



---

## Human Development Report **2007/2008**

**Fighting climate change:  
Human solidarity in a divided world**

Human Development Report Office  
OCCASIONAL PAPER

---

### **Pastoralism – Managing Multiple Stressors and the Threat of Climate Variability and Change**

Isobel Birch and Richard Grahn

2007/45

## **Background note on pastoralism**

Final draft, May 2007, Isobel Birch/Richard Grahn

### 1. Context

The consequences of future global climate variability for pastoralists are uncertain. The general picture is one of likely desiccation – of a decrease in the amount and predictability of rainfall, combined with an increase in evaporation caused by the warmer temperatures. One estimate is that, on present trends, the area affected by drought will double by the end of this century from 25% to 50%, and that while the number of drought periods may not significantly increase, they are likely to last for longer, making recovery (herd reconstitution, replenishment of water sources) less dependable.<sup>1</sup> This scenario is consistent with recent trends: the mean annual number of people killed and affected by drought in Eastern Africa, for example, has increased over ten-fold in the past thirty years, from 584 per 100,000 people in 1974-78 to 6067 in 1999-2003.<sup>2</sup>

However, these are global projections. The picture at a local level is far less clear and likely to be mixed. Rainfall is the most important climatic influence on African agriculture. For pastoralists it determines the distribution, amount, and quality of pasture. The IPCC's report in 2001 noted that scenarios for Sahelian summer rainfall vary by as much as +/- 20%. Some analysts argue that the Sahel will continue to dry out as East Africa becomes wetter;<sup>3</sup> others argue that a temporary 'greening' of the Sahel is plausible due to increased rainfall over the coming decades, but that this is likely to be reversed by the end of the century.<sup>4</sup> Thus, the importance of understanding and adapting to global climate change at the local level is clear.

Pastoralism is by its very nature a form of adaptation to climate change, which has been demonstrated over millennia. Pastoralism in Africa evolved in response to long-term climate variability. The Sahara entered a period of prolonged desiccation approximately 7000 years ago. With no reliable supplies of permanent water (away from the rivers Nile and Niger), pastoralism enabled people to adapt to an increasingly arid and unpredictable environment by moving livestock according to the shifting availability of water and pasture.<sup>5</sup>

Several thousand years later, at the end of the nineteenth century, Eastern Africa experienced a period of unprecedented ecological and environmental collapse. The advent of previously unknown epizootic diseases such as rinderpest killed large numbers of cattle, but herds had largely recovered by World War One. Pre-colonial pastoralist communities in East Africa were not isolated entities but part of complex networks that tied together complementary economies and ecologies.<sup>6</sup> Farmers and hunter-gatherers joined Maasai age-sets; stockless Maasai and Turkana herders were temporarily integrated within neighbouring hunting, fishing, or farming communities,

---

<sup>1</sup> Hadley Centre 2006.

<sup>2</sup> Guha-Sapir et al, 2004. The authors include several cautions about the reliability of disaster-related data.

<sup>3</sup> Hadley Centre 2006; Lorimer n.d., drawing on research by Held (2005).

<sup>4</sup> Brooks 2004 and 2006. See also Brahic 2006.

<sup>5</sup> Brooks 2006.

<sup>6</sup> Waller and Sobania 1994.

from where they could rebuild their herds and eventually return to the range.<sup>7</sup> These fluid social and economic ties and identities were important strategies through which all parties, including pastoralists, were able to manage various forms of risk, including climate variability.

Pastoralists today apply similar principles of flexibility and opportunism in managing their environment. Mobility, herd stratification, livestock loans and gifts, diversification of species and livelihoods – all these are ways of spreading risk and making maximum use of natural resources that vary both temporally and spatially.<sup>8</sup> Indeed, long-term research from Northern Kenya suggests that livestock keeping is more competitive than formal banking in terms of returns to capital.<sup>9</sup> However, in the intervening years pastoralists have experienced a dramatic decline in their political fortunes. One hundred years ago East Africa's livestock keepers were at the centre of regional political economies in which wealth was defined by cattle. Fifty years later they found themselves on the periphery of economies driven not by livestock but by export agriculture, and ones which offered very different routes to accumulation.<sup>10</sup> Human development involves the steady expansion of people's choices and options, but for pastoralists the reverse has been true. Their options have been progressively closed off, at first by spatial barriers (the political and ethnic boundaries imposed by the colonial and post-colonial state) and then by the obstacles inherent in the development models those states have pursued.

For most of the twentieth century, rangeland management in Africa followed a model imported from the temperate grasslands and equilibrium conditions of North America.<sup>11</sup> Its principles chimed well with the modern state's desire for legibility, predictability, and order, and with its aspiration to tame the natural environment.<sup>12</sup> But in Africa's non-equilibrium drylands the model failed. Nevertheless, its dominance reinforced a view of pastoralism as irrational and outmoded. 'Despite overwhelming evidence to the contrary, many policy makers consider pastoralism to be archaic and economically irrational, and in need of modernisation or replacement. Such conclusions are based on a

**Box 1:**

**Learning to live with uncertainty**

Uncertainty is part of the new range ecology of Scoones, Benkhe, Kerven, et al, which developed during the 1990s. Their work demonstrated that the underlying assumptions of equilibrium range ecology (such as fixed carrying capacities) and consequent solutions (such as destocking) were inappropriate to many parts of Africa. The spatial distribution of livestock rather than their number is what must be managed to avoid overgrazing, thus highlighting the critical importance of mobility in dryland resource management. A more opportunistic approach to ecosystem management is essential in areas with high coefficients of variation in rainfall.

If climate uncertainty is on the increase, so are non-equilibrium conditions. Even in places where unpredictability has been the norm, this will have major implications for livelihood sustainability. However, equilibrium notions of control and predictability also infect development thinking. 'Planners, managers, and policy makers, just as dryland farmers and pastoralists in Africa, must learn to live with uncertainty.'

[Scoones 2007, Davies/Hatfield 2006, Mortimore 2003]

<sup>7</sup> Spear and Waller 1993; Broch-Due and Anderson 1999.

<sup>8</sup> Niamir-Fuller 1999; Galvin et al 2004.

<sup>9</sup> McPeak 2005.

<sup>10</sup> Waller and Sobania 1994.

<sup>11</sup> Scoones 2007.

<sup>12</sup> Scott 1998.

narrow view of what constitutes value in pastoral systems.’<sup>13</sup> The consequences of the ‘stickiness’ of this view are illustrated in the next section.

The dominant sets of ideas through which policy-makers view the world, and the discourse they use to communicate these paradigms, define how issues are addressed.<sup>14</sup> If pastoralism is understood as backward and irrational, then the logical response will be to modernise it. In similar fashion, an alarmist narrative of ‘deserts on the move’ drove concerns about desertification since the 1930s and led in large part to the same top-down, technical ‘solutions’ which failed to engage with the actual experience of dryland farmers and pastoralists.<sup>15</sup> The global discourse on climate change must avoid falling into the same trap, and must make space for those directly affected, including pastoralists, to shape it.

## 2. Constraints to adaptation

Pastoral production has shown itself, both in practice and in theory, to be highly flexible, exploiting geographical niches and surviving decadal intervals of growth and contraction. This evidence notwithstanding, the ability of any group to cope with and respond to threats and challenges is critically linked to their access to resources (economic, ecological, social, and human)<sup>16</sup> and to the existence of supportive policies and institutions, both formal and informal. Furthermore it is overwhelmingly the poor who suffer from the impacts of natural disasters.<sup>17</sup> This axiom holds whether one considers risk to natural hazards such as drought, floods, and cyclones or more recent challenges such as the HIV/AIDS pandemic. The quality of drought management systems is thus one indicator of how well pastoralists are already equipped to manage shocks.

### **Investing in drought management: a political choice**

Climate change is likely to increase the frequency and intensity of drought and floods in many arid and semi-arid environments. Pastoralists, in common with other affected groups, will need access to resources that help warn them of impending calamities, protect their livelihood assets, and increase their resilience. The level and nature of their exposure to hazard differs from fellow members of their national communities. Access to resources and opportunities is determined by social factors, including economic and political processes.<sup>18</sup> The lacklustre performance to date of governments and development agencies in supporting livelihoods and reducing poverty in arid and semi-arid environments, particularly in Africa, points to a very real concern that the ability of pastoral groups to both cope with and adapt to climate change will continue to be compromised.

Where pastoral groups are stronger, and where governments invest more in drought preparedness, drought can be much more effectively managed. While Africa is not the most drought-exposed continent, it suffers most in terms of human and economic

---

<sup>13</sup> Davies/Hatfield 2006.

<sup>14</sup> Stone et al 2001.

<sup>15</sup> Swift 1996.

<sup>16</sup> Huq et al 2006.

<sup>17</sup> UN/ISDR 2003.

<sup>18</sup> Wisner/Blaikie 2004.

losses.<sup>19</sup> Of course, as countries develop economically, the impacts of hydrological drought are mediated by the relatively small size of the agricultural sector compared with other productive sectors. However, even among relatively poor countries, there is a wide discrepancy in the degree to which governments have invested in developing and protecting livelihoods in drought-prone areas, or have rather relied on food aid as a safety net and social insurance mechanism. Failure to invest constitutes a political choice. It leads to a chronic weakening of pastoralists' resource base, which in turn threatens health and well-being and undermines pastoralists' capacity to pursue alternative futures, whether through education or through livelihood diversification. Investing in an effective drought management system, and in opportunities for income generation that are complementary to pastoral production and that promote alternative livelihoods, is more dependent on political will than on size of GDP. The governance dimensions of famine and drought have been central to a vital current within drought thinking since Sen's work on famines and democracies, and they need to be invoked in thinking about the future of dryland communities.<sup>20</sup>

### **Pastoralists: passive victims of crisis or active agents of change?**

Since the 1990s, economic studies of pastoral production have shown it to be highly adaptable within time and space, and between two and ten times more productive than commercial ranching under the same conditions.<sup>21</sup> With secure rights to their lands, access to markets, and the space to make their own decisions, communities can make a successful living from semi-arid lands, as studies in Kenya, Niger, Nigeria, and Senegal have shown (see Box 2). This is likely to be a far more cost-effective policy choice than constant emergency response.<sup>22</sup>

Research shows that pastoral livelihoods are far from static. The experience of indigenous Arctic peoples maps out how pastoral production may change over time, as economic and social factors are affected by a mixture of endogenous and exogenous influences. These include an outward migration of skilled individuals, and deeper integration into national economies, particularly fishing and mineral economies. At the same time, traditional livelihoods such as hunting and fishing continue to be practised

#### **Box 2:**

##### **The Machakos hypothesis.**

The 'Machakos hypothesis' refers to the proposition that 'under the right conditions there may be positive linkages between population growth, agricultural intensification and the improvement of livelihoods' (Mortimore/Tiffen 2004). It emerged from a study of long-term change (60 years) in the semi-arid district of Machakos, Kenya, and its validity was subsequently endorsed by further long-term studies in Niger, Nigeria, Senegal, and Makueni district, Kenya. Far from being necessarily constrained by the limitations of poor soil and unreliable rainfall, dryland farmers demonstrated significant capacity to adapt to change and respond to new opportunities when the overall policy environment enabled them to do so (such as improved access to markets and the right incentives to invest). The Machakos hypothesis challenges dominant neo-Malthusian paradigms concerning the link between population growth and environmental degradation.

[Drawn from Mortimore 1998 and Mortimore/Tiffen 2004]

<sup>19</sup> [www.droughtnet.org](http://www.droughtnet.org)

<sup>20</sup> See, for example, Oxfam Briefing Paper No. 88, 'Delivering the Agenda: Addressing Chronic Under-Development in Kenya's Arid Lands'; Oxfam Briefing Paper No. 89, 'Making the Case: A National Drought Contingency Fund for Kenya'; Batterbury/Warren 2001.

<sup>21</sup> Scoones 1995.

<sup>22</sup> The cost of the 1999-2000 drought in Kenya was estimated at \$2.5bn. See UN/ISDR 2005.

but with modern technologies and a mixture of traditional and modern regulatory systems.<sup>23</sup> These traditional practices still remain the basis of sustainable land-use systems that balance human and ecological needs.

Importantly, a human-rights based approach to climate change is more advanced within Arctic societies than within African. In 2005, Inuit campaigners petitioned for a hearing on Arctic climate change within the Inter-American Commission on Human Rights, a body of the Organisation of American States. The group will submit findings from studies including the 2004 Arctic Climate Impact Assessment, which concluded that the Arctic is extremely vulnerable to global warming and is now experiencing some of the most rapid changes on earth. The group argues that the deterioration in hunting conditions constitutes a violation of their right to practise a hunting-based lifestyle.

In contrast, African pastoral societies have largely been portrayed as victims of global climate change. The peak of the 2005-06 drought which affected most pastoral areas in the Horn of Africa prompted one international NGO to conclude that Kenya's pastoralists would be the sentinel population for global climate change – 'climate canaries'.<sup>24</sup> This focus on the purported impacts of climate change on marginalised groups arguably lacks political sophistication. Pastoralists in the Horn and East Africa are generally poorly represented in their governments and lack genuine, organised civil society representation.<sup>25</sup> Equally, pastoral groups often do not have the means by which to communicate the message that in many places adaptability has enabled pastoral production to respond to climate variability on both an inter-annual and inter-decadal scale. Nevertheless, in other places the options for pastoralists are being progressively closed down, as the following examples from Kenya and Sudan illustrate.

#### **Wajir District: the consequences of constraining mobility<sup>26</sup>**

Wajir covers nearly 60,000km<sup>2</sup> of Kenya's arid North Eastern Province. Its population is predominantly Somali, and primarily engaged in nomadic pastoralism, herding combinations of cows, camels, and shoats. Rainfall variability is high, and droughts are frequent.<sup>27</sup> The process of limiting mobility and flexibility began in the colonial era, when ethnic groups were allocated fixed grazing areas. These prevented pastoralists from exploiting variable natural resources, and created a firmer association between clan and territory which was contrary to the more fluid social ties of the pre-colonial era.

Both the colonial and the post-colonial governments pursued a highly technical ranching model in Wajir. This was driven in part by fear: fear of over-grazing and degradation, and fear of livestock disease infiltrating white-owned ranches further south. New boreholes were drilled to service the grazing blocks, and these in turn led

---

<sup>23</sup> Arctic Human Development Report 2004.

<sup>24</sup> Christian Aid 2006.

<sup>25</sup> A notable exception to this, the Kenya Pastoral Forum, gave rise to the Kenya Pastoral Parliamentary Group which 'sent shockwaves through the political establishment' and showed, perhaps, the potential of organised pastoralist representatives. Goldsmith, *Perceptions of Pastoralism in Kenya*, unpublished report.

<sup>26</sup> This section is based on Walker and Omar, 2004.

<sup>27</sup> Some of the most serious droughts since independence in 1963 have been in 1970, 1984, 1991, 2000, and 2004.

to the emergence of new settlements (Box 3). More water points and settlements have a detrimental impact on pastoralists' ability to manage the natural resource base effectively, and therefore on their capacity to withstand drought.

Traditionally, areas of dry season and wet season grazing in Wajir were distinct. During the dry season livestock were grazed close to permanent water points. When the rains came, they moved to fresh grazing in wet season areas, where natural pans had by now filled, leaving dry season pastures to recover. Areas of reserve grazing were also important fall-back resources. But since the 1970s this pattern has broken down. With more water points, most areas of the district can now be accessed all year round. The areas grazed only in the wet season have reduced, leading to fewer areas of fresh pasture following the rains, while the areas grazed in the dry season get no chance to recover; drought reserve areas have all but disappeared. As a result, pastoralists report an increase in stocking density, a reduction in palatable grass and browse, and a decline in milk production for all species. The consequence is that their ability to manage an uncertain environment, and therefore their resilience to drought, has decreased.

**Box 3:**  
**Settlements and major dry season water points in Wajir**

	Settlements	Water points
1940	4	4
1996	45	24
2002	71	40

However, the process of sedentarisation in Wajir is not linked solely to inappropriate development models; it also has political roots. With the advent of multi-partyism in 1992, the positions of chief and sub-chief became a means of political reward; the loyal post-holders would in turn promise to deliver a block vote from their sub-clan. This led to a growing sub-division of the district administration. A sub-chief would settle in his new sub-location, invite members of his sub-clan to join them, and then pressure would increase for all the trappings that a settlement requires (borehole, school, clinic). A second political factor has been the new poverty-reduction funds channelled since 2003 not through line ministries but through constituencies and locations. These have created an incentive for people to settle closer to the centre of political power in their area in order to access these resources. But many of these new settlements have no permanent source of water, and are thus reliant on water tankering in the dry season. The government's own technical officers – ironically now displaying more understanding of disequilibrium environments – have been unable to hold these trends in check. In the words of one government officer, 'water tankering has become a response to a self-inflicted disaster'.

Similar trends can be seen in Red Sea State (Box 4)<sup>28</sup> and in the Sahel, where the 'irreversible cycle of impoverishment' of some pastoral communities is explained by a policy bias towards agriculture, decreasing security of tenure, and the impact of modern infrastructure (such as boreholes and cemented wells) which have weakened traditional systems of negotiation over access to key resources such as water points. 'These institutional and political pressures have sapped the capacity of pastoralists to adopt flexible coping strategies in the face of climatic fluctuations and other natural pressures but have won increasing official sanction.'<sup>29</sup> Scoones notes that in Southern Africa, contemporary droughts seem to have a much bigger impact than those of ten

<sup>28</sup> Based on Pantuliano 2002.

<sup>29</sup> Thébaud 1998.

or twenty years ago, even though the degree of climatic disruption that triggers a food crisis is far smaller. His conclusion is that the long-term resilience of people's

**Box 4:**

**Growing vulnerability to drought in Halaib, Red Sea State, Sudan**

*'Increased vulnerability to drought and other external shocks is what characterises the evolution of the Beja livelihood system throughout the second half of the twentieth century.'*

Halaib is the most northern of the four provinces that make up Red Sea State in north eastern Sudan. The Beja pastoralists that inhabit the area used to have multiple strategies to cope with the variability of their ecosystem, but the resilience of these has declined over the past century as a result of several factors.

First, the Turko-Egyptian administration introduced commercial agricultural schemes on grazing land. These were expanded by the British, who allowed strategic drought reserve areas in the Gash Delta to be used for the production of cotton and other crops. Second, the imposition of a hierarchical administrative system was at odds with the flexibility of traditional leadership; it also created an artificial ruling elite that was ill-equipped to defend the interests of the Beja. Third, the government's bias towards settled agriculture led to a focus on 'modern' systems of livestock husbandry, such as livestock development centres and dairy farms, rather than investment in mobile pastoralism. Fourth, the 'pull' factor of paid work in Port Sudan reduced the availability of male labour within pastoral households. And finally, relief programmes concentrated aid in settlements and diverted labour into food for work schemes - most of which were focused on fixed structures or agriculture, and therefore of less relevance to pastoralists.

livelihoods has been undermined.<sup>30</sup>

The Beja of Halaib Province, the Somali of Wajir District, and the shepherds of the Sahel have always lived with uncertainty, but the strategies they once used to manage this have been progressively undermined. In part this has been because external actors (governments, aid agencies, private investors) have failed to understand the complex relationship between pastoral systems and dryland environments. The systematic marginalisation of pastoral areas in Sudan, north and south, is acknowledged as one of the key drivers of the conflict in the south and the latent conflict in the east of the country.<sup>31</sup> In places such as these, pastoralists have already been pushed to the limit. 'Business as usual' strategies of allowing food aid to fill the gaps of under-investment are not viable options, either for pastoralists or for their governments. However, national political factors and dynamics have also played their part; in some cases pastoral elites have deliberately chosen an alternative and highly unsustainable development path, for which the political system has rewarded them.

---

<sup>30</sup> Scoones 2007.

<sup>31</sup> Flint/de Waal 2005.



### 3. Conclusions

So what are the policy options for addressing climate change within the arid and semi-arid environments of the world? On the basis of the above, strategies would logically be underpinned by a commitment to strengthen pastoralists' existing adaptive capacities, and to put in place the kind of enabling environment within which they can exercise them. Policy-makers need to avoid reifying pastoralism and therefore stifling its ability to innovate and change. A commitment to enhance pastoralists' mobility is critical – for example by protecting migration routes and facilitating cross-border migration.<sup>32</sup> Diversification into other rural livelihoods is also important and must be underpinned by investments in enabling infrastructures – roads, rail links, and livestock marketing routes. Climate change and the global carbon market offer potential opportunities for pastoral groups. In Shinyanga region of Tanzania, agropastoralists have reforested 250,000 hectares of degraded land.<sup>33</sup> Capping slaughter houses and other facilities can reduce methane emissions and provide valuable certified reductions in greenhouse gas emissions. More broadly, changes in conservation and wildlife policies are needed to enable pastoralists to benefit more from the minimal impacts their lifestyle has on biodiversity and wildlife that has a global environmental intrinsic and commercial value.<sup>34</sup>

In essence, climate change need not entirely be a narrative of loss. Pastoralists should be well placed to exploit increasingly erratic rainfall – it is what they have been doing for years. They might even expand their migration range: as mentioned at the beginning of this paper, one scenario for the Sahel in the short- to medium-term is an increase in rainfall and a greening of presently arid areas. Provided we can get the global architecture right, payment for environmental services such as the protection of biodiversity and carbon sequestration become lucrative supplements to pastoral production. But all of this, of course, depends on pastoralists' leaders, representatives, and governments being able to exploit the opportunities that are offered. Pastoralists are not yet part of the debate on adaptation to climate change, in the same way that they are not part of other policy processes. Too often adaptation is assumed. Adaptation flows risk favouring those already better equipped to take advantage of them, such as sedentarised and politically influential groups. The result would be to maintain or even exacerbate existing social and economic inequalities.

Whatever the predictions of global climate change may be, the one certainty is that the future will be less predictable. Pastoralism is a system that by its nature can adapt to unpredictability, but only if pastoralists have the physical and political space within which to do so.

---

<sup>32</sup> Davies/Hatfield 2006.

<sup>33</sup> Barrow/Mlengi 2003.

<sup>34</sup> See DFID's Wildlife and Poverty Study, December 2002. Elliot, J., Grahn, R., Sriskanthan, G., Arnold, C.

## References

- Arctic Human Development Report*, 2004. Akureyi: Stefansson Arctic Institute, Iceland.
- Barrow, E. and Mlengi, W., 2003. 'Trees as Key to Pastoralist Risk Management in Semi-Arid Landscapes in Shinyanga, Tanzania, and Turkana, Kenya'. International Conference on Rural Livelihoods, Forest and Biodiversity, CIFOR, Bonn, Germany.
- Batterbury, S. and Warren, A., 2001. 'Viewpoint: The African Sahel 25 Years After the Great Drought: Assessing Progress and Moving Towards New Agendas and Approaches'. *Global Environmental Change*, 11, 1-8.
- Behnke, R., Scoones, I. and Kerven, C., eds., 1993. *Range Ecology and Disequilibrium: New Models of Natural Variability and Pastoral Adaptation in African Savannas*. London: ODI.
- Brahic, C., 2006. *Wet or Dry? Sahel's Uncertain Future*.  
<http://www.scidev.net/features/index.cfm?fuseaction=printarticle&itemid=528&language=1>
- Broch-Due, V. and Anderson, D., 1999. 'Poverty and the Pastoralist: Deconstructing Myths, Reconstructing Realities'. In: Anderson and Broch-Due, *The Poor Are Not Us: Poverty and Pastoralism in Eastern Africa*.
- Brooks, N., 2004. *Drought in the African Sahel: Long Term Perspectives and Future Prospects*. Tyndall Centre for Climate Change Research, Working Paper 61.
- Brooks, N., 2006. *Climate Change, Drought and Pastoralism in the Sahel*. Discussion note for the World Initiative on Sustainable Pastoralism.  
[http://www.iucn.org/wisp/documents\\_english/climate\\_changes.pdf](http://www.iucn.org/wisp/documents_english/climate_changes.pdf)
- Christian Aid, 2006. *Life on the Edge of Climate Change: The Plight of Pastoralists in Northern Kenya*. London: Christian Aid.
- Davies, J. and Hatfield, R., 2006. *Global Review of the Economics of Pastoralism*. Prepared for the World Initiative for Sustainable Pastoralism. Nairobi: IUCN.
- Flint, J. and de Waal, A., 2005. *Darfur: A Short History of a Long War*. London: Zed Books.
- Galvin, K., et al, 2004. 'Climate Variability and Impacts on East African Livestock Herders: the Maasai of Ngorongoro Conservation Area, Tanzania'. *African Journal of Range and Forage Science*, 21 (3), 183-189.
- Guha-Sapir, D., Hargitt, D., and Hoyois, P., 2004. *Thirty Years of Natural Disasters: The Numbers*. Centre for Research on the Epidemiology of Disasters/Presses Universitaires de Louvain.
- Hadley Centre, 2006. *Effects of Climate Change in Developing Countries*. Hadley Centre for Climate Change, UK Met Office.
- Huq, S., et al, 2006. *Climate Change and Development Links*. IIED Gatekeeper Series 123.
- Lorimer, J., n.d. *Background Research Paper on the Predicted Climate Change Impacts of Greatest Relevance to Oxfam*. Oxford University Centre for the Environment. Unpublished.

- McPeak, J., 2005. 'Individual and Collective Rationality in Pastoral Production: Evidence from Northern Kenya'. *Human Ecology*, 33 (3), 171-197.
- Mortimore, M., 1998. *Roots in the African Dust: Sustaining the Sub-Saharan Drylands*. Cambridge: Cambridge University Press.
- Mortimore, M., 2003. 'Is There a New Paradigm of Dryland Development?' *Annals of Arid Zone*, 42 (3&4), 459-481.
- Mortimore, M. and Tiffen, M., 2004. 'Introducing Research into Policy: Lessons from District Studies of Dryland Development in Sub-Saharan Africa'. *Development Policy Review*, 22 (3), 259-285.
- Niamir-Fuller, M., 1999. 'A Review of Recent Literature on Pastoralism and Transhumance in Africa'. In: M. Niamir-Fuller, ed., *Managing Mobility in African Rangelands: The Legitimization of Transhumance*. London: IT Publications.
- Pantuliano, S., 2002. *Sustaining Livelihoods Across the Rural-Urban Divide: Changes and Challenges Facing the Beja Pastoralists of North Eastern Sudan*. London: IIED.
- Scoones, I., 1995. *Living with Uncertainty: New Directions in Pastoral Development in Africa*. London: ITDG.
- Scoones, I., 2007. *Climate Change and the Challenge of Non-Equilibrium Thinking*. Contribution to WISP e-conference, February 2007.
- Scott, J., 1998. *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*. New Haven/London: Yale University Press.
- Spear, T. and Waller, R., 1993. *Being Maasai: Ethnicity and Identity in East Africa*.
- Stone, D., Maxwell, S. and Keating, M., 2001. 'Bridging Research and Policy'. Paper presented at an international workshop funded by the UK DFID, Warwick University, 16-17 July 2001.
- Swift, J., 1996. 'Desertification Narratives, Winners and Losers'. In: M. Leach and R. Mearns, *The Lie of the Land: Challenging Received Wisdom on the African Environment*. Oxford: James Currey.
- Thébaud, B., 1998. *Sahelian Shepherds Still Struggling 25 Years After the Big Drought*. ID21 Research Highlight. <http://www.id21.org/id21ext/10aas.html>
- UN/ISDR, 2003. *Early Warning as a Matter of Policy*. The Conclusions of the Second International Conference on Early Warning, 16-18 October 2003, Bonn, Germany.
- UN/ISDR, 2005. Discussion paper for the UNDP-DDC/BCPR and UN-ISDR expert workshop 'Drought Risk and Development Policy', January 31 – February 2, 2005, Nairobi.
- Walker, R. and Omar, H., 2002. *Pastoralists Under Pressure: The Politics of Sedentarisation and Marginalisation in Northeast Kenya*. Nairobi: Oxfam GB.
- Waller, R. and Sobania, N., 1994. 'Pastoralism in Historical Perspective'. In: E. Fratkin et al, eds., *African Pastoralist Systems: An Integrated Approach*. Boulder, Co: Lynne Rienner.

Wisner, B. and Blaikie, P., 2004. *At Risk: Natural Hazards, People's Vulnerability, and Disasters*. Routledge, UK.

Keywords: human development; climate change (search for similar items in EconPapers) JEL-codes: Y8 Z00 (search for similar items in EconPapers) Pages: 12 pages Date: 2007-11 References: View references in EconPapers View complete reference list from CitEc Citations: View citations in EconPapers (1) Track citations by RSS feed. Published as background research for the 2007/2008 Human Development Report. Downloads: (external link) [http://hdr.undp.org/en/reports/global/hdr2007-2008 % 20Grahnrichard.pdf](http://hdr.undp.org/en/reports/global/hdr2007-2008%20Grahnrichard.pdf) (application/pdf). Related works: This item may be available elsewhere in EconPapers: Search for items with the same title. Export reference: BibTeX RIS (EndNote, ProCite, RefMan) HTML/Text. 6. Birch I, Grahnr, R. Pastoralism: managing multiple stressors and the threat of climate variability and change. New York (NY): UNDP Human Development Report Office Occasional Paper, UNDP; 2007 May. 12 p. Report No. 45. 17. Pekkarinen A. Changes in reindeer herding work and their effect on occupational accidents. *Int J Circumpolar Health*. 2006;65(4):357-64. Climate Change and Variability. Climate conditions in the Sudano-Sahel are harsh and unpredictable. The region often has recurrent cycles of low rainfall as well as periods of high rainfall characterized by heavy precipitation events. It is because of this climate variability that livestock herding is a highly effective method of food production in the Sudano-Sahel: mobile pastoralism, due to its flexibility, generally manages climate variability better than sedentary crop and livestock farming. However, a series of particularly severe droughts in the 1970s and 1980s devastated the region and dramatically altered the agricultural landscape. Food production fell far below population needs, and hundreds of thousands of people and millions of animals died.