4

ON NON-EQUILIBRIUM AND NOMADISM

Knowledge, diversity and global modernity in drylands

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Introduction: conceptualizing drylands and nomads[1]

> [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)*

The quote above describes widespread views of 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 eruption of disorder, conflict and banditry and the apparent need for a civilizing intervention that favours settlement, land privatisation and planning (e.g. Hardin, 1968; Lamprey, 1983; Sinclair and Fryxell, 1985; Timberlake, 1988; Grainger, 1992).

In the 1980s and 1990s an alternative discourse emerged which 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, 1996c, 2000a; Mortimore, 1998; Oba *et al.*, 2000; Brockington, 2002; Sullivan and Rohde, 2002). For example, numerous studies now question assumptions of agro/pastoralist-induced degradation, whether of rangeland habitat (Sullivan, 1999b; 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). And increasingly, debate and dialogue among range ecologists, development workers, policy makers and practitioners emphasize the ecological and economic rationales behind mobile livestock production systems in drylands (Sandford, 1983; Behnke *et al.*, 1993; Young and Solbrig, 1993; Niamir-Fuller, 1999a; Niamir-Fuller, 1999b).

Beinart (2000) describes these analyses as attempts to build a 'corrective and anti-colonial' discourse that might say as much about the paradigmatic post-colonial framework these scholars have been working within as about the 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, 1997b; 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 (increasing land-surface light reflectivity) and falling rainfall (Charney *et al.*, 1975), Nicholson *et al.* (1998) indicate that over the last few decades there has been no 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).[2]

In this chapter we aim to extend discussion not by asking who is '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 in these contexts.

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 regarding the same phenomena. This is not only an outcome of a Foucauldian power/knowledge nexus (Foucault, 1981) – it is also related to ways in which *ignorance*, conscious or otherwise, sustains exclusionary

discourses, policies and practices (Gordon, 1998; Sullivan, 2000b). Thus a reining in of the imagination, 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, 1996a; Leach and Fairhead, 2000).

We complement this analysis by drawing on the explanatory power of theories of conceptual and ritual purification, associated with anthropologist Mary Douglas (Douglas, 1996); of the empowered Panopticon[3] society, with its requirements for diffuse and minutely controlled surveillance and regulation (Foucault, 1981); and of the ideological differences between state and nomad science as considered by philosophers Gilles Deleuze and Félix Guattari (1980).

For example, we consider the classic anthropological concept of purity and danger (Douglas, 1966) to be central to understanding both the current situation and long-term trajectories regarding dominant policy trends in drylands. Mary Douglas argued that rituals of purity and impurity enacted as components of cultural and religious praxis are central for the maintenance of unifying categories used to classify, conceptualize and construct 'reality' (Douglas, 1996). Importantly, these categories require the avoidance and purification (or eradication) of phenomena representing danger and disorder to their internal order. The elimination of sources of disorder thus becomes 'a positive effort to organize the environment', carried out by 'separating, purifying, demarcating and punishing transgressions' through acts made possible 'by exaggerating the difference between within and without' so as 'to impose system on an inherently untidy experience' (Douglas, 1966). 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, colonizing and globalizing culture of modernity.

We consider here that 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 that act as homogenizing 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, partitioning and abstracting phenomena from their social and moral contexts, makes possible their use in technological, industrial and militaristic arenas with significant social and ecological consequences (cf. Nader, 1996a). And third, the particular and constraining gender constructs embodied by modern patriarchy (Belenky *et al.*, 1986; Hodgson, 1999; Hodgson, 2000). Organically and pragmatically, these structuring norms have underscored a number of familiar and globalizing phenomena, including:

- centralized 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; Scott, 1998; Hodgson and Schroeder, 1999; Hughes, 1999; Abramson, 2000). To use Foucault's words, space is thus 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' (Foucault, 1977);

- the instrumentalization, commodification and militarization of a reified western 'technoscience' (Nader, 1996a) with the ability to 'act at a distance' from the locales of its formalization (Latour, 1987, 1993; Murdoch and Clark, 1994);
- the standardizing and commercializing 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. Irigaray, 1996).

Thus the *power* of state science, planning and regulation is maintained precisely by the delegitimizing and dehumanizing of concepts, practices and peoples that, in Mary Douglas' terms, pose *danger* to hegemonic structures and categories (Douglas, 1966). As Foucault writes of the extensive disciplinary power over all individual bodies desired by 'the utopia of the perfectly governed city', state-making requires '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). It is this empowered conceptual process, together with the technological phenomena utilized in its support, that in part enables the acts of assimilation and colonization – not to mention the purification and eradication – of 'the other' that we know only too well from history.

Clearly, the 'edge' (Jacobs, 1996) of the meeting between 'the modern colonial imperative and the colonized periphery' has manifested differently in the geographically distant drylands that form the focus of this chapter. 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 (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 eleventh and twelfth centuries, when the Christian Reconquista frontier forced back the Moors (Behnke, 1983). European colonists displaced earlier inhabitants across the vast part of the 'New World' drylands through genocidal dispossession at the colonizing frontier (seventeenth century in South America, nineteenth century in North America, Australia and Southern 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 generated the continual requirement for new land, becoming associated with the extreme violence and 'genocidal moment' of the frontier (Dirk Moses, 2000).[4]

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 and Mott, 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 emphasize wildlife and wild landscapes over, or as well as, other livelihood practices (e.g. Alexander and MacGregor, 2000; Duffy, 2000; Brockington, 2002). Women have been excluded from decision-making processes (e.g. Sullivan, 2000a) and undermined by the commercializing and formalizing of production practices (Hodgson, 1999). As Smith (2001) 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 draw into debate insights from the brilliant (if sometimes frustratingly obscuring) work of philosophers Gilles Deleuze and Félix Guattari (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, privatized and settled systems of production on the one hand, and traditional (customary) subsistence, communal (common property) and 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-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 nomadic practices are problematic *precisely because they are qualitatively and conceptually different* to the cross-cutting phenomena of formal science, the categorizing rationality of modernity and centralized 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 logic of state-centrism and rationality. In resisting what amounts to a paradigmatic contestation of a colonizing, hegemonic and state-centric modernity, supported by a mechanistic, linear and equilibrium-oriented technoscience, these categories thus have been physically and/or conceptually suppressed (purified), incorporated and transformed (colonized), or peripheralized

(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.[5]

We are coming to a view that these differing perspectives 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, evaluating and being in the world, as well as from different ways of realizing power. Indeed, it is salutary to remember that even for the so-called objective or 'hard' sciences, 'a scientific question cannot be completely separated from the question of *values*' (Saner, 1999, emphasis added), such that natural science data themselves can be construed as inference-laden signifiers that represent choice, perception, interpretation and scientific *habitus* (Bourdieu, 1980) in the building of an empirically verifiable and variously technologically useful world 'out there' (Orestes *et al.*, 1994, in Baumann, 2000).

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 – i.e. equilibrium and non-equilibrium thinking, state-centric (settled) and nomadic practice – do not exist in isolation from each other, but *in relationship with* each other (cf. Nader, 1996b). To paraphrase Deleuze and Guattari (1980), they function as pairs, each containing the seed or definition of the other (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 approach 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 is an approach that 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 conceptualized and analysed in ways that move beyond and reflect back on simple defences 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, at what scales, and under what conditions, might these different dynamics and practices arise. Further, what might be learned or elucidated by their relationships to each other in these contexts? Hegemony of one component of an oppositional pair, and purification or marginalization of the other, for example, would denote a relationship that is out of balance. With exceptions, we maintain that this is precisely what can be observed with regard to the linear, equilibrium thinking that has underscored the conceptualization and management of drylands and pastoral peoples under modernity. If this is indeed 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 below and summarized in the quotation with which we began this chapter.

The chapter proceeds in three sections. In the next two sections we review debates regarding knowledge production and policy intervention in dryland environments and in relation to pastoralist/nomadic peoples. For ease of organization and readership we focus first on ecological debates, and second on socio-cultural aspects with the important provision that these domains are overlapping and cross-cutting in all areas of discussion and 'reality'. We then move on to focus on policy and intervention, emphasising ways in which these have been shaped 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 emphasize 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 that emphasize the emergence of density-dependent dynamics from the producer-consumer relations that exist between species, and particularly between vegetation 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 to provide 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 4.1, 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) and 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 (1) of such significance that 'a system' can effectively be better understood as an equilibrium system; or (2) allow survival/maintenance

TABLE 4.1 An overview of ecological dynamics associated with equilibrium and non-equilibrium conceptions of rangelands, together with related policy and economics outcomes

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 unpredictably varying forage production
Policy and economics:	***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 managed 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 (reinforced by prohibitions on indigenous participation in emerging capitalist economies)

Source: Drawing on but modifying Oba *et al.* (2000, p37).

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 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 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.

Having to some extent ridden the crest of a wave of paradigmatic change in the 1980s and 1990s, non-equilibrium ideas in dryland ecology have been undergoing intense scrutiny by ecologists, particularly in Southern Africa (e.g. Illius and O'Connor, 1999, 2000; Campbell *et al.*, 2000). Many of the tenets and precepts of non-equilibrium ideas have been asserted as both 'challenged' and 'falsified' (Cowling, 2000), and many of these challenges have themselves been disputed (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 review by South African ecologist Cowling (2000), in which he asserts his scepticism for all things non-equilibrial 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 a 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 (Table 4.2). Among these references are a score of articles drawing on non-equilibrial dynamical concepts 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. It seems unreasonable to dismiss these articles, as well as contributions made by their authors and others as peer-reviewed chapters in edited volumes brought out by academic presses, as academically and scientifically irrelevant.

It seems to us pertinent to consider the knowledge politics 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

TABLE 4.2 Publications regarding rangeland dynamics that draw on non-equilibrium ideas in ecology

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, 1996c; Turner, 1998a, 1998b; Sullivan and Rohde, 2002
The Geographical Journal	Scoones, 1997
Conservation Ecology	Holling, 1998
Global Ecology and Biogeography	Sullivan, 1999b
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 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, 2000a/b; Turner, 1999.

Listed by journal of publication. For full details of the citations see the list of references.

(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' (Deleuze and Guattari, 1980) 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 defending ecological orthodoxy?

Scientific ecology 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, capitalism and imperialism (Scott, 1998;

Anker, 2002). Scientific ecology in this reading thus acted to entrench on a global scale the situations of inequality arising from a particular mode of economic behaviour: the latter associated with the mechanization and homogenization of production; the grabbing and mining of previously uncommodified resources; the desirability of continual economic growth; the monopolization of profit; the capture of peoples' effort as abstracted labour; and lucrative collaboration between government and business. In both general and systematic terms, a further empire-building necessity 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 (Nader, 1996b). These desires were pursued variously through the assimilation, colonization, and extermination of local peoples, assisted by the surveying and mapping, and hence control, of geographical spaces (Scott, 1998), combined with the rationalization and measurement of time-keeping (Corbett, 2003), and the measurement and purification of smell (Corbin, 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.

Without affirming a simplistic environmental determinism, it is significant that these desires and assumptions emerged within, and were/are 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 of relevance to economic productivity and decision making (interannual and over several decades). 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 nineteenth century, the extreme drought of 1976 and the devastations of foot and mouth disease in 2001 (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' (as discussed in detail for scientific forestry as a state-building activity in Chapter 1 of Scott, 1998). This further supported a particular and instrumental relationship with nature (Merchant, 1980), and was entangled with the structuring and maintaining of power relationships and processes of territorial expansion through the rationalization of landscape administration (Mukerji, 1997; Scott, 1998). As asserted by Deleuze and Guattari (1980), through such techniques 'nomad science' is variously submitted 'to civil and metric rules that strictly limit, control, localize'; under what Paul Virilio refers to as the 'geometrical imperialism of the West' (1975, in Deleuze and Guattari, 1980).

We outline below some key assumptions underlying the core principle of equilibrium, and indicate ways in which non-equilibrium ecology departs from these assumptions. Table 4.3 summarizes these differences and indicates 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

In modernity, a key assumption is that all 'systems', whether ecological, social or economic, 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). In ecology, the equilibrium community state frequently has been delineated with respect to vegetation parameters (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 (Stott, 1998) – as well as throughout Oriental/eastern philosophy – flows and flux are considered 'reality itself' (Deleuze and Guattari, 1980), 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), with surprise, uncertainty and unpredictability emerging from both biotic and abiotic sources and with effects that differ according to scale of observation. Pattern and order emerge, whilst phenomena are never absolutely repeatable – exactly the same – through time and space. Patterns and persistence are better imagined as qualitative system trajectories in n-dimensional phase space, drawn to basins of attraction but sometimes shifting from these, and always pursuing pathways that differ quantitatively to varying degrees through time and space. Analytically and dynamically a state of equilibrium in a living system (or complex) can signify only one thing, namely, death (Jantsch, 1980; Waldrop, 1993; Cilliers, 1998). Thus, Waldrop (1993, 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

TABLE 4.3 Correspondences for the intertwined notions of equilibrium dynamics and state science, and non-equilibrium dynamics and nomad science

State science	*Nomad science*	*Key references*
Science practice	*Science practice*	*Science practice*
Analyst	Synthesist	Baumann, 2000, p3
Atomism/reductionism – a science of parts	Holism – a science of wholes	Rosenberg, 1995
Mechanistic	Living	Deleuze and Guattari, 1988, p372
Rationalist/materialist	Spiritualist/existential	Deleuze and Guattari, 1988, p361
Equilibrium	Non-equilibrium	
Quantitative	Qualitative	
Extraction of constants/laws/absolutes – universalist and globalising	Engagement with continuous variation of variables	
Focus on solid forms and linear analytics	Focus on flows, vortices and spirals and nonlinear analytics	
Manifestations	*Manifestations*	*Manifestations*
Technoscience (associated with instrumental outcomes; commodification and militarization of knowledge) a science of ends/goals and of experts	Ethnoscience a science of means/processes and of folk/citizens	Levi-Strauss, 1966, in Nader, 1996, p6
City and Polis (government)	Outskirts/country and Nomos (governance)	Deleuze and Guattari, 1988, p372
Planning from the centre	Knowledge distributed through networks	Deleuze and Guattari, 1988, p80
Managerial/state centric	Devolved/distributed decision making	
Engineering Reproduction of sameness	Bricolage	
Static/settled	Following/tracking of variability and change	
Knowledge	Moving/mobile/mobilizing	
Information-based	*Knowledge*	*Knowledge*
Doctrinal	Practice-based, *habitus*	Bourdieu, 1990 (1980)
Symbolically conservative/impoverished	Gnostic (self-knowledge; intuitive wisdom)	Pagels, 1979
	Symbolically imaginative/rich	

continued

TABLE 4.3 Continued

State science	*Nomad science*	*Key references*
Models and metaphors of organization	*Models and metaphors of organization*	*Models and metaphors of organization*
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
Geographies	*Geographies*	*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*	*Power*
Power over	Power to	Foucault (1998 (1976) after Nietzsche)
Orthodox (apostolic)	Heretic (gnostic) = persecuted and purified	Pagels, 1979, 382
Centred	Acentred	
Associated gender	*Associated gender*	
Male	Female	

stable. It's dead'. Similarly, Cilliers (1998) asserts that 'to yearn for a state of complete equilibrium is to yearn for a sarcophagus'.

Disturbance (from equilibrium)

In equilibrium thinking, movement or perturbation away from the predetermined and functional equilibrium indicates disturbance. It is generally framed as negative, i.e. as degradation. Disturbance in ecology might be seen as something akin to 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 organizing ideas. The concept of ecological succession (primarily associated with Clements, 1916), for example, analyzes 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 (as predicted by state and transition, and multiple equilibria models, May 1977).

This has since been challenged and reformulated by concepts that affirm the possibilities for contingency, indeterminacy and irreversibility. Such dynamical behaviour is introduced, for example, by:

- path dependency (i.e. history; de Rosnay, 1979, in Saner, 1999) and the possibility of there being a multiplicity of possible paths (e.g. Turner, 1998a, 1998b, 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; Belsky *et al.*, 1993a, 1993b) and the long-term effects of animals on substrate factors (e.g. Turner 1998a, 1998b, 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 (Aubréville, 1938). Ingersell 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' (Ingersell, n.d.).

Successional dynamics nevertheless remain an important conceptual organizing 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 is to 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 as relatively undisturbed and therefore undegraded (for a range of references in relation to the Southern African context, see Sullivan and Rohde, 2002).

Underlying the somewhat Edenic notion of an equilibrial baseline community or ecological 'deep structure', is a dominant organizing and philosophical metaphor in western thought, namely that of the tree (Deleuze and Guattari, 1980). 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 and revealed through reductionist analytics (Holling, 1998) combined with processes of excavation and experimentation involving the tracing back of genealogies and lineages. In terms of organization, 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, policy makers and other professionals, as well as the hierarchical organizational 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 (cf. Scott, 1998). 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. They enable harvesting rates to be set and profits to be predicted; they justify policy, planning and intervention from the centre; they empower the expert by generating an impression of being able to provide solutions to pressing issues; and they make elegant analyses possible. As Levins and Lewontin assert, however, a tautologous situation can arise such that analyses are constrained to the problems and

methods that are amenable to analysis (Levins and Lewontin, 1985, in Baumann, 2000). The use of equilibrium acts to 'narrow uncertainty' in both conceptual and applied domains (Holling, 1998), contributing a 'normal science' framework (cf. Kuhn, 1962) that dictates possibilities for the types of questions asked and the analytical methods applied, whilst perhaps enabling scientists to maintain an aura of certainty and expertise in 'today's institutional[ized] science regime' (Baumann, 2000). Further, the naturalizing of a dominant normal science and the perspectives arising from it, 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 (discussed in Brockington and Homewood, 1996; Sullivan, 2000b; Brockington and Homewood, 2001; Homewood *et al.*, 2001; Brockington, 2002).

As hypothetically posed by several authors (e.g. Seddon, 1997; 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. The debates outlined above, then, are significant because they carry with them political currency shaped by specific contexts, and as such translate into impacts on the lives of people who do not share their foundational assumptions. As we have indicated, non-equilibrium ideas are resisted in some scientific quarters, and also pose challenges and problems for developing and implementing appropriate policy (discussed further below). Non-equilibrium thinking perhaps generates resistance – not so much because of inaccuracies, but for the following reasons: it demotes the superior positioning of 'experts' by emphasizing 'unknowability' in terms of predicting the behaviour of complex systems; it creates 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 it emphasizes the significance of local and historical specificities in creating currently valued landscapes.

Nomadism: 'Not all those who wander are lost'[6]

This brings us to the second key term of our title – '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 marginalized *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 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' (Deleuze and Guattari, 1980).

The corresponding suppression of pastoralist 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 rationalization. Given the legislative and assumed primacy or interiority (i.e. 'habit') of the state (Deleuze and Guattar, 1980), 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), nomadic peoples have been both marginalized and placed at the frontlines of international 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 with the exponential spread of firearms and 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 and 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 4.3 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 variously nomadic pastoralism is 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 idealized 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 product diversity rather than (only) for single products with value on commercial commodity markets (e.g. Evans-Pritchard, 1940; 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, 1999a, 2000b, 2005 and references therein; Sullivan and Homewood, 2004), cultivation (e.g. Thompson and Homewood, 2002), trade (e.g. Zaal and Dietz, 1999), and remittances from wage labour (e.g. Pantuliano, 2002). And women, contrary to assumptions of the 'patriarchal pastoralist' (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 are 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 – these will not be described in depth here (e.g. Niamir-Fuller, 1999a, 1999b; Hampshire and Randall, 1999, 2005). 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 repertoire 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).

This material necessity of mobility practices means that in many circumstances nomadism is maintained through disobedience of 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, northwest 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 characterized the area since its demarcated farms were redistributed to indigenous herders in the 1970s (Sullivan, 1996a). 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, 1996a; Beinart, 2003). Similarly, several case studies report 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 individualized land tenure holdings are essential for economic productivity and welfare.

But as well as this, and as framed by authors as varied as Bruce Chatwin (in his 1987 bestseller *The Songlines*) and Deleuze and Guattari (1980), abiding in a *habitus* of nomadism carries with it a rationality or 'pool' of collective subjectivities that positions mobile pastoralists – those accessing and using the dispersed resources of drylands – as counter or peripheral to the centre-oriented interiority of the settled 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, pp222–23)*

Chatwin's 'desert dwellers' in the above quote again are somewhat idealized. 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 Chatwin 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 occur through time – such that we might think of nomad knowledge, or of 'citizen science' or ethnoscience more generally, as integrative through its practice of collating and using multiple sources of knowledge, evidence or information (Holling, 1998). The phenomenologist Edmund Husserl describes this as a 'vagabond nomadism', for which knowledge is 'essentially and not accidentally inexact' (cited in Deleuze and Guattari, 1980). 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, 1999a), and knowledge expertise and specialization, in relative terms, are distributed throughout collectives of people. This way of knowing is flexible and open, 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 East Africa, for example, pastoralists engage in complex 'cross-sectional and cross-ethnic bond-friendships' (Lind, 2003, following Sobania, 1991) which act to 'sort out' the particular attributes and niches of different 'groups' to help minimize 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 enabling exchange and reciprocity, as is an ability to recognize 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 peoples inhabiting Southern African drylands provides what Fuller describes as a superbly enabling framework 'for the expansion and contraction of the network of relatives with whom one maintains reciprocal obligations' (Fuller, 1993). 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). Fuller 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' (Fuller, 1993; cf. Gordon, 1972). 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 conceptualize the multi-layering of social and kin networks, and the 'contractual alliances' on which they are based (Knight, 1991), 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; cf. Fuller, 1993).

The colonial administrative imperative ushered in an era that fetishized 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 mobilizations 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[7]

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 individualized tenure. This makes common property regimes typical of pre-colonial drylands where movement is essential in order to access forage and other resources.

Box 4.1 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 and Homewood, 1998; and Brockington, 2002);
- sophisticated collaborative management, of both the timing of herd access and the co-ordination 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).

BOX 4.1 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 recognized 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 to 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-twentieth 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 used, was controlled by those with recognized 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 use 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 providing edible fruits, were protected by making the cutting of trees without the permission of the local King or his councilors 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 considered 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 may be harvested by women, with some distilled into saleable liquor for their own profit, other products might be accessible to the whole household. Cutting of the tree for firewood or other wood products generally requires permission from the household head and neighbours may request permission to harvest excess fruits and/or use the branches for livestock forage.

Indigenous cultural 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, eroding incentives among local farmers to manage these resources for use 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.

(Sullivan, 1996b and references therein)

For so-called 'hunter-gatherers', and despite conventional stereotypes of their relentless mobility and their inability to recognize land and natural resources as belonging to any individual or group, a number of anthropological studies indicate complex conceptualizations of land access and tenure rights (Box 4.2). Again, these are mediated via kin relations and rules guiding inheritance.

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, 1980). 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, 1980). Thus, mechanisms of constraint are embodied in the 'fabric of immanent relations' (Deleuze and Guattari, 1980) characterizing 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, 1991; Sullivan, 2005); in sharing; and in widely observed mechanisms for the diffusion of wealth. Together, these represent 'another kind of justice' (Deleuze and Guattari, 1980): one that is relatively distributed throughout the 'system', 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 (Sandford, 1983; Gordon, 1991; Roe *et al.*, 1998).

BOX 4.2 TRADITIONAL CONCEPTS OF LAND OWNERSHIP AMONG JU|'HOANSI 'BUSHMEN'

Although conventionally thought to have little concept of land tenure or resource ownership (an assumption that has undermined formal claims to land throughout Southern and East Africa) 'hunter-gatherer' populations conceptualize 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 western Botswana and eastern Namibia. The Ju|'hoansi recognize two types of communal land: the broad category of *gxa|kxo* and the named places of *n!oresi*. These are discussed separately.

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. *Gxa|kxo* thus is not the property of any corporate body within the Ju|'hoansi. The rights of individuals within the *gxa|kxo* include:

- 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 recognized 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;
- and the right to live at a permanent source of water during drought periods.

N!oresi

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 recognized only 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 recognized 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.

(Ritchie, 1987; Botelle and Rohde, 1995)

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 *collective* management and restraint, in favour of an emphasis on individual profit maximizing behaviour necessitating freehold title to land. As discussed further below, this discounting has led to 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 may be better equipped to mobilize the opportunities presented by variable environmental productivity than the various livestock development initiatives introduced to stabilize production in settled locations and thereby reduce the perceived poverty and insecurity of pastoralist livelihoods (see below). We might say that the flexibility these practices 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 or constancy (cf. Sandford, 1983; Deleuze and Guattari, 1980; Rohde, 1994). Modes of organization are characterized more by the horizontally spreading rhizome rather than the rigidly hierarchical tree (Deleuze and Guattari, 1980), while pastoral production practices are infused with multiplicity, diversity and heterogeneity over specialization regarding products and skills.

These points have implications for analytics. For example, and as Waldrop describes:

> there's no point in imagining that the agents in the system can ever 'optimize' 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 characterized by perpetual novelty.
>
> *(Waldrop, 1992, following computer scientist John Holland, e.g. 1992, 1998, 2000)*

Given that '[t]he concern of the state is to conserve' (Deleuze and Guattari, 1980), 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, 1980). In the next section we elaborate this 'standpoint of the state' through outlining trends in policy and intervention and their impacts on dryland dwellers and environments.

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

The assumptions of a colonizing and globalizing modernity have influenced state policy and development interventions in drylands. Here we focus on how

the rationality underscoring indigenous land use practices has been marginalized in the processes of change associated with colonialism and globalization. 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 Homewood and Rodgers, 1987; Homewood, 2008; Sullivan, 1996c, 2000a; Niamir-Fuller, 1999a, 1999b; Platteau, 2000; Nachtergaele, 2002). As a result, techniques associated with state science and the central control of natural resource management frequently have been emphasized at the expense of local practices and social institutions, with 'western' systems of management and production replacing customary institutions of control (e.g. Leach and Mearns, 1996; Mortimore, 1998; Carswell, 2002). Outside expertise consistently has been ranked above indigenous knowledge. Commercialized production, benefiting national élites, has tended to be subsidized and to take priority over local livelihoods that sustain the majority of the population (Klink *et al.*, 1993; Silva and Moreno, 1993). Associated with this has been repressive regulation of natural resource use by indigenous smallholders, tenant farmers and landless peoples, while environmentally problematic large-scale commercial land uses, whether of crops or livestock, have been favoured (e.g. Lane and Pretty, 1990; Young and Solbrig, 1993; Government of Tanzania, 1997). Post-Soviet steppe drylands have been following other 'Old World' common property drylands down the rhetorical pathways of overgrazing and pastoralist-induced degradation into the realities of rapid and inequitable privatization (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 globalizing contextual trends have guided these interventions:

1. the increasing commercialization, commoditization and monetization of production practices (e.g. Zaal and Dietz, 1999);
2. the rationalization of both people and landscapes for administrative purposes;
3. increasing statism, i.e. the consolidation of the nation state and state-centric systems of government and management (of production and reproduction);
4. and the interaction of political economies with ideologies of ecological 'truth', which tend to assume that degradation follows from pastoral land use, and which emphasize 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

Commercializing 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. Prior to the 1980s, the emphasis of development in the 'Old World' drylands of the Middle East, Africa, Asia and Europe thus was on introducing high-tech, capital-intensive, exotic systems and breeds to revolutionize agricultural and livestock production. The aims were to generate wealth and kick-start health, education and infrastructural improvements, while bringing greater numbers of citizens into the formal 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; Haldermann, 1985; Adams, 1992). 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 facilitated the channelling of artificially cheap timber and wood pulp materials to manufacturing industries supplying urban markets in ways that passed the costs of ensuing woodland degradation onto the rural poor. Access by tribal and landless people dependent on the commons for subsistence grazing, fuel, fibres, construction needs and income from the sale of these products has been progressively marginalized. Similarly, in the Brazilian *cerrados,* heavily subsidized inputs have favoured commercial enterprises and mechanized farming by wealthy landowners (Klink *et al.*, 1993), while in the *llanos* of Venezuela's Orinoco Basin environmental pollution has been an outcome of heavy dependence on petrochemical-based fertilizers and pesticides (Silva and Moreno, 1993).

Rationalizing 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 characterized by extensive cattle ranching, low stocking rates per unit area of land and the regular harvest of a surplus 'crop' of young cattle for meat. As noted above, this has become the model for rangeland development interventions worldwide, requiring the codification of land tenure to facilitate the rationalization of livestock management (i.e. 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.[8]

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 (as described in Box 4.3). Further, by assuming that land is not occupied in times when it is not in use, this view has paved the way for land dispossession due to pressures from elsewhere (e.g. Lane and Pretty, 1990; Birch, 1996). This also is occurring through the *de facto* privatization 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 privatizing 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 not able to access and capitalize on these opportunities, e.g. women, poorer individuals/families and sometimes particular ethnic groupings (as documented in Talle, 1988; Galaty, 1999; Igoe and Brockington, 1999).

BOX 4.3 LAND TENURE AND SUBDIVISION ON MAASAI GROUP RANCHES, KENYA

Lemek group ranch near the Maasai Mara in Kenya (745 km^2) was established in 1969. The group ranch chairman and land adjudication committee allocated land to educated or influential Maasai in a belt along the western portion of the group ranch boundary bordering the Mara River. These allocations were cemented under private ownership with the issuing of title deeds, the process being facilitated by the local administrative chief and land registry staff. Ostensibly to guard against the continued westward movement of non-Maasai cultivating groups onto Maasai lands, beneficiaries included Maasai administration chiefs, MPs, councilors, county council officials and a police inspector. Ironically, many of these new landowners rapidly sold land on a piecemeal basis to the same in-migrant cultivating groups apparently causing concern to Maasai pastoralists.

On the northern portions of Lemek and since 1984, outside entrepreneurs have been approaching the administration chief and group ranch chairman to cultivate wheat on leases of upwards from 2,000–4,000 acres per contractor. In addition to arranging these leases for their own benefit, the administration chiefs and chairmen have been giving responsibility to other group ranch committee members, councilors and associates to arrange leases with contractors. On sub-divided land on Lemek, each registered member was supposed to be entitled to receive 100 acres of land (in fertile places) or 128 acres on steeply sloping or marshy areas. The process of registering involves all circumcised men deemed to have been resident on the Group Ranch by the land adjudication committee prior to the closing of the register in 1993. According to the Narok County Council there were 1,021 registered members on Lemek. Initial

attempts by local élites to allocate larger shares to themselves were thwarted in 1995 when, under the supervision of the District Commissioner, a revised survey was undertaken to ensure plots were of equal size.

Despite this survey, locally influential people (with access to the register and map providing the location of the plots) have still been able to exercise control for personal benefit of the land sub-division process. Examples include:

i) Those previously involved in leasing land for wheat cultivation using the considerable sums generated to buy the permanent/modern houses constructed by contractors. Once owners of the permanent housing, their stake to the land on which the house is located is secure, thus ensuring a position in the lucrative wheat-leasing belt.

ii) Those involved in leasing out the land for wheat farming use the money accrued to buy out poorer neighbours' shares in land. Once agreement has been reached (usually a hand-written confirmation signed or marked with a fingerprint) the position of the selling party's land is changed to ensure it is located on the wheat belt.

iii) Influential people register their younger (uncircumcised) sons and ensure that the shares are located adjacent to each other in the wheat belt. In this way, farms of up to 1,000 acres in extent are established. All of these mechanisms facilitate the further consolidation of land in the hands of the wealthy, while excluding poorer land users whom the subdivision process is ostensibly intended to benefit.

(Thompson and Homewood, 2002)

Formal land tenure reform at the level of national policy has also tended 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 – e.g. see Haugerud, 1989). For example, the Government of Tanzania's Livestock and Agriculture policy specifically stresses that 'shifting agriculture and nomadism will be discouraged'; transhumant movements are to be 'modernized' 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 (Government of Tanzania, 1997). This then 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 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 privatization 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, privatized pastures and the other natural resources occurring on these lands, tend to experience disproportionately adverse effects due to privatization 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; Homewood *et al.*, 2004).

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 relationships with, land associated with a settler European farming culture and with indigenous peoples. Broadly speaking, this can be summarized as the differences that emerge respectively between 'people owning the land' and 'the land owning people'; corresponding to the conceptual and experiential differences arising between land as object to be transformed into profit, and as partner in affective relationships with cultural practices (for elaboration see Bender, 1993; Tilley, 1994; Abramson and Theodossopoulos, 2000; Ingold, 2000). For example, Australia's major programme of restoring Aboriginal land rights has come under criticism as a result of the seeming impossibility of genuinely accommodating ideational, affective and dynamic relationships with landscape within the cadastral logic of a legal system based on the necessity of formalizing, structuring and attaching these relationships to a separately surveyed and mapped landscape:

> [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.
>
> *(Holmes and Mott, 1993; see also Morphy, 1993; Jacobs, 1996)*

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). 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.

Trends in wildlife conservation

In 'Old World' drylands the drive to substitute commercial ranching on private land for indigenous livestock production on communal rangelands 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 is also clear in the Middle East (Debaine and Jaubert, 2002; Chatty, 2003), 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, 2000; 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 and Borner, 1995; Campbell and Hofer 1995; Caro, 1999a, 1999b). 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, 1996a; 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 clearly contradict this narrative, and which require 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; Shackleton, 2000). The qualitative

social and ecological character of drylands is inextricably intertwined with processes of continual disturbance through patchy and unpredictable rainfall, fire, grazing and 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, colonize and persist in a patchy, unpredictably fluctuating and continually 'disturbed' environment. In such landscapes habitat disturbance *per se*, therefore, is not necessarily detrimental to species survival (Davis *et al.*, 1994; Stattersfield *et al.*, 1998; Homewood and Brockington, 1999). For example, measures of dryland biodiversity increase with the extent of the landscape throughout which mobile species are able to disperse in pursuit of seasonal and annual fluctuations of productivity, such that it can become misleading to limit these measures to the formal administrative boundaries defining the spatial extent of a protected area (Western and Ssemakula, 1981; Western and Gichohi, 1993). In the East African contexts, large mammal density, frequency and abundance are at least as great in unfenced protected-area buffer zones (Maddox, 2002) and can be greater (Norton Griffiths, 1998). Local hunting of species with high reproductive rates (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,[9] alongside the targeting of 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 (Brockington, 2002); enforcement through paramilitary style ranger forces (Leader-Williams and Albon, 1988; Campbell and Borner, 1995; Campbell and Hofer, 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 local livelihoods is banned.

A number of challenges to this overall policy of strict protection 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, 1996a). In its place, various forms of community-based conservation (CBC) have 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 realization 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). In Old World drylands, particularly sub-Saharan Africa, International

Monetary Fund-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 *et al.*, 2001). Community-based conservation and community-based natural resources management (CBNRM) have thus been conceived and marketed by development agencies and donors as a people-friendly alternative to fortress conservation (Sullivan, 2002). 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 aims (Roe *et al.*, 2000; Hulme and Murphree, 2001; Davies *et al.*, 1999).

As with agriculture and livestock developments, community-based wildlife management initiatives frequently depend on the demarcation of landscape boundaries and the registering of community membership within these boundaries, and can require the setting aside of areas of communal land for conservation purposes. For local people this can mean curtailing through passage, land-use options and mobility, and may also further extend the arm of the state over rural (and otherwise 'peripheral') populations (e.g. Fairhead, 2000; Sullivan, 2002). An outcome can be less to involve local people in protected area conservation, than to extend conservation control from the centre over indigenous uses of resources occurring 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). Increasingly, private land title and/or private sector access is proffered to entrepreneurs establishing eco-tourism and high-paid trophy-hunting ventures from which local people are considered to benefit via employment and other income opportunities (Wøien and Lama, 1999). In many cases, this process is managed by central government and bypasses control by the local rural population altogether. Within the co-operative 'community-based' wildlife associations established on Kenya's Group Ranches, for example, small subsets of well-placed individuals were able to identify and secure legal title to key areas of high tourist potential, and then moved rapidly to exclude other members from sharing the potential benefits (Galaty, 1999; Thompson and Homewood, 2002). In Zimbabwe's CAMPFIRE programme, initiatives hailed by donors and implementers as successful for the 'community' excluded gatherer-hunters who effectively became refugees and criminalized poachers on their own land (Marindo-Ranganai and Zaba, 1994). Nevertheless, there are recurrent institutional pressures to cast community-based wildlife management initiatives as *the* route for producing win/win outcomes favourable to development and to wildlife conservation (e.g. LWAG, 2002). Despite claims of success, 'community-based conservation' is also critiqued as an extension of a 'northern' corporatism that requires commoditization of land and natural resources, normalizes particular socio-economic uses of, and relationships with, these resources, and acts to assert access and control by wealthy 'outsiders' via ecotourism, trophy-hunting and the globalizing of neoliberal economic (and conservation) agendas (Holmes and Mott, 1993; Escobar, 1996b; Brockington,

2002; Sullivan, 2002). A growing response has been the emergence of local protest to such initiatives in several contexts (Patel, 1998; Alexander and MacGregor, 2000; Sullivan 2003).

(En)gendering modernity in drylands

While cognisant of the problems of essentializing categories, a view is emerging that an expanding frontier of modernity in drylands has tended to have a particularly disempowering impact on women. Androcentric colonial and donor assumptions that men are heads of households, the holders of land title and the owners of livestock have created and exacerbated gender inequalities in drylands (e.g. Hodgson, 2000). Women's workloads, together with loss of control over their own labour, have been exacerbated by sedentarization 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 previously their access, use of resources and livelihoods 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 (as recorded in 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 commoditization and commercialization 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.

Sedentarization, codification and commercialization have affected another component of rural women's economic security, namely their use of gathered resources. The rapid increase of private and exclusive ownership throughout drylands, the spread of fencing, and increasing human and livestock populations around settlements, compromise women's access to wild plants for fuels, foods, fibres, medicines (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 (Anonymous, 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 masculinized wildlife of large mammals in conservation initiatives (Sullivan, 2000a).

These problematic outcomes of development initiatives 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 an orientation towards local identification of problems and priorities, addressed through low-capital, low-tech and indigenous practices offers more chance of 'sustainable development' than expensive interventions transplanted from western systems. There also has been a general 'development policy shift' (at least rhetorically) towards strengthening livelihood security, health, education and political representation, as opposed to attempts to maximize income and monetary profit. Ostensibly, this participatory (and 'pro-poor') rhetoric, together with the low-impact inputs with which it is associated, might minimize opportunities for élites and middlemen to benefit from the development process at the expense of target groups. Nevertheless, those administering dryland areas, both Old and New World, have been quick to respond to changing official priorities and development fashions. In some cases, those constituting local, regional and national bureaucracies (and their inevitable alliances with politicians and commercial entrepreneurs) have indicated compliance with donor and structural adjustment agendas, restructuring 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 lip service 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; with élites seeking to protect their privileged positions,

and recipients experiencing 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 marginalization (e.g. Little, 1985; IIED, 1994; Brockington, 2002).

To summarize then, development trends in drylands have emphasized interventions that are capital-intensive and frequently subsidized, amounting to hi-tech inputs that require reliance on exogenously produced petrochemicals, and emphasizing production for single product external markets. They have necessitated the rationalization of land tenure into static, fenced and privately owned landholdings, and they have supported conservation initiatives that fetishize a spectacular animal wildlife and 'wilderness' landscapes, and that affect 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, even predictable, if they are considered as part and parcel of the suite of hegemonic rationalizing and ideological assumptions underscoring modernity (see introductory section), i.e. which emphasize 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 naturalized within 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 legitimized? Men as gaining disproportionately from introduced systems of land title and the commodification of natural resources?

One element of the debate relates to an urgent need to shift from a formal science 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) 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). Such a shift would underscore a rebalancing towards policies that facilitate opportunistic tracking of environmental dynamics, and a relinquishing of decision-making and administrative power by the centre to the periphery. Given the inherently conservative nature of states and institutions, however, it is perhaps wishful thinking that such a reorientation 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 dehumanized '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 demonize 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.

But 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 involve the further surveillance, codification, rationalization and control of peoples' lifestyles and landscapes.

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Notes

1 This chapter was first commissioned in 2002 and a version has been available online as a working paper since 2003 (Sullivan and Homewood, 2003). In revisiting the piece for publication in the present collection we have decided against systematically updating our source material in the text. The chapter is already reference-heavy and a major integration of new material arising over the intervening 14 years would add too much length to an already long piece. We observe, however, that even with inclusion of new research it is likely that we would come to similar conclusions, since the issues we discuss here remain systemic. The possible exception is global climate change, for which concern has heightened considerably since we first wrote this chapter and which has particular implications for the already very variable environmental settings of the dryland contexts we explore here. For a more recent synthesis of pastoralist ecology in African contexts and the impacts of varied development interventions see Homewood (2008).

2 Nonetheless, a major initiative – the Great Green Wall for the Sahara and Sahel Initiative (GGWSSI) – was launched in 2007 by the African Union, in association with the United Nations Convention to Combat Desertification, to finance the establishment of a 'green wall' of sustainable land and forest management and restoration that creates a '15 km wide tree barrier linking Dakar to Djibouti in order to stop "desert encroachment"' (GGWSSI, 2014).

3 The panopticon is a circular building with an observation tower in the centre of an open space surrounded by an outer wall. This wall contains cells for occupants as part of a design that increases security by facilitating more effective surveillance. In his book *Discipline and Punish, The Birth of the Prison*, Michel Foucault (1977) describes the 'panopticon' as an experimental laboratory of power in which behaviour could be modified. Foucault viewed the panopticon as a symbol of the disciplinary society of surveillance.

4 This typology is somewhat problematic for the southern African context where livestock have been herded nomadically for some 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 practices 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).

5 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 nineteenth 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 Tutsi dominated nineteenth century Rwanda 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). Nonetheless, our focus here is on the ways in which variously nomadic peoples 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.

6 Tolkien, 1954: p. 260.

7 This subsection draws heavily on material developed for Sullivan and Homewood (2004).

8 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 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 sheepherders.

9 Soulé and Sanjayan, 1998, for example, argue for 50% of the land surface area globally and nationally to be protected.

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