Desertification

and the social sciences

The inspirational text for this section is *The Political Economy of Soil Erosion in Developing Countries*

(Blaikie, 1985). Johnston (2009, 46) explains that social science is the study of human society drawing from disciplines such as economics, political science and sociology. During the second half of the 20th century human geography moved away from a position that occupied the nexus between the arts and physical sciences towards full inclusion in the social sciences. This juxtaposition at first led to a preoccupation with spatial science and then an engagement with more diverse approaches, which, in this context include modernisation theory, the dependency school of development, post development and postcolonial theories.

Blaikie's text is unusual because it still advocated a link between human and physical geography as its focus. In doing so he brought together a number of approaches interlacing together ideas about soil erosion, politics and economics, combining scientific claims about soil erosion with a Marxist metanarrative. He advocates an approach that combines the study of the essential physical and social approaches in the political economy of soil erosion.

'Such a study must include a 'place-based' analysis of soil erosion – where it actually occurs, where flooding and siltation caused by soil erosion in one place affects another, and where land-users have been spatially displaced to and from. It must also include and combine 'non-place-based' analysis of the relations of production under which land is used, the technology used and why, prices, taxes and so on' (Blaikie, 1985, 5).

The text also marked a significant step forward in the ideas that underpinned political ecology, which combined the concerns of ecology and broadly defined political economy. Political ecology initially was concerned with human and physical approaches to land degradation using a theoretical approach to the ecological crisis that contained detailed local placebased studies and general principles (Peet & Watts, 2004, 7), and encompassed ' the constantly shifting dialectic between society and land-based resources, and also within classes and groups within society itself' (Blaikie & Brookfield, 1987, 17).

Geographer Nick Middleton demonstrated how Blaikie's text and the adoption of political ecology approaches affected studies of desertification.

'Slowly, the United Nations and other international bodies have come to realize that many programmes to combat desertification have failed because they have concentrated almost exclusively on the physical symptoms rather than the societal, economic and political diseases. Too great a reliance on technical solutions to dryland degradation problems is now giving way to a more balanced approach in which the political contexts, economic realities and cultural backgrounds of land managers are being taken into account. New emphasis is now being placed upon local community participation, redeployment of traditional coping strategies in times of environmental stress, such as drought, and tackling problems which stem from the marginalization of rural inhabitants by traditionally urban-based governments' (Middleton, 1997, 78).

Desertification, as a social construct, has varied greatly over time and space, its many meanings and numerous definitions have created a bewildering multisided 'social fact'. Robbins (2004,12) argues that the goal of political ecology is to 'take the hatchet' to environmental myths, using the tools of science and social science to expose the false assumptions and unsuitability of certain ecological models. Stott and Sullivan (2000, 2) explain more fully that political ecology is concerned with tracing the genealogy of narratives concerning "the environment", with identifying power relationships supported by such narratives, and with asserting the consequences of hegemony over, and within, these narratives for economic and social development, and particularly for constraining possibilities for selfdetermination'.

There are several prevailing 'myths' surrounding desertification. Some are expressed as narratives, some as prevailing discourses. Old paradigms have been defended and new paradigms have been developed about desertification.

The desertification paradigm

The desertification paradigm sees dryland ecosystems existing in equilibrium, a steady stable state driven by the interaction socioeconomic and biophysical factors acting in tandem. A disturbed ecosystem state occasioned by extreme fluctuations in rainfall leading to droughts, extensive and frequent bushfires and human induced changes set in spin a spiral of destruction (Cleaver & Schreiber, 1994), a diminution



in ecosystem productivity ending in irreversible land degradation—that is, desertification (Safriel & Adeel, 2005, 645). The paradigm holds that population growth intensifies pressure on drylands, that overgrazing and the expansion of land under the plough leads to such land degradation (Tolba, 1992, 58). Put more explicitly, according to the World Bank, the Sudano- Sahel belt, 'features one of the most rapid annual population growth rates of the continent, despite the fact that in many areas the mainly rural population . . . is already beyond the carrying capacity at current technological levels. This growth has resulted in a downward spiral of extensive land degradation and fuelwood shortage' (World Bank, 1996: 24).

This is a dire situation, amplified when droughts occur, reduce soil and plant productivity. Fallow periods are shortened in rain-fed dryland croplands and irrigation salinity occurs where groundwater and external water supplies are used. Anthropogenic drivers of desertification could be global, as in the demand for cash crops, regional such as changes in land tenure as well as scientific and technological such as the building of concrete lined wells or prohibitions against the movement of livestock. All this results in reduced land productivity (Brown, 2008, 94) and is evident in increased poverty, malnutrition, poor health that, in turn, results in catastrophic famine and increased mortality rates. Rural-urban migration ensues and environmental refugees add to the problems of poverty, urban sprawl (Tolba, 1992, 62) and political tensions (WCED, 1987, 7). It is a chain of processes (Blaikie, 1985, 19) driven by anthropogenic change (Carwardine, 1990, 72) leading through a downward spiral of productivity loss and increasing poverty. To make matters worse, the paradigm implies, that aridity is cumulative, built into a feedback loop whereby desertification is irreversible (Cleaver & Schreiber, 1994, 29). Because areas of desertification are seen to be associated with areas of widespread grazing and crop production thus agricultural practices are blamed for desertification. The poverty that ensues means that the considerable investments that are required to redress desertification are in short supply. It is a very powerful and pervasive paradigm.

Above: The Kyrgyz Chuya, Central Asia. Soure: Wikimedia Commons

According to Chapter 12 of Agenda 21, which focuses on desertification, one-quarter of the total land area of the world suffers from desertification (Keating, 1993, 21). Further, the Secretariat of the UN Convention to Combat Desertification, which came into force in December 1996, stated that 250 million people are directly affected by desertification and that one billion are at risk (Adger, Benjaminsen, Brown & Svarstad, 2001, 690).

Exploding the myth of desertification

As early as 1994, Geographers, David Thomas and Nick Middleton examined desertification as a social construct. The power relationships contained in their conclusions are self-evident.

Four findings were laid out in *Desertification Exploding the Myth* (Thomas & Middleton, 1994):

- i. the global extent of desertification seems to be grossly exaggerated using inaccurate data, often based on guesswork, a 'voracious process' affecting one third of the world's land surface;
- ii. dryland ecosystems, rather than being regarded as fragile ecosystems, are well adapted to environmental stresses and often appear to exhibit good recovery characteristics;
- iii. desertification and drought have been used as scapegoats for human suffering and misery masking more serious causes, including political mismanagement, and poorly run economies; and
- iv. the UN created desertification as an 'institutional myth' creating much misinformation about colonial stereotypes of overgrazing and advancing deserts that ignored more reliable scientific and social scientific findings (Thomas & Middleton, 1994, 160–1, Evans, 2012, 264–5).

Desertification narratives

Social Scientist Jeremy Swift (1996) explains the pervasiveness of the desertification narrative, identifying three groups interested in perpetuating the construct. The first group is the authorities—first the French or British colonial authorities in sub-Saharan Africa, and later national governments. They have used the narrative about desertification to justify government rather than household control over land and resources. Secondly, some sections of the overseas aid lobby have used the image of the spreading desert to collect funds, especially for planting trees to stop desert encroachment. Finally, some self-interested researchers promote an image of environmental deterioration in the Sahel in order to pursue research grants focused on desertification.

The desertification crisis narrative is well expressed by Social Scientist Emery Roe: 'Crisis narratives are the primary means whereby development experts and the institutions for which they work claim rights to stewardship over land and resources they do not own' (1995, 1066). Other, often cited, desertification counter narratives include the argument that smallholder farmers are not as responsible as commonly thought for deforestation in West Africa (Fairhead & Leach, 1996). The argument is that 'forest islands' in the savanna of Guinea are created and sustained by human action rather that the remnants of a extensive forest ecosystem; an ecology of disturbance rather than one of equilibrium (Jacobs, 1999). Historian Bill Gammage (2011) describes a pre 1788, similarly fashioned, park-like landscape in semi arid and dry sub humid Australia. Another narrative tells that desiccation and desertification may not result primarily from overgrazing or human settlement in the savanna landscapes of Côte d'Ivoire (Bassett and Zuéli, 2000, 69). Further, 'In contrast to the view that wooded savannas are becoming desertified, characterized by a progressive loss of trees and an expansion of grasslands, we argue that the landscape is becoming more wooded' (69).

Melissa Leach and Robin Mears (1996, 11) observe, 'perhaps the best known supporting narrative from social science is the so- called "tragedy of the commons" argument, used to support received wisdom about drylands environmental changes. They explain that a strong counter narrative refutes it explaining that dryland savanna ecosystems can be managed sustainably. Most collectively grazed pastures are not open access but are, or have been, collectively managed by identified groups of users (Swift, 2003, 5). So-called 'tragedies' occur when governments restrict open access to grazing land and interfere with the rational practises of pastoralists. The "tragedy of the commons" argument is often used to support the conviction that the world's deserts are "on the march," in spite of an absence of reliable empirical evidence to support that view (Swift, 1966).

Norwegian Geographer Tor Benjaminsen in (Adger, Benjaminsen, Brown & Svarstad, 2001, 691-2) examined a particular narrative about the links between the collection of fuelwood, deforestation and 'deserts on the march' in two regions in Mali. He found that all the wood used by villagers in the Gourma region in northern Mali was dry wood collected from dead trees. There was an abundance of dead wood available because of unpredictable rainfall and the frequency of droughts. The other region studied was the densely populated cotton zone of southern Mali. Collecting data from some fifty villages he found that the amount of green wood collected was sustainable in terms of forest regeneration. Only one locality near a major road suffered severe depletion where fuelwood was collected to be sold in urban centres.

Leach and Mearns (1996, 3) point out that there are three important factors that are overlooked when it comes to this narrative:

- i. most fuelwood comes from surplus wood left over from clearing land for agriculture, or from lopping branches off trees used for many purposes such as the provision of shade, building materials or edible fruits;
- ii. surveys of woodlands as defined by foresters greatly underestimates other sources of fuelwood such as those from smaller trees and woody shrubs; and
- iii. where there is a realisation of fuelwood shortages people tend to respond in various ways, such



as reducing fuel consumption, or planting or encouraging the natural regeneration of trees.

African studies scholar William Beinart (1996) makes reference to a politically inspired narrative in South Africa. Under apartheid desertification was supposedly caused by the destructive farming practices of white farmers. 'Yet time-series evidence tells a rather different story of general stability in grassland composition over the period in question' (Leach & Mearns, 1996, 12).

Neil Adger and colleagues tell the tale of,

'The most famous and often-repeated story relating to desertification concerns the observations of an ecologist, Hugh Lamprey, in a reconnaissance flight over an area in the Sudan in 1975. The story has been used extensively to present the extent of desertification. Lamprey was assigned by the UN to give an estimate of desert encroachment. Using a light aircraft he compared what he observed in 1975, which was just after a severe drought, with a vegetation map from 1958, at the end of an exceptionally wet decade in the Sahel. The conclusion drawn was that the Sahara had moved south by 90-100 km from 1958 to 1975. This implied an average desert advance of 5-6 km per year (Lamprey, 1975). Subsequently, these data have been widely-quoted by governments, international aid donors and the media, and have entered school textbooks as an example of irrefutable facts pointing to a global environmental crisis. This is an apposite example of how a single narrative has contributed significantly to the institutionalization of a crisis discourse' (Adger, Benjaminsen, Brown & Svarstad, 2001, 690-691).

These scholars identify two discourses, with associated narratives, that support the idea of desertification:

- the neo-Malthusian discourse that depicts overpopulation in drylands as the main problem, a problem that leads to land degradation and fuelwood shortages; and
- the populist discourse explains land degradation by marginalization of smallholders and pastoralists caused by colonial and subsequent neo- colonial exploitation, an explanation that incorporates political economy viewpoints.

'Both the neo-Malthusian and populist discourses on desertification have proven to be powerful and have informed state intervention and the aid industry' (Adger, Benjaminsen, Brown & Svarstad ,2001, 691).

Arid lands scientists Stefanie Herrmann and Charles Hutchinson (2005, 549) refer to these two discourses the Global Environmental Management (GEM) vs. the populist discourse. According to the GEM discourse, one inspired by modernisation theory and neo-Malthusian assumptions, people cause desertification, and yet, these land managers are at the same time the victims of the same process. Scientists, aid bureaucrats and national civil servants are depicted as heroic figures that provide solutions to environmental problems. The GEM discourse is interventionist and technocratic whereby environmental issues such as desertification require urgent and international action (Bettini & Andersson, 2014, 163). This discourse is reflected in the United Nations 1977 Plan of Action for Combating Desertification that was superseded by the UN Convention to Combat Desertification.

Desertification actually appeared on the agenda of the 'Earth Summit', the UN Conference on Environment and Development, Rio de Janeiro, 1992, because of a strong lobby from African delegates. It was successful because the United States was suffering from criticisms over its environmental policies and a failure to support the Biodiversity Convention and a 'go slow' in the preparations for the Climate Change Convention. Support for the Desertification Convention was a 'trade off' between 'North' and 'South'. European Union and United States support for the Desertification Convention ensured African support for the other two pillars of the Earth Summit of 1992 (Adger, Benjaminsen, Brown & Svarstad, 2001 2001, 690)

In the populist discourse, with its philosophical groundings in Marxism, dependency school of development (see for example Franke & Chasin, 1981 examined in the last section) and post development critiques (Escobar, 1992, 144) sees global capitalism, transnational corporations and northern consumers as the 'villains' whose actions have caused a marginalisation of local farmers and pastoralists. While the local land managers are considered to be both as victims and heroes capable of sustainable management of their natural environment.

Geographer Alan Grainger (2009) refers to the desertification myth as a denial narrative. Inclined to support the populist narrative, he refers to the geographers and other scientists that were excluded from the United Nations Environment Program's group of experts. Scholars that challenged some scientific concepts agreed at the United Nations Convention on Desertification, e.g. the role of fuelwood cutting in causing desertification, the 'unidirectional and irreversible frontier expansion of desert fringes' (Grainger, 2009, 418) and the overestimates of the global extent of desertification were ignored for a long time.

He says that a contemporary view of desertification reveals a complex phenomenon involving interactions between multiple causal factors, one that varies over time, from context to context and from place to place.

Geographers Simon Batterbury and Andrew Warren explain that 'laying the desertification discourse to rest is difficult' (2001a, 3527). They identify six themes that are essential elements of the desertification debate:

- Advance of desert the Sahara Desert expansion has not been proven. The current view is that the Sahara expands and contracts in response variations in precipitation.
- Resilience of dryland ecosystems and land-use systems – semi arid ecosystems are resilient rather than fragile. They exist in a range of semipermanent 'states' well adapted to periodic attack from droughts, bushfire and insect plagues. In addition, many indigenous management systems effectively create 'enriched' patches in the landscape.
- Influence of grazing and livestock the diversity in dryland environments and the 'enriched' patches that follow on from pastoralist grazing strategies are critical to many drylands. It is difficult to overgraze in a dynamic non-equilibrium system, dominated by annual grasses, where the external forces like drought are more powerful controlling animal numbers – drought precludes the growth of annual pastures.
- Effects of increased population in rainfed, dryland agricultural systems – there is not necessarily a neo-Malthusian link that exists between increased population and resource degradation. Empirical evidence suggests that there is an incentive for rural people to invest in conservation measures in these circumstances – more people may mean less erosion.
- Soil erosion and fertility decline although topsoil erosion does occur in drylands such soil can accumulate down-slope or down-wind as a valuable resource for others. Many indigenous dryland soil conservation systems are impressive.
- Climate Change the biogeophysical feedback mechanism, referred to in an earlier section, is disputed. Potential global warming and global teleconnections between sea surface temperatures and climate anomalies will have differential, and as yet uncertain effects on drylands. In 2001, the IPPC observed, 'Africa is the most vulnerable region to climate change, due to the extreme poverty



NASA image of an African dust storm. Source: Wikimedia Commons

of many Africans, frequent natural disasters such as droughts and floods, and agricultural systems heavily dependent on rainfall' (cited in Mortimore, 2010, 134).

The various discourses about desertification and the narratives that support them still emerge in the literature, see for example Bettini and Andersson, (2014), but a number of scholars are also now working within the confines of the GEM discourse, i.e. producing materials under the broad United Nations banner. They also manage to do so by incorporating the populist discourse and other research from the physical sciences and the social sciences more broadly. The 'Dahlem Desertification Paradigm' (Reynolds, Stafford Smith & Lambin, 2003), 'Millennium Ecosystem Assessment on Ecosystems and Human Well-Being: Desertification Synthesis' (Millennium Ecosystem Assessment, 2005), International Geographical Union's Commission on Land Degradation, Desertification (Conacher, 2006) and 'Drylands Desertification Paradigm' (Reynolds et al, 2007) are all examples of this process.

The two 'Desertification Paradigms' are examined here.

The Dahlem Desertification Paradigm

The very core of this model is the unambiguous assertion that desertification is a phenomenon that encompasses both biophysical and socioeconomic dimensions (Reynolds, Stafford Smith & Lambin, 2003, 2043). The Dahlem Desertification Paradigm arose out of two United Nations programs, Global Change and Terrestrial Ecosystems program and the Land-Use and Cover Change programs, which were part of overarching 'International Geosphere-Biosphere Programme'. The latter has the following vision 'to provide essential scientific leadership and knowledge of the Earth system to help guide society onto a sustainable pathway during rapid global change' (IGBP, 2010). Researchers and scientist were brought together to study desertification. A workshop convened in 2001 at the University, in the Berlin district of Dahlem, was titled 'Global Desertification: Do Humans Cause Deserts?'The findings were then published in a book with the same title (Reynolds & Stafford Smith, 2002).

Nine assertions make up the paradigm (Reynolds, Stafford Smith & Lambin, 2003). The first four stress the complex interconnections between biophysical and socio economic systems that drive desertification. They concentrate on systems behaviour such as the importance of slow variables, threshold effects and the non-linearity of systems. Others refer to the effects of geographic scale and time on desertification and the importance of local environmental knowledge (LEK).

The Drylands Desertification Paradigm

Building on the ideas expressed in the Dahlem Desertification Paradigm an article in Science (Reynolds et al, 2007) written by a host of Geographers, Earth Scientists, Environmental Scientists, Social Scientists and Agronomists outlined the Drylands Desertification Paradigm. This framework aimed to reveal various advances in science relevant to desertification and rangelands ecology. They also sought to include the vulnerability of people to change in drylands, as well as understandings of poverty alleviation and the role of community development practices. The researchers acknowledged that the United Nations had periodically focused on drylands, as in the Convention to Combat Desertification and setting aside 2006 as the International Year of Desert and Desertification, but they wanted to suggest a common framework for managing dryland systems to the wider scientific community. They enumerated five general lessons concerning the condition and dynamics of human-environment systems in drylands (Reynolds et al, 2007, 847).

- i. The need for an integrated approach, involving both researchers and land managers, acknowledging that ecological and social issues are intertwined.
- ii. An awareness that short term measures will not redress persistent, recurring problems nor will they cope with continual change.
- iii. An appreciation that dryland systems are not in equilibrium, have multiple thresholds and are subject to many different ecological and social states.
- iv. Recognition that problems and solutions at one scale influence and are influenced by those at other scales.
- v. Much greater value should be placed on local environmental knowledge (LEK).

The Drylands Desertification Paradigm consists of five principals that are based on the five general lessons and are consistent with contemporary understandings of the interconnections between biophysical and socioeconomic factors.

P1: Dryland human-ecological systems are coupled, dynamic and co-adapting, with no single target equilibrium point. They are a product of the interconnections between human-ecological systems, have distinctive histories and geographies and are the locus of change.

As far as biophysical systems are concerned Hutchinson and Herrmann (2005, 543) explain that the concept of 'equilibrium' dominated much ecological thinking until the 1970s. This concept, one that guided most land management policies, held that internal ecosystem regulation is achieved through negative feedback mechanisms that move the system toward stability. In effect, a 'balance of nature' is arrived at. An alternative point of view assumed permanent disequilibrium in arid ecosystems because both the populations of herbivores and the condition of the vegetation are so strongly controlled by unpredictable rainstorms and erratic seasonal conditions.

Similarly, the role that land managers, individuals, households and communities play, are adapted to non-equilibrium conditions. In dryland sub-Saharan Africa, 'Case studies show that adaptive strategies of small farmers include techniques to improve fertility, conserve water, manage trees, increase live- stock, and take advantage of changing markets' (Tiffen & Mortimore, 2002, 218). The disjunction between these two points of view led to complete misunderstanding about environmental decline after the Sahel droughts of the 1970s and 1980s. 'Inspired by the findings of the UNCOD in 1977, scientists and government officials portrayed the people of the Sahel as responsible for the degradation of their own environment, some going so far as to blaming West Africans for causing or at least exacerbating their own droughts' (Hutchinson & Herrmann, 2005, 546)

The Dahlem Desertification Paradigm would add 'At any particular point in time, a dryland system is the product of a set of complex interactions between biophysical factors (biogeochemical cycles, population dynamics, climate variability, etc.), social factors (conflict resolution, role of culture in shaping attitudes, etc.), and economic factors (supply-demand, economic stratification, work force, etc.)' (Reynolds, Stafford Smith & Lambin, 2003, 2046). The drivers of system change could be external such as the onset of drought and/or internal, for example, a farmer's response to install drip-feed irrigation apparatus.

P2: The critical dynamics of dryland systems are determined by '*slow'* variables (e.g. soil fertility, household capital wealth) rather than 'fast' variables (e.g. crop yields, household disposable cash). Put another way, soil takes a long time to develop in semi-arid ecosystems but economic changes are relatively rapid in drylands whereas educational and cultural factors are slow variables.

P3: Slow variables have thresholds that, if crossed, move the system into a new state or condition. When this occurs the cost of intervention to 'return' the system to the desirable condition or state increases. In other words, the costs of intervention rise non-linearly with increasing degradation.

P4: Coupled human-ecological systems are hierarchical, nested and networked across multiple scales. There are multiple stakeholders involved at each of these scales with differing objectives and perspectives that need to be acknowledged.

The Dahlem Desertification Paradigm goes further to assert that the accepted definition of desertification adopted by the Convention to Combat Desertification should be adopted at a broad scale but at the finer scale of the household or community land degradation should be used and more importantly it will always be necessary to define what factor is degraded. They liken desertification with 'sustainable development' or 'biodiversity conservation' as useful overarching concepts but of limited usefulness when applied at a scale of 10 hectares of rangeland (Reynolds, Stafford Smith & Lambin, 2003, 2045).

P5: The maintenance of a body of up-to-date LEK is key to functional co-adaptation of human-ecological systems. Local environmental knowledge, such as the Desert Knowledge initiative in Australia (Stafford Smith & Reynolds, 2003), should be integrated with sciencebased knowledge and mediated through effective institutional structures.

Again a scalar framework is implied because landholders operating at the household or farm scale may have different perceptions from interest groups operating at the regional, national or even global scale. For example the workshops conducted in Bolivia, Mexico and Honduras by the ARIDnet (Assessment, Research, and Integration of Desertification research network) scientists, a network that developed out of the Dahlem Desertification Paradigm, facilitate fieldlevel interactions between researchers, local farmers, landholders and developers (Reynolds et al, 2007, 851).

The Humanities and Desertification

Denis Cosgrove has written a short essay *Geography* with the humanities (2011) in which he explains that the approaches used in the humanities involve a succession of commentary and criticism rather than the establishment of theories and laws 'although rules of evidence and logical argument are vital to their practice' (2011, xxii). He describes History as gueen on the humanities but would also include other subjects, for example, Philosophy, Philology (language, literature, linguistics), Theology and the study of Art. Alison Blunt (2009, 66) would add Literary Studies, Archaeology and Cultural Studies to this list. 'The goal of humanities' study is still best encapsulated by the Greek aphorism: "Know thyself," and the idea that we best come to knowledge through the reflective study of exemplary human achievement' (Cosgrove, 2011, xxii-xxiii). Another text by Cosgrove Geography & Vision: Seeing, Imagining and *Representing the World* is chosen as the inspirational text for this section.

Eating the haystack

Geographer Les Heathcote wrote about desertification in an Australian context. He referred to the phenomenon of excess carrying capacity of livestock in arid and semi arid Australia during the Federation Droughts of 1895 – 1902. A station inspector for Dalgety and Co. gave evidence before the Royal Commission to Inquire into the Condition of the Crown Tenants, NSW, 1901, the inquiry into the Federation Droughts in the Western Division, NSW. He explained,

'There is no doubt that in my mind that the carrying capacity of the country was greatly overestimated by the early settlers. In its virgin state, with the saltbush and other edible bushes in their prime, there was hardly a limit, except as regards water, in the opinion of the settlers then to what the country could carry, and in many cases it was stocked accordingly, but they forgot in doing this that they were eating the haystack, and there was soon no crop growing to build another. Then the rabbits came along' (Heatchcote, 1987a, 294).

The notion of carrying capacity has been alluded to in the previous section. Let it be said that it is a European or North American construct: a presupposition that 'every set of ecological conditions can support a given number of people and/or livestock which, once exceeded, will lead to a spiral of declining productivity' Leach & Mearnes, 1996, 9). However, it was not one that was evident in pre-colonial Australian environments. Nevertheless, Heathcote is obviously correct in his observations. The early settlers approached the



Australian bush with no regard for carrying capacity, nor any knowledge of its ancient soils, aridity and unpredictable rainfall.

Heathcote (1987b, 10) explained that a series of 'desert outbreaks' such as those in the Flinders Ranges and northern parts of South Australian, in 1865, the Federation Drought years, 1895-1902, the 1935-40 widespread mid century droughts and the 1982-1983 El Nino drought in the Western Division, NSW, led to concerns about desertification, the perception of the expansion of the desert into more humid productive areas and subsequent economic distress in the rural community.

Michael McKernan (2005) believed that the 1982-1983 drought marked a turning point in Australian society, one where rural and urban dwellers began to understand the reality of drought as a recurring phenomena rather than a threat that presaged the notion of the expanding desert. The Millennium Drought, 2001–2009 was described as the worst drought on record in southeast Australia (van Dijk et al, 2013, 1040) and yet there was no mention of desertification in the popular press. There were other concerns: enforced water restriction in most major cities, increased electricity prices and the outbreak of catastrophic bushfires. Desertification in its many guises was not the focus of concern despite the decline in riparian River Red Gum forests and increased tree mortalities away from the rivers (2013, 1051)

Heathcote (1983, 164) referred to desertification in general,

Livestock during drought, Riverina . Source: Wikimedia Commons

'First came the removal of the edible species and thereby the encouragement of inedible species. Then, if pressures continued, the modification of soil and water conditions to the extent that all vegetation was removed and soil erosion became a major problem. Associated with this deterioration of the vegetation were rapid reductions in livestock carrying capacities, usually by massive deaths in droughts'.

The NSW Royal Commission of 1901, set up to investigate the effects of the Federation Drought, investigated six main causes for the appalling conditions in the Western Division: low rainfall and periodic drought, rabbit plagues, overstocking, large scale destruction of vegetation, the spread of woody weeds, or non-edible shrubs and the decline in prices of pastoral products (Holmes, 1983, 50). Heathcote (1965) quoted from the Sydney Morning Herald in 1899,

'It is the land of drifting desert sand and stone strewn ridges, of open treeless plains, and dense impenetrable scrubs. It is the home of the treacherous mirage, of disappointing salt lakes and fleeting waterholes, of drying winds and exasperating dust storms. It is the stronghold of the rabbit and the most frequent victim of the drought. It is, too, just now a land of buried yards and fences, of abandoned holdings and deserted homesteads, of broad acres but tragically shrunken flocks' (cited in Holmes, 1983, 50). The journalist's description of desertification was substantiated by the Commission's investigations. Much of this rhetoric was to resurface in the Dust Bowl years in North America and the Sahel droughts of the 1970s and 1980s. All fill out our conception of desertification.

Alternative visions

There was of course, an alternative Australian vision articulated by Adelaide-based, Prussian-born entomologist, Johann Tepper. Writing in the Agricultural Gazette of NSW in 1896 he wrote about the country clothed in trees, 'the soil loose and porous, the banks of the watercourses thickly overgrown and lined with shrubs' (1896, 33, cited in Powell, 1993, 26). He went on, 'If the first settlers had thoroughly understood the interrelation of plants and fertility, provision could easily have been made to conserve a due proportion of forest (and heath) land, and such devoted to tilling and pasture by an intelligent and wisely determined government' (1896, 35). Unfortunately,

'nothing was done to provide for the future; the country has gradually drifted to the verge of becoming a hopeless desert, like most parts of Palestine, Arabia, Persia, North Africa and even Spain, with similar climates and soils like our own, which history proves to have been thickly wooded etc., when supporting great nations and high civilisations' (1896, 36).

Desertification is seen here quite literally as a deserted place and a place made desert – empty of life, waterless and unproductive (Mabbutt, 1985).

But there is also another vision of Australia. Novelist Robert Dessaix (1991, 152) examined the psyche of the early European settlers explaining that 'the land is often feminine to Europeans, but given sense, owned, by generations of the masculine'. Historian Michael Cathcart (2009, 140) points to an oft-repeated theme in contemporary feminist readings of the land, the notion that nineteenth settlers thought of the land as a woman whom they were destined to conquer. Europeans, by and large, came from well-watered climes, 'it was fecund, moist, moody, manicured, colourful' (Dessaix, 1992, 212). And yet, 'The land the men came to was 'barren', dry, stable, unkempt, monochromatic and peopled by stick men with few possessions'. Coming to this harsh and barren land, according to Geographer Faye Gale, 'The saving power of technology was seen as essential to 'tame it.' But to the Aboriginal people the Australian landscape, whether desert or tropical; coast was a lush rich country provided one lived in a respectful relationship with nature' (Gale 1994, 22). Historian Bill Gammage remarked on the workload of Aboriginal

women in the arid land, 'I never saw an Aboriginal woman come in empty handed, though in 1935 there was a drought' (2011, 302). Furthermore, he stressed that mobility was the key, 'It gave the people abundant food and leisure and let them live in every climate and terrain' (304) and 'they usually lived comfortably in parks they made' (311). But more sombrely, 'Knowledge of how to sustain Australia, of how to be Australian, vanished with barely a whisper of regret' (323).

The adventures of a biologist in Australia

Heathcote (1987) explained that Francis Ratcliffe, brought from Britain to investigate the supposed 'desert outbreaks' of the 1930s, found the attitudes to drought 'extraordinary' and 'discouraging'. The primary assumption was that drought was an exceptional occurrence, whereas he suggested that people had to live with recurring droughts. In *Flying Fox and Drifting Sand the adventures of a biologist in Australia* (1947) he concluded that, 'the fodder reserve of the semi-desert country is nowhere sufficient to stand up indefinitely to the strain that must be placed on it by pastoral settlement' (Holmes, 1991, 53).

Such views were in accord with the many Geographers who have written on desertification. Grainger (1990, 65) cites four main types of poor land use as causes of desertification: overcultivation, overgrazing, deforestation and poor irrigation practices. Thomas and Middleton (1994, 82) add urban and industrial activities to this list. They also provided an expanded list of suggested root causes of accelerated land degradation including natural disasters, population change, under development, internationalisation (now probably referred to as globalisation), colonial legacies, inappropriate technology and advice, lack of knowledge about land degradation, institutional or personal attitudes to land degradation and, war and civil unrest (1994, 85). Andrew Goudie and Heather Viles (1997, 27) refer to the 'demographic explosion' that impacted on to the four factors identified by Grainger. Richard Huggett (2010, 47) would cast the net more widely referring to the primary causes of desertification as climatic variations, ecological change and socioeconomic factors adding drought, poverty, political instability and even desert warfare to Grainger's four main types of poor land use.

Stories of desert advance

As we have seen, as early as 1865 an awareness of desertification became apparent when drought devastated the pastoral lands of the Flinders Ranges and resulted in the demarcation of Goyder's Line, the isohyet that separates the mallee scrub from the saltbush



A Break Away! An iconic painting of 1891 by Tom Roberts, depicts a time of drought in the Australian outback. Source: Art Gallery of South Australia

country, the northern limit of crop faming in South Australia. The 1901 Royal Commission increased anxiety about potential desertification and Ratcliffe produced a paper on soil erosion and sand drift in 1937 that investigated 'desert advance' leading to further disquiet about desertification in northern South Australia and southwest Queensland.

But it is the Federation Drought that has the greatest impact. Various writers expressed the uneasiness and the sense of despair about desertification in Australia.

'The excessive numbers of sheep and cattle denuded inland pastures and when, between 1895 and 1903, drought dried up the inland fertile crescent of eastern Australia – from Queensland, through New South Wales, Victoria and into South Australia - the land was devastated. East of the Darling, 90 percent of the original perennial saltbush disappeared. Grass also vanished from paddocks and topsoil began drifting and blowing away. Albermarle station near Wilcannia, New South Wales lost topsoil up to a depth of 30 centimetres from 40 500 hectares. The great drought culminated in a huge dust storm and the largest, on 11-13 November 1902, covered areas of South Australia, Queensland, New South Wales and Victoria. In Victoria, lightning and balls of fire accompanied gales of dust which so darkened the sky that fowls roosted in the middle of the day, and people used lanterns to get about.

When the droughts began, Australia had grazed 110 million sheep. Eight years later, 57 million sheep remained alive and pastoralists abandoned large tracts of sheep country. In 1891 the western division of New South Wales carried fifteen million sheep; less than half that number depasture there now. Sixty years after the great drought, the dead mulga still stood, and some plants common before the drought, did not appear until 50 years afterwards (Lines, 1992, 131–2).

Journalist, Michelle Grattan revisited the Western Division of NSW to follow the footsteps of journalist and later war correspondent, Charles Bean. She mentioned the earlier writings of journalist and politician Edward Davis Millen who travelled around the Western Division of NSW and had his observations published in the Sydney Morning Herald in 1900. He wrote presciently that the normal condition of the West was drought 'punctuated with occasional moist seasons' (2004, 46).

Bean had written *On the Wool Track* (1910) about the inquiry carried out by the Western Lands Commission. He described western NSW as bad and black and hopeless as it could be: the country had been made a desert (2004, 53). He described the land around Bourke as a mass of shifting red and grey sand where dead sheep and fallen tree trunks initiated sand hills 'the West was literally not different from the Sahara Desert' (2004, 82)

Eighty years later the Western Lands Commission was more ambivalent about the Western Division. Somehow the spectre of desertification had faded. 'The region is predominantly flat. It is hot and it can be dusty. But it can be mild and lush and there is natural beauty in the rolling plains of Mitchell grass in the harsh ridge country or among the red gum forests which flank the major rivers' (Western Lands Commission, 1990, cited in Grattan, 2004, 57). Nevertheless, as early as 1946 geographer James Macdonald Holmes was sufficiently concerned about the future of the Western Division of NSW that he suggested it might revert to a national park (Heathcote, 1987b)

The impacts of overcultivation are alluded to in the following extract where a group of Western Australian social scientists addressed one of the prime causes of *The Salinity Crisis*,

'In Western Australia until the end of the first World War clearing heavily timbered country was done by axe, and hand-made rollers. 'Even clearing by axe alone, a strong skillful worker could clear between half and one acre a day, although the process of stacking and burning was a much slower job. But evidence of development could be found all over the expanding wheat frontier. Burning operations after mid-February darked the sky with smoke by day and left myriads of twinkling log fires at night' (Beresford, Belke, Philipps & Mulcock, 2001, 44)

Michelle Grattan referred to the visit of Russell Drysdale to the western division in 1944, along with a Sydney Morning Herald journalist and photographer. Drysdale



Dust storm, Stratford Texas, 1935. Source: Wikimedia Commons

sent back images of cattle rotting in the earth and twisted trunks of apparently tortured trees in a dead and dying landscape (Mulligan & Hill, 2001, 67). He showed resilient people in a landscape of skeleton trees, derelict windmills and dying soil (Grattan, 2004, 87). 'South of Broken Hill, where 600,000 sheep died in one corner of the State, Drysdale remembers being given cold drinks and a meal in a home surrounded by sand dunes higher than its roof, and in which all the ceilings had collapsed. The talk in these stricken areas was not only of loss, but of development and irrigation' (Burke, 1951, 12).

Nevertheless, contemporary newspaper accounts seemed to focus on the Western Division of NSW becoming a sandy desert like those in North Africa rather than on the stoicism of the landholders, as instanced in the Finley Mail, 15 November 1944 (McKernan, 2005, 196). And, Sydney's Daily Telegraph, 4 November 1944 predicted, 'it will be of no use to anyone except future archaeologists who will have to dig under sand hills to fond the remains of an extinct civilisation' (196). Michael McKernan wrote of Drought as The Red *Marauder*. He wrote of drought, of drought and dust storms, drought and bush fire: occurrences that would return to visit Australia. 'They never really leave it' (2005, 269), he said. This is a much more fruitful way to think of desertification in Australia. As Historical Geographer Joe Powell remarked, terms like desertification derive from the vocabularies of 'anxious scientists and sensationalising magazines and newspapers' (1993, 9).

Armistice Day 1933

Pulitzer Prize winning author John Steinbeck immortalised the Dust Bowl,

'The dust from the roads fluffed up and spread out and fell on the weeds beside the fields, and fell into the fields a little way. Now the wind grew strong and hard and it worked at the rain crust in the cornfields. Little by little the sky was darkened by the mixing dust, and the wind felt over the earth, loosened the dust, and carried it away. ... The wind grew stronger, whisked under stones, carried up straws and old leaves, and even little clods, marking its course as it sailed across the fields. The air and the sky darkened and through them the sun shone redly, and there was a raw sting in the air' (Steinbeck, 1939, 1-2).

Marc Resner was no stranger to evocative prose either,

'The first of the storms blew through South Dakota on Armistice Day, November 11, 1933. By nightfall, some farms had lost nearly all their topsoil. "Nightfall" was a relative term, because at ten o'clock the next morning the sky was still pitch black. People were vomiting dirt. Machinery, fences, roads, shrubs, sheds – everything was covered by great hanging drifts of silt. ... A naked human tethered outside would have been rendered skinless – such was the scouring power of the dirt-laden gales. Huge numbers of jackrabbits, unable to close their eyes, went blind. That was a blessing. It gave the humans something to eat' (Resner, 1986, 155).

Drought is a reoccurring phenomenon on the Great Plains of the United States of America and every time it resurfaces atmospheric scientist Michael Glantz thinks back to the great debate that took place in the 19thc whether the Plains would revert to an unproductive desert or whether it would become a 'sustainable garden' as the humid Eastern States were perceived (Glantz, 1994 29-30). The Dust Bowl was to return twice more in the 20thc (Millennium Ecosystem Assessment, 2005, 16) after Dust Bowl I in the 1930s. These events reoccurred despite all the policy interventions, economic reforms and the migration of 1 million people out of the Great Plains between 1940 and 1970. Dust Bowl II that occurred in the 1950s damaged more land than Dust Bowl I (Thomas & Middleton, 1994, 22); and Dust Bowl III in the 1970s caused as much soil loss as the 1930s event (1994, 22). Geographer Mark Whitehead (2014, 66) refers to Dust Bowl I as a defining moment in the Anthropocene, one of the most devastating human-induced ecological disasters in history. It was also an example of the use of opportunistic politics and hyperbole regarding desertification. David Thomas (1997, 587) explained,

'In the 'dirty thirties' the dust bowl soil erosion issue in the USA and the desire to get public funds for relief efforts led Secretary of State, Dean Acheson, to advise President Truman to take an alarmist stance in a forthcoming speech to Congress: 'Scare Hell out of them Harry, or nothing will be done'

Woman in the Dunes

Hiroshi Teshigara's award-winning 1964 film *Woman in the Dunes* is set in vast expanse of coastal sand dunes stretched out along the Japanese coast. In a giant swale in the dunefields sits a ramshackle dwelling, surrounded by cliffs of sand, whose owner exists for only one purpose: clearing away the sand. Her house lies on the edge of a village threatened by the advancing wall of sand. She has lived alone since her family were lost in a sand storm. Unless the sand is removed the entire village will be lost. The *Woman in the Dunes* is one of a number of captive workers who shovel sand every day to protect the village from the advancing dunes. Another captive, a teacher from Tokyo who strays into the sand pit on an expedition to collect insects, joins her.

Geographer Matthew Gandy examines the film in the context of representations of landscape to explore the projection of human values, hopes and fears in this sandy wasteland. He says, 'Modern Japan is presented as a spiral of entrapment: the man is caught within a faceless society that regards its workers as little more than automatons while the woman represents a lonely outcast from Japan's post-war miracle' (2010, 203). Advancing sand is essential to the plot of the film as sand slides down the dune slopes and is borne remorselessly onwards by the wind. Geologist Michael Welland explains, 'sand is the enemy but also the central character' (2010, 133).

The actual central characters, deserted by the villagers and wider Japanese society are stranded in a wasteland, an alien place: a desert. At the end of the film it is revealed that the man has been absent for seven years and is now classified as a missing person. The advancing sand threatens civilisation. The metaphor is a powerful one; one that permeates much thinking about desertification. It is difficult to shift notions of advancing walls of sand towards the currently accepted concept of land degradation in drylands. As geographer Jack Mabbutt remarked ' the symbol of the palm tree disappearing under the advancing sand is locally warranted, but as a general view of desertification it could lead to mistaken combative strategies' (1985, 1).

Environmental visions of the Maghreb

The most common 'vision' about desertification, accelerated land degradation in the Maghreb states of Algeria, Tunisia and Morocco is one of human-induced change despite the fact that the region has experience significant climatic fluctuations over the past several thousand years. Meteorologist Kenneth Hare concluded that desert expansion in North Africa was largely a consequence of unwise human decisions set in a framework of recurring droughts (Blaikie & Brookfield, 1987, 123). But others are not so certain. It may be that human ingenuity actually impeded natural erosion rather than accelerated it. It may be that in the centuries after 1000 CE when intensive agricultural methods declined that accelerated land degradation increased (1987, 126).

Historian Diana Davis has an interesting reading of the environmental history of the Maghreb viewed through the prism of French colonial engagement with this part of North Africa. She analysed environmental change during the French colonial occupation of the Maghreb between 1830 to about 1956 using evidence from the classics, history and colonial art. The dominant narrative created during this period was based on French interpretations of ancient Greek and Roman writings about North Africa. But,

'It is a false story of environmental decline at the hands of the "invading Arab nomads" and their voracious herds. It was wielded like a weapon during the heyday of French colonialism in North Africa from the 1860s until independence to justify and facilitate imperial goals' (Davis, 2010, 171).

Before French occupation of Algeria in 1830 the prevailing vision was of a fertile and bounteous land that was not reaching its potential under Ottoman rule and peopled by lazy "natives." After occupation the story began to change with the nomadic herders being blamed for turning Algeria into a desert through overgrazing, deforestation and through burning off the vegetation. In fact, the evidence for extensive forests over the Maghreb is very thin with most deforestation occurring from the 1890s to the 1940s. The French however saw the landscape as a degraded space and it was the duty of France to plant vast forests to bring back the rains. This exposition allowed for the expropriation of the land from North Africans. French forestry experts mapped the supposed former forests using subjective judgements over the former extent of the natural vegetation of the Maghreb. So powerful did this vision become that a French scientist published evidence from a series of pollen cores in the 1970s that appeared to show significant deforestation that was coincident with the 11thc "Arab invasion" (175). Subsequent tree ring analysis in the 1990s in the Rif Mountains indicated that there had been a severe drought from 1100–1250 CE and this was what the pollen cores showed rather than the march of the Arab tribes.

Davis explains that biophysical data makes up only part of the story of environmental change. She says, 'We also need to understand what various people and cultures believed about the environment and environmental change over time and how and why they acted on those beliefs' (170–171).

The impact of foresters has had a marked impact on the development of thinking about desertification. Louis Lavuaden used the term in 1927 when he was working in the forest service in Madagascar. He explained that in order to end the desertification process in the Maghreb extensive tree plantations, restricted grazing rights, a series of protected reserves and the suppression of bushfires were essential policies to be implemented. He saw desertification as even more precarious south of the Sahara, because there the French had to deal with "primitive people" who were incapable of understanding "the purpose of rules" (Benjaminsen & Berge, 2004, 42). Another forester, Aubréville is more generally acknowledged as the first person to coin the term when, in 1949, he noticed that the Sahara Desert was expanding into the surrounding savanna (Huggett, 2010,47).

And then there are Stebbing's accounts from West Africa. Edward Stebbing, also a forester, addressed an audience at the Royal Geographical Society in London on 4 March 1935. He travelled through the savanna lands of West Africa from the Côte d'Ivoire through to Nigeria reporting on large herds of cattle and flocks of sheep and goats clustered around waterholes and great fires crossing the countryside, all living and taking place a mere 30 miles from the outskirts of the Sahara. He explained,

'The people are living on the edge, not of a volcano, but of a desert whose power is incalculable and whose silent and almost invisible approach must be difficult to estimate. But the end is obvious: total annihilation of vegetation and the disappearance of man and beast from the overwhelmed locality' (Stebbing, 1935, 510).

Journey through a dead land

Schoolteacher Michael Asher journeyed to the Kababish dar, the land of the Kababish, in northern Sudan in 1982 at the height of the drought in the Sudano-Sahel. The perception of the drought in Sudan was so acute that on March 14 1986 the then Vice President of the USA, George Bush senior, urged that aid should be dispatched to the country because 'desertification was advancing at 9 km per annum' (Binns, 1990, 107).

'The sand looked fresh and pristine as if no other foot had ever trodden there. There were stumps of dead trees and little heaps of deadwood thatcrumbled to a powder at the touch. 'Look at those trees!' Jibrin said. 'This was the famous Sallaym pastures. A few years ago all the Kababish in the north used to collect here. There were sallam trees and tundub and siyaal. The sands were green with grasses. You could not move for camels, and there was as much game as you could hunt. There was gazelle, oryx and even ostrich. I know men that saw herds of them, twenty at a time.'

'What happened?'

'The grazing got less every year, and the rains failed. There was never much rain here, but enough to bring grazing along the wadis. Then the trees died and the Arabs of the Nile came and chopped up the rest for firewood.'

'Will it bloom again?'

'Only God knows but I don't think it will bloom here. If they had left something, the tops of the trees, and just collected the fallen wood it would have been better. I have seen sallam trees go for years without water. You think they are dead, but the spirit is still in them. It just needs a shower of rain and shushsh! They are green again. But this is a dead place. They have left nothing''(Asher, 1986, 298).

One could be forgiven here in conjuring up an image of the advancing Sahara or irreversible desiccation but to reiterate, in contrast to popular perceptions; desertification is not the natural expansion of existing deserts, but the dispersed, patch-like degradation of land in arid, semi-arid, and dry sub-humid areas (Grainger, Stafford Smith, Glenn, & Squires, 2000, 365). Again, we have to point to recent research suggests that the drylands are resilient places and that local African pastoralist strategies have developed highly flexible mechanisms to cope with highly unstable environmental conditions (Adger, Benjaminsen, Brown, & Svarstad, 2001, 691).

Ulf Helldén and other Swedish Geographers at the University of Lund who demonstrated, in the 1980s, through a combination of fieldwork and the analysis of satellite images in Sudan, that there was no systematic advance of desert in the Sahel, nor was there a reduction of vegetation cover, although woody weeds had invaded some areas. They established conclusively that drought caused dramatic changes to the land cover and that productivity recovered completely at the end of the drought (Nicholson, 2011, 434).

The Trek of Sidi Mohammed

Anthropologist Richard Franke and sociologist Barbara Chasin wrote a classic paper titled *Peasants ,Peanuts, Profits and Pastoralists* (1981) that examined the role of the nomadic pastoralists in exacerbating land degradation in the Sahel during the savage droughts of the 1970s. The paper is representative of what has been



termed "the large body of literature on the Sahel" that has emerged since the 1970s (Blaikie & Brookfield, 1987, 108). The authors attributed blame to the peanut producers further south effectively pushing the pastoralists northwards into the desert fringes. They also questioned the ambitious development plans that forced the nomads to become sedentary herders.

Sidi Mohammed gave testimony before the United States Senate Hearings on *World hunger, health and refugee problems. Part IV: Famine in Africa,* in March 1974.

'Sidi Mohammed, a Nigerien herder took his family of ten, including his mother, brother, Sidi's wife who had recently given birth, and six children, including the infant, and began heading south. They took with them two camels and three donkeys. They left their home after the herds had died, their destination, a town where food was supposedly available. His wife died on the way, the infant son, without his mother's milk "wasted away to skin and bones." He too would die. Sidi desperately tried to give away his two youngest daughters since he could not feed them, but no one was able to take them on. When they arrived in Maradi, almost at the border with Nigeria, and a major peanut and staple crop region, they discovered there was no food to be had. They sold their animals and the sons went begging. The family finally took up residence in a refugee camp, hoping the rain would come next year and somehow they could go back up north and begin again' (Franke & Chasin, 1981, 156).

2011 Drought in the Horn of Africa Source: Wikimeia Commons

Franke and Chasin explained that the people that bore the brunt of the 1973 Sahel drought were the pastoral peoples that lived in the Sahel on the edge of the Sahara Desert. The nomadic pastoralists were formerly in contact with farmers further south bringing their animals in during the dry monsoon season to fertilise the soil with their dung and urine and graze on the stubble in a reciprocal arrangement between farmers and graziers. Then came the great surge in groundnut (peanut) production. Between 1934 and 1968 there had been a six-fold increase in the area sown to groundnuts. The traditional ability of the pastoralists to migrate across the savanna, to chase the fluctuations in annual rainfall and emulate the natural migrations of the wildebeest and white-eared kob, had become increasingly constrained (Goudie, 1986, 49) Both African domestic cattle and the wildebeest and kob need surface water supplies as well as forage in order to survive (Sinclair & Fryxell, 1985, 988). Cattle traditionally remained in the northern part of the Sahel for three months or so during the wet monsoon season where the annual grasses were high in protein. The migration system had been operating for many centuries perhaps as long ago as 5000 years BP when domestic cattle first appeared in the Sahel (1985, 989).

The pastoralists relied on movement to survive in nonequilibrium drylands. They were able to rely on a variety of pastures, watering points and salt licks, realising that pasture growth is determined by last season's rainfall. External experts had observed that the pastoralists were continually moving in search of water as a consequence boreholes were dug in the southern Sahel and pastoralists were encouraged to become sedentary graziers. This had a number of implications. Firstly, the nutritious northern grasses were unavailable to them and then the lower quality perennials of the southern Sahel became grazed all year round with no respite. The grasses were eaten out in the wet season leaving little or no forage in the nine-month dry season particularly in the areas around the bores. Worse was yet to come as "bush encroachment" ensued with the invasion of unpalatable trees and shrubs. The perennial grasses that did survive are highly susceptible to small decreases in annual rainfall. The low rainfall totals in the 1973-1975 period were the proximate cause of the famine but the supposed ultimate cause was overgrazing, an occurrence complicated by the spread of cash cropping in the form of groundnut production and a complete change in the political economy of Niger.

Today, much more is known about desertification in the Sahel, and in Niger in particular. During the 20th century, the droughts of 1913-1914, 1931-1933, 1942, 1973-1974 and 1983–1985 were severe ones (Thébaud & Batterbury, 2001, 70). The much wetter conditions experienced in the 1950s and 1960s allowed pastoralists to restock their herds. Even after the 1973–1974 drought the herds were re-formed (Warren, 1995, 196). Evidence from Kenya suggested that after a two-year drought herds were re-established in only three years and, more importantly, the recovery process suggested little or no damage to pasture capacity (Warren, 1995, 196). Satellite data also showed significant greening during the 1990s after the drought years in the 1980s (Olsson, Eklundh & Ardo, 2005, 556).

As Batterbury and Warren (2001b, 3) explained in hindsight 'It may well be that diversity and change have always been evident to the Sahelians themselves, and that is only being 'rediscovered' by scientists'. Traditional pastoralism in Niger should be viewed as an economic system that rarely has the opportunity to overstep carrying capacity because a severe, once a decade, drought culls the herd by 50 to 70 percent and the gradual rebuilding of the herd allows the pasture to gradually recover.

Nevertheless, the more recent droughts of 1973-1974 and 1983-1985 have had serious and long lasting effects on rural communities in the Sahel and, more particularly, on pastoralists. Thébaud and Batterbury (2001) examined pastoralist' livelihoods in eastern Niger where they found that access to pasture and water, particularly from public wells and boreholes, has resulted in political tension and conflicts between pastoral and agro-pastoral groups. Ironically, government efforts to provide secure watering points for the pastoral groups have initiated social conflicts and violence, rather than creating security. This is a long way from the cliché of the self-absorbed, irrational pastoral nomad, building up herds to enhance prestige and consuming pasture and water supplies at an unsustainable rate.

Conclusion

Environmentalist Norman Myers wrote about desertification in the late 1980s, a period of intense pessimism about our common environmental futures. He predicted that by the Year 2000 many more countries would be affected by the spread of deserts with some 900 million people then suffering from desertification set to rise to perhaps 1250 million sufferers (Myers, 1988). Physical geographers, empowered by geospatial technologies, have long since had a more sophisticated understanding of the spread of deserts. Environmental geographers have contributed an extensive portfolio of case studies from drylands that question earlier, simplistic assumptions about desertification. Piers Blakie's insistence on focusing on indigenous land managers, with their toolkits of local wisdom and practices, and 'chains of explanation' (1987, 46) throughout the wider political economy, changed the ways in which geographers began to examine land degradation in drylands. Dennis Cosgrove's endeavours to see, imagine and represent the world, added another dimension to enable geographers to disentangle this difficult conception. All these traditions better inform us about the most neglected and least understood leg of the troika of Conventions: on Biological Diversity, the Framework on Climate Change, and, to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, legally binding agreements ratified by most of the world's nation states.

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