable Land Use*, Vol 12, Man and Biosphere Series, UNESCO and Parthenon Publishing Group, Carnforth and New York

Knight, K (1991) *Blood relations: menstruation and the origins of culture*, Yale University Press, New Haven and London

Kristjansen, P, Radeny, M, Ndekianye, D, Kruska, R, Reid, R, Gichohi, H, Atieno, F and Sanford, R (2002) *Valuing Alternative Land Use Options in the Kitengela Wildlife Dispersal Area of Kenya*, ILRI, Nairobi

Kuhn, T (1970 (1962)) *The Structure of Scientific Revolutions*, second edition, University of Chicago Press, Chicago

Kumar, S (2002) *You Are Therefore I Am* Green Books, Totnes

Kurimoto, E and Simonse, S (eds) (1998) *Conflict, Age and Power in North East Africa*, James Currey, Ohio University Press, Oxford, Ohio

Lambin, E, Turner, B, Geist, H, Agbola, S, Angelsen, A, Bruce, J, Coomes, O, Dirzo, R, Fischer, G, Folke, C, George, P, Homewood, K, Imbernon, J, Leemans, R, Li, X, Moran, E, Mortimore, M, Ramakrishnan, P, Richards, J, Skånes, H, Steffen, W, Stone, G, Svedin U, Veldkamp, T, Vogel, C, Xu, J, (2001) 'Our emerging understanding of the causes of land-Use and -cover change', *Global Environmental Change*, vol 4, pp261-269

Lamprey, H.F (1983) 'Pastoralism Yesterday and Today: The Overgrazing Problem', pp643-666 in Bourliere, F (ed) *Tropical Savannas*, Ecosystems of the World vol. 13, Elsevier, Amsterdam

Lancaster, W and Lancaster, F (1986) 'The concept of territory among the Rwala Bedouin', *Nomadic Peoples*, vol 20 pp41-48

Lane, C and Pretty, C (1990) 'Displaced pastoralists and transferred wheat technology in Tanzania', *Sustainable Agriculture Programme Gatekeeper Series* 20, International Institute of Environment and Development, London.

Latour, B (1987) *Science in Action*, Open University Press, Milton Keynes

Latour, B (1993) *We Have Never Been Modern,* trans. By Catherine Porter, Harvester Wheatsheaf, Hemel Hempstead

Leach, M and Fairhead, J (2000) 'Fashioned forest pasts and the occlusion of history: landscape, conservation and politics in the historiography of West Africa', *Development and Change*, vol 31, pp35-59

Leach M and Mearns, R (eds) (1996) *The Lie of the Land: Challenging Received Wisdom in African Environmental Change and Policy*. The International African Institute, James Currey and Heinemann, London, Oxford and Portsmouth

Levins, R and Lewontin, R (1985) *The Dialectical Biologist*, Harvard University Press, Cambridge, Massachusetts

Levi-Strauss, C (1966) *The Savage Mind*, University of Chicago Press, Chicago

Lewis, I (2001) 'Why the warlords won: how the United States and the United Nations misunderstood the clan politics of Somalia', *Times Literary Supplement* vol 5123, pp3-5

Lind, J (2003) *Adaptation, Conflict and Ccooperation in Ppastoralist East Africa: A Case Study From South Turkana, Kenya*, Paper prepared for CICERO (Centre for International Climate and Environmental Research, Oslo), April 2003

Mace, R (1991) 'Overgrazing overstated', *Nature*, vol 349, pp280-281

Markakis, J (1966) *Resource Conflicts in the Horn of Africa*, Sage and International Peace Research Institute, London and Oslo

Markakis, J (1993) (ed) *Conflict and the Decline of Pastoralism in the Horn of Africa*, Macmillan, Basingstoke

Marindo-Ranganai, R and Zaba, B (1994) *Animal Conservation and Human Survival: A Case Study of the Tembomvura People of Chapoto Ward in the Zambezi Valley, Zimbabwe*, Harare University Research Paper, Harare.

May, R.M (1977) 'Thresholds and breakpoints in ecosystems with a multiplicity of stable states', *Nature*, vol 269, pp471-477

Merchant, C (1982 (1980)) *The Death of Nature: Women, Ecology and the Scientific Revolution*, Wildwood House Ltd, London

Morphy, H (1993) 'Colonialism, History and the Construction of Place: The Politics of Landscape in Northern Australia', pp205-243 in Bender, B (ed) *Landscape: Politics and Perspectives,* Berg Publishers, Oxford.

Mortimore, M (1998) *Roots in the African dust: Sustaining the Drylands*, Cambridge University Press, Cambridge

Mukerji, C (1997) *Territorial Ambitions and the Gardens of Versailles*, Cambridge University Press, Cambridge

Murdoch, J and Clark, J (1994) 'Sustainable knowledge', *Centre for Rural Economy Working Paper Series* 9

Nachtergaele, F (2002) 'Land degradation assessment in drylands', *LUCC Newsletter* 8, p15, IGBP/IHDP Louvain, Belgium

Nader, L (ed) (1996) *Naked Science: Anthropological Enquiry into Bounadries, Power, and Knowledge*, Routledge, London

Nader, L. (1996) 'Preface', pp xi-xv *Naked Science: Anthropological Enquiry into Bounadries, Power, and Knowledge*, Routledge, London

Neale, J (2002) *You Are G8, We Are 6 Billion: The Truth Behind the Genoa Protests*, Vision Paperbacks, London

Negri, A (2002) 'Approximations: Towards an Ontological Definition of the Multitude', Translated by Bove, A. from Multitudes*, vol 9 pp36-48, http://www.nadir.org/nadir/initiativ/agp/space/multitude.htm*

Niamir-Fuller, M (ed) (1999a) *Managing Mobility in African Rangelands: The Legitimization of Transhumance*, IT Publications and FAO, London and Rome.

Niamir-Fuller, M (1999b) 'Towards a Synthesis of Guidelines for Legitimizing Transhumance', pp266-290 in Niamir-Fuller, M (ed) *Managing Mobility in African Rangelands: The Legitimization of Transhumance*, IT Publications and FAO, London and Rome

Nicholson, S, Tucker, C and Ba, M.B (1998) 'Desertification, drought and surface vegetation an example from the west African Sahel', *Bulletin of the American Meteorological Society*, vol 79, pp815-829

No Borders (2004) 'Traveller evictions', *Indymedia UK*, 27 January 2004, On-line. http://www.indymedia.org.uk/en2004/01284446.html (17 February 2004).

Noy-Meir, I (1973) 'Desert ecosystems: environment and producers', *Annual Review of Ecology and Systematics*, vol 4, pp25-51

Noy-Meir, I (1975) 'Stability of grazing systems: an application of predator-prey graphs', *Journal of Ecology*, vol 63, pp459-481.

Oba, G (2000) '"Where the bulls fight, it is the grass that suffers:" impact of border administration on drought-coping strategies of the Obbu Booran during the 20th century', *Journal of Oromo Studies*, vol 7(1&2), pp87-108

Oba, G, Stenseth, N.C and Lusigi, W.J (2000) 'New perspectives on sustainable grazing management in arid zones of sub-Saharan Africa', *BioScience*, vol 50, pp35-51

Oba, G, Weladji, R.B, Lusigi, W, and Stenseth, N.C (2003) *Scaling effects of grazing on rangeland degradation as a test of equilibrium and nonequilibrium hypotheses: a case study from northern Kenya*, Paper to be presented at IRC workshop on 'Rangelands at equilibrium and non-equilibrium', Durban, 26-27 July 2003.

Orestes, N, Shrader-Frechette, K and Belitz, K (1994) 'Verification, validation, and confirmation of numerical models in the earth sciences', *Science*, vol 263, pp641-646

Osbahr, H (2001) *Livelihood Strategies and Soil Fertility in Southwestern Niger*, PhD Thesis, Geography, University College London

Pagels, E (1979) *The Gnostic Gospels*, Weidenfeld and Nicolson, London

Pantuliano, S (2002) 'Sustaining livelihoods across the rural-urban divide. Changes and challenges facing the Beja pastoralists of north eastern Sudan', *Pastoral Land Tenure Series* no 14, International Institute of Environment and Development, London.

Parmesan, C and Yohe, G (2003) 'A globally coherent fingerprint of climate change impacts across natural systems', *Nature*, vol 421, pp37-42

Patel, H (1998) *Sustainable Utilization and African Wildlife Policy: the Case of Zimbabwe's Communal Areas Management Programme for Indigenous Resources (CAMPFIRE),* Cambridge, Massachusetts, Indigenous Environmental Policy Centre

Peluso, N.L (1995) 'Whose woods are these? Counter-mapping forest territories in Kalimantan, Indonesia', *Antipode*, vol 27, pp383-406

Platteau, J-P (2000) 'Does Africa Need Land Reform?' pp51-74 in Toulmin, C and Quan, J (eds) *Evolving Land Rights, Policy and Tenure in Africa*, Department for International Development, International Institute of Environment and Development, Natural Resources Institute, London

Pockley, P (2003) 'Bushfires leave ecologists hot under the collar', *Nature* vol 415, p105

Prior, J (1994) 'Pastoral development planning', *OXFAM Development Guidelines* no.9, OXFAM, Oxford

Potkanski, T (1994) *Property Concepts, Herding Patterns and Management of Natural Resources Among the Ngorongoro and Salei Maasai of Tanzania*, IIED Drylands Programme Pastoral Land Tenure Series no. 6, International Institute of Environment and Development, London

Rae, J (1999) *Tribe and State: Management of the Syrian Steppe*, Ph. D. thesis, University of Oxford

Ramisch, J (1999) 'In the Balance? Evaluating Soil Nutrient Budgets for an Agro-pastoral Village of Southern Mali', *Managing Africa's Soils* 9, IIED Drylands Programme, International Institute of Environment and Development, London

Rangan, H (1996) 'From Chipko to Uttaranchal: Development, Environment, and Social Protest in the Garhwal Himalayas, India', pp205-226 in Peet, R and Watts, M (eds) *Liberation Ecologies: Environment, Development, Social Movements,* Routledge, London

Rangan, H (2000) *Of Myths and Movements: Rewriting Chipko into Himalayan History*, Verso, London

Richards, P (1985) *Indigenous Agricultural Revolution: Ecology and Food Production in West Africa*, Unwin Hyman, London

Richards, P.W (1996 (1952)) *The Tropical Rain Forest* (2nd edition), Cambridge University Press, Cambridge

Ritchie, C (1987) *The Political Economy of Resource Tenure: San Survival in Namibia and Botswana*, MA thesis, Boston University, Boston

Roe, D, Mayers, J, Grief-Gran, M, Kothari, A, Fabricius, C and Hughes, R (2000) 'Evaluating Eden: Exploring the Myths and Realities of Community Based Wildlife Management', *Evaluating Eden Series* 8, International Institute of Environment and Development, London

Roe, E, Huntsinger, L and Labnow, K (1998) 'High reliability pastoralism', *Journal of Arid Environments*, vol 39, pp39-55

Rohde, R.F (1994) 'Tinkering with chaos: towards a communal land tenure policy in former Damaraland', *SSD Discussion Paper* 8, Social Sciences Division, MRC, University of Namibia, Windhoek

Rohde, R.F (1997a) *Nature, Cattle Thieves and Various Other Midnight Robbers: Images of People, Place and Landscape in Damaraland*, *Namibia*, PhD thesis, University of Edinburgh

Rohde, R.F (1997b) 'Looking into the past: interpretations of vegetation change in Western Namibia based on matched photography', *Dinteria*, vol 25, pp121-149

Rohde, R.F, Benjaminsen, T.A and Hoffman, M.T (2001) 'Land reform in Namaqualand: poverty alleviation, stepping stones and "economic units"', *PLAAS Land Reform and Agrarian Change in Southern Africa Occasional Paper* 16, University of the Western Cape, Cape Town

Rosenberg, A (1995) *Philosophy of Social Science*, Second Edition, Westview Press, Boulder, Colorado

Salih, M (1985) 'Pastoralists in town: some recent trends in pastoralism in the north west of Omdurman District', *ODI Pastoral Development Network* 20 b, Overseas Development Institute, London

Sandford, S (1983) *Management of Pastoral Development in the Third World*, Overseas Development Institute, London, with John Wiley and Sons, Chichester and New York

Saner, M.A (1999) 'Two cultures: not unique to ecology', *Conservation Ecology* 3, http://www.consecol.org/vol3.iss1/resp2/

Schreckenberg, K (1996) *Forests Fields and Markets: A Study of Indigenous Tree Products in the Woody Savannas of the Bassila Region, Benin,* Ph.D. Thesis, University of London, London

Scoones, I (1991) 'Wetlands in drylands', *Ambio*, vol 20(8), pp366-371

Scoones, I (1992) 'Land degradation and livestock production in Zimbabwe's Communal Areas', *Land Degradation and Rehabilitation*, vol 3, pp99-114

Scoones, I (1993) 'Why Are There so Many Animals? Cattle Population Dynamics in the Communal Areas of Zimbabwe', pp62-76 in Behnke, R.H.Jr, Scoones, I, and Kerven, C (eds) *Range Ecology at Disequilibrium: New Models of Natural Variability and Pastoral Adaptation in African Savannas*, Overseas Development Institute, International Institute for Environment and Development, and Commonwealth Secretariat, London

Scoones, I (1995) 'Exploiting heterogeneity: habitat use by cattle in dryland Zimbabwe', *Journal of Arid Environments*, vol 29, pp221-237

Scoones, I (1997) 'The dynamics of soil fertility change: historical perspectives on environmental transformation from Zimbabwe', *The Geographical Journal* vol 163(2), pp161-169

Scoones, I (1999) 'New ecology and the social sciences: what prospects for a fruitful engagement?' *Annual Review of Anthropology*, vol 28, pp479-507

Seddon, G (1997) *Landprints: Reflections on Place and Landscape*, Cambridge University Press, Cambridge

Shackleton, C (2000) 'Comparison of plant diversity in protected and communal lands in the Bushbuckridge lowveld savanna, South Africa', *Biological Conservation*, vol 94, pp273-285

Silva, J and Moreno, A (1993) Land use in Venezuela', pp239-258 in Young, M.D and Solbrig, O (eds) *The World's Savannas: Economic Driving Forces, Ecological Constraints and Policy Options for Sustainable Land Use*, Vol 12, Man and Biosphere Series, UNESCO and Parthenon Publishing Group, Carnforth and New York

Simpson, J and Evangelou, P (1984) *Livestock Development in Sub Saharan Africa: Constraints, Prospects, Policy*, Westview Press, Boulder Colorado

Sinclair, A.R.E and Fryxell, J.M (1985) 'The Sahel of Africa: ecology of a disaster', *Canadian Journal of Zoology*, vol 63, pp987-994

Skotnes, P (ed) 1996 *Miscast: Negotiating the Presence of the Bushmen*, University of Cape Town Press, Cape Town

Smith, M (2001) 'Repetition and difference: Lefebvre, Le Corbusier and modernity's (im)moral landscape', *Ethics, Place and Environment*, vol 4, pp31-44

Sobania, N (1991) 'Feasts, Famine and Friends: Nineteenth Century Exchange and Ethnicity in the Eastern Lake Turkana Region', pp118-142 in Galaty, J and Bonte, P (eds) *Herders, Warriors and Traders: Pastoralism in Africa*, Westview Press, Boulder Colorado

Starhawk (2003) 'What happened in New York', *New Society*, On-line. http://www.newsociety.com/News/newyork.html (18 March 2003)

Stattersfield, A, Crosby, M, Long, A and Wedge, D (1998) 'Endemic bird areas of the world. Piorities for biodiversity conservation', *Birdlife Conservation Series* No.7, Birdlife International, Cambridge

Stott, P (1997) 'Dynamic tropical forestry in an unstable world', *Commonwealth Forestry Review*, vol 76(3), pp207-209

Stott, P (1998) 'Biogeography and ecology in crisis: the urgent need for a new metalanguage', *Journal of Biogeography*, vol 25, pp1-2

Sullivan, S (1996a) 'Towards a non-equilibrium ecology: perspectives from an arid land', *Journal of Biogeography*, vol 23, pp1-5

Sullivan, S (1996b) *The 'Communalization' of Former Commercial Farmland: Perspectives from Damaraland and Implications for Land Reform*, Research report 25, Social Sciences Division of the Multidisciplinary Research Centre, University of Namibia, Windhoek

Sullivan, S (1996b) *People and Plants on Communal Land in Namibia: The Relevance of Indigenous Range and Forest Management Practices, and Land Tenure Systems, to In Situ Plant Genetic Resources Conservation in the Arid and Semi-arid Regions of Namibia*, International Plant Genetic Resources Institute (IPGRI), Nairobi

Sullivan, S (1999a) 'The impacts of people and livestock on topographically diverse open wood- and shrub-lands in arid north-west Namibia', *Global Ecology and Biogeography* (Special Issue on Degradation of Open Woodlands), vol 8 pp257-277

Sullivan, S (1999b) 'Folk and formal, local and national: Damara cultural knowledge and community-based conservation in southern Kunene, Namibia', *Cimbebasia*, vol 15, pp1-28

Sullivan, S (2000a) 'Getting the science right, or introducing science in the first place? Local 'facts', global discourse – 'desertification' in north-west Namibia', pp15-44 in Stott, P and Sullivan, S (eds) *Political Ecology: Science, Myth and Power*, Edward Arnold, London

Sullivan, S (2000b) Gender, Ethnographic Myths and Community-based Conservation in a Former Namibian "Homeland"', pp142-164 in Hodgson, D (ed) *Rethinking Pastoralism in Africa: Gender, Culture and the Myth of the Patriarchal Pastoralist*, James Currey, Fountain Publishers, EAEP, Ohio University Press, Oxford, Kampala, Nairobi, Athens

Sullivan, S (2002) 'How Sustainable is the Communalising Discourse of 'New' Conservation? The Masking of Difference, Inequality and Aspiration in the Fledgling 'Conservancies' of North-west Namibia', pp? in Chatty, D. and Colchester, M. (eds) *Conservation and Mobile Indigenous People: Displacement, Forced Settlement and Sustainable Development*, Berghahn Press, Oxford

Sullivan, S (2003a) 'Protest, Conflict and Litigation: Dissent or Libel in Resistance to a Conservancy in North-west Namibia', pp69-86 in Berglund, E and Anderson, D (eds) *Ethnographies of Conservation: Environmentalism and the Distribution of Privilege*, Berghahn Press, Oxford

Sullivan, S (2003b) 'Frontline(s)', e*phemera: critical dialogues on organization*, vol 3(1), pp68-89, www.ephemeraweb.org

Sullivan, S. (in press) 'Detail and Dogma, Data and Discourse: Food-gathering by Damara Herders and Conservation in Arid North-west Namibia', *in* Homewood, K (ed) *Rural Resources and Local Livelihoods in sub-Saharan Africa*, James Currey, Oxford

Sullivan, S. (forthcoming) 'Distributed networks and the politics of possibility: interpretations of what's new about glocal anti/post-capitalist politics', *CSGR Working paper*

Sullivan, S and Rohde, R (2002) 'On non-equilibrium in arid and semi-arid grazing systems: A critical comment on A. Illius and T.G. O'connor (1999) On the relevance of nonequilibrium concepts to arid and semiarid grazing systems. Ecological Applications, 9, 798-813', *Journal of Biogeography*, vol 29, pp1595-1618

Sullivan, S and Homewood, K (2004) 'Natural Resources: Use, Access, Tenure and Management', in Potts, pp118-166 *in* D and Bowyer-Bower, T (eds) *Eastern and Southern Africa*, Institute of British Geographers' Developing Areas Research Group, Addision Wesley Longman, London

Suzman, J (2000) '"*Things from the Bush": A Contemporary History of the Omaheke Bushmen*' (with an introduction by Robert J. Gordon), P. Schlettwein Publishing, Basel Namibia Studies Series 5, Basel

Talle, A (1987) 'Women as heads of houses: the organisation of production and the role of women among the pastoral Maasai in Kenya', *Ethnos*, vol 52, pp50-80

Talle, A (1988) *Women at a Loss: Changes in Maasai Pastoralism and Their Effects on Gender Relations*, University of Stockholm, Studies in Social Anthropology, Stockholm

Talle, A (1990) 'Ways of Milk and Meat Among the Maasai: Gender Identity and Food Resources in a Pastoral Economy', pp73-92 in Palsson, G (ed) *From Water to World-making*, Scandinavian Institute for African Studies, Uppsala

Thompson, M and Homewood, K (2002) 'Elites, entrepreneurs and exclusion in Maasailand', *Human Ecology*, vol 30(1), pp107-138

Tilley, C (1994) *A Phenomenology of Landscape: Places, Paths and Monuments*. Oxford, Berg

Timberlake, L (1988) *Africa in Crisis: The Causes, the Cures of Environmental Bankruptcy*, Earthscan, London

Tolkien, J.R (1954) *The Fellowship of the Ring* (being the first part of 'the lord of the rings'), George Allen and Unwin, London

Toulmin, C and Quan, J (eds) (2000) *Evolving Land Rights, Policy and Tenure in Africa*, Department for International Development, International Institute of Environment and Development, Natural Resources Institute, London

Trafzer, C.E (2000) *As Long as the Grass Shall Grow and Rivers Flow: a History of Native Americans*, Harcourt College Publishers, London

Turner, M (1998a) 'Long-term effects of daily grazing orbits on nutrient availablity in Sahelian West Africa I', *Journal of Biogeography*, vol 25, pp669-682

Turner, M (1998b) 'Long-term effects of daily grazing orbits on nutrient availablity in Sahelian West Africa II', *Journal of Biogeography*, vol 25, pp683-694

Turner, M (1999) 'Spatial and temporal scaling of grazing impact on the species composition and productivity of Sahelian annual grasslands', *Journal of Arid Environments*, vol 41, pp277-297

Virilio, P (1975) *L'insecurite du Territoire* Stock, Paris

Waldrop, M.M (1993) *Complexity: The Emerging Science at the Edge of Order and Chaos*, Viking, London

Waller, R (1985) 'Ecology, migration and expansion in east Africa', *African Affairs*, vol 84 pp347-370

Ward, D, Ngairorue, B.T, Kathena, J, Samuels, R and Ofran, Y (1998) 'Land degradation is not a necessary outcome of communal pastoralism in arid Namibia', *Journal of Arid Environments*, vol 40, pp357-371

Waters Bayer, A (1985) 'Dairying by settled Fulani women in Central Nigeria and some implications for dairy development', *ODI Pastoral Development Network* 20c, Overseas Development Institute, London

Western, D and Gichohi, H (1993) 'Segregation effects and the impoverishment of savanna Parks: the case for ecosystem viability analysis', *African Journal of Ecology* vol 31, pp268-271

Western, D and Ssemakula, J (1981) 'The future of savanna ecosystems', *African Journal of Ecology*, vol 19, pp7-19

Wiens, J (1984) 'On Understanding a Nonequilibrium World: Myth and Reality in Community Patterns and Processes', pp439-457 in Strong, D.R, Simberloff, D, Abele, L.G and Thistle, A.B (eds) *Ecological Communities: Conceptual Issues and the Evidence* Princeton University Press, Princeton

Wøien, H and Lama, L (1999) 'Market commerce as wildlife protector? Commercial initatives in community conservation in Tanzania's northern rangelands', *IIED Pastoral Land Tenure Series* no 12, International Institute of Environment and Development, London

Young, M.D and Solbrig, O (eds) *The World's Savannas: Economic Driving Forces, Ecological Constraints and Policy Options for Sustainable Land Use*, Vol 12, Man and Biosphere Series, UNESCO and Parthenon Publishing Group, Carnforth and New York

Zaal, F and Dietz, T (1999) 'Of Markets, Meat, Maize and Milk: Pastoral Commoditization in Kenya', pp163-198 in Anderson, D.M and Broch-Due, V (eds.) *The Poor Are Not Us: Poverty and Pastoralism in Eastern Africa*, James Currey, East African Educational Publishing, Ohio University Press, Oxford, Nairobi, Ohio