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FIFTY YEARS OF RESEARCH ON PASTORALISM AND DEVELOPMENT

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Climate Change and the Challenge of Non-equilibrium Thinking

Ian Scoones

1 Introduction

Climate change is happening, that much is certain. But in what way? How much? And with what impacts? Complex, non-linear models try to predict trends and patterns, but, inevitably, each model is different, parameters are difficult to estimate and the precise impacts remain uncertain. We live in an uncertain world, one where the knowledge about both likelihoods and outcomes remains uncertain (Stirling 1999). The striving for increased predictive power over the consequences of climate change has yielded results in the past few decades. We clearly know a lot more than we did. But this is not enough to allow climate science to inform people to direct the future. While global circulation models and forecasting approaches will improve with better technology, more empirical data and faster number-crunching capacities, the nature of climate–ecosystem interactions is such that non-linearity and the complexity of dynamic interactions means that uncertainty will always be present. This article explores the implications of this, drawing lessons from the drylands of Africa, where non-equilibrium thinking has challenged conventional approaches to pastoral development.

2 Living with uncertainty: lessons from the drylands

Highlighting complexity, non-linearity and non-equilibrium dynamics has major consequences for thinking about responses to climate change. We can learn a lot from settings where uncertainty has always been part of day-to-day life and survival: where systems are not at equilibrium, where sometimes chaotic, often stochastic, dynamics prevail and where predictability and control are false hopes. The pastoral rangelands of the world are such places. Here, there is a temporal variation of rainfall and so forage production is high and the spatial patterning of available fodder resources is enormous. Pastoralists and their herds and flocks have responded to this and over the ages, have developed an array of strategies that allow them to live with this uncertainty.

In the early to mid-1990s, a group of range ecologists, livestock specialists and social scientists gathered together to examine the reasons for the failure of pastoral development in Africa.[1] Again and again, development initiatives in the dryland pastoral areas tried to replicate solutions more suited to wetter, more predictable climes. Fences were erected to control grazing movement, stocking rates were controlled, bush was cleared, water points were drilled and supplementary feeding pens were established. This was supposed to bring a more ordered, predictable form of livestock production amenable to the market and to external management. Yet repeatedly, over many decades, such projects and programmes failed. Why was this?

The applied science and practice of rangeland management underlay these initiatives. This was developed in the temperate grasslands of North America in the early part of the last century, as a way of boosting the cattle economy. It assumed that predictable rainfall patterns would result in predictable grassland production and this in turn could be managed according to the theories of vegetation succession, propounded by Frederick Clements, to result in predictable meat and milk production. In this original context it worked well. Only later did it become the standard formula for range management the world over. Pastoralists were not the beef ranchers of the Midwest, and the drylands of Turkana, Karamoja, Borana and the Sahel were not the same. As the authors in the volume *Rangelands at Disequilibrium* (Behnke *et al.*

Table 1: Emerging perspectives: implications for development thinking

Theme	Conventional views	Emerging views
Livelihoods and resource management	Single use, sectoral view of resources; resources as commodities; production focus	Multiple users, complex and diverse livelihoods
Institutions	Static, rule-based, formal, clear boundaries, fixed, exclusivity	Dynamic, overlapping, heterogeneous, socially defined, emergent from adaptive practice, flexible
Legal frameworks	Formal legislation: fixed rules and procedures	Evolving law in practice, multiple systems, legal pluralism
Development planning and policy	Blueprint approach; linear policy model	Adaptive planning, flexible, responsive, learning; non-linear policy: negotiation, adaptation, discretion key
Knowledge/power	Science as arbiter, single source of authoritative knowledge; conflict, dissent and debate underplayed	Multiple sources; plural and partial perspectives; conflict, dispute and dissent inevitable; negotiated understandings
Risk and uncertainty	Measurable risks and predictable outcomes; assumptions of "normal", "standard" patterns	Uncertainty and ignorance; temporal variability and spatial diversity
Governance	Separation of levels: local vs global; rules and formal institutions of governance	Integration of levels: multi-level governance, messy interactions, negotiation of outcomes

Source: Mehta (1999) and Scoones (1995)

1993) showed, the underlying assumptions of equilibrium range ecology were fundamentally flawed in many parts of Africa and over most time periods. The resulting solutions – whether in terms of range management, animal husbandry, marketing strategy, resource tenure or pastoral administration – were often wildly inappropriate. Such management, institutional and policy solutions were more suited to equilibrium conditions, not to the conditions of uncertainty found most often in the rangelands.

In the subsequent book *Living with Uncertainty* (Scoones 1995), a series of authors explored the implications of taking a non-equilibrium view for a range of themes. The results were startling. The standard way of thinking about a whole host of issues – from tenure to marketing, from fencing to veterinary care, from service provision to fodder management – had to be radically rethought (see Table 1). With a non-equilibrium perspective, things looked very different. And, according to Jim Ellis (1998), systems where equilibrium conditions do not apply, exist in very large swathes of Africa where the coefficient variation of rainfall amount has historically been at or over 30 per cent.

Of course such perspectives were nothing new to pastoralists (or indeed dryland farmers and agropastoralists carving out a livelihood in similar settings). They could have told the planners and policy makers working earnestly on pastoral development initiatives in the dry rangelands that their grand designs would not work. But their understandings of their own setting and the ecological and social dynamics that govern it were

dismissed. Pastoralists were backward, ignorant and in need of development. And for many planners, development meant managed, controlled, predictable, stable, single function systems. The straight fence lines, the rotational grazing, the settled homesteads and the meat market orientation was what development was about. Modernity was an equilibrium notion for both colonial and post-colonial planners.

3 From equilibrium to non-equilibrium thinking: challenges for management, planning and policy

So what did the "new" thinking in range ecology suggest for management, planning and policy? Table 1 highlights some of the implications, contrasting with the equilibrium perspective. Of course such dualistic contrasts hide the shades of grey that inevitably exist, but the bottom line message is that, if you take non-equilibrium thinking seriously, which you must where conditions of climatic uncertainty prevail, then a different approach to development intervention must be constructed, with fundamental shifts in our understanding of institutions, governance and policy as a result (Mehta 1999; Mehta *et al.* 2001)

4 Implications for climate change responses

If climatic uncertainty and variability are on the increase – more droughts, more floods, more storms, more dramatic snow falls, more heatwaves – as all models seem to suggest, then non-equilibrium conditions are on the increase and, like the pastoral development specialists of the African drylands, we must shed our blinkered equilibrium views and solutions and search for alternatives that allow for "living with uncertainty". While recognising that climate uncertainty and variability is here to stay, almost no matter how effective mitigation measures might be, the now familiar "adaptation" argument often does not go beyond providing mechanisms for early warning and so rapid response and relief when disaster strikes (although see Adger *et al.* 2001 for a more nuanced discussion).

Popular and often policy images of climate change though tend to grab the headlines with a drama and this can guide intervention responses, sometimes in a misleading or inappropriate way. The media profile of climate change has grown with public awareness of the issue, but tends to reinforce a view of climate change being associated with an event, a disaster, or a drama (e.g. a devastating flood: people up trees and in boats; helicopters rushing to help out victims, etc.). The disaster narrative is continued in the assessment of impacts: "x" per cent increases in global temperatures will result in the loss of "y" thousands (or millions) of species with dramatic effects on the ecosystem, biodiversity and human survival in the long term. While droughts, floods and dramatic biodiversity loss are all causes for concern and legitimate foci of response, there is a less dramatic storyline that needs to be better understood.

As discussed by Devereux and Edwards in this *Bulletin*, it is the across-year and within-season variability in rainfall patterns that are set to increase. This may not result in dramatic events every year (although these may occur with increasing frequency), but perhaps more significantly for overall impact, such shifts in patterns of variability will mean a shift to a more non-equilibrium dynamic over ever larger areas. This will result in less predictability for farming and livestock keeping and the need to change coping strategies for all those dependent on rainfall and the land for their livelihoods. Even in dryland areas where such unpredictability has been the norm (Hulme 1996), this will have major implications for livelihood sustainability.

Opportunistic approaches to livestock management or dryland farming have worked well in the past. A seasonal downturn in rainfall or a mid-season drought could be compensated for by ingenious, but well-tried responses – moving livestock, cutting browse, harvesting water, shifting crop mixes and much more (Davies 1996; Scoones *et al.* 1996; Mortimore 1989). Cyclical patterns of rainfall availability allowed periods of drought to be offset by periods of plenty, when herds and flocks grew again and stores of grain were established. But, if climate change predictions are correct, without the respite of good years among bad, high rainfall periods among low, the longer term dynamics of livelihood sustainability becomes severely compromised.

This is particularly so when combined with other factors. A major drought today appears to have a much larger impact than it did even in the 1990s and certainly the 1980s. Take southern Africa over the past few years; while the dire predictions of the

aid agencies thankfully proved to be exaggerated, the food crisis that struck the region in 2002–03 was by any standards severe. Yet the climatic trigger for crop failure and livestock death was far smaller than the droughts of 1991–92 and certainly 1982–84. The resilience of the livelihood system had been lost. The contrasting explanations for this cannot be detailed here – climate impacts interacted with health conditions (especially HIV/AIDS impacts), asset levels (availability of land, livestock and fit, health labour to cope), economic factors (notably the consequences of structural adjustment on the wider macroeconomy) and governance questions (see, e.g. Wolmer and Scoones 2003). But what is clear, is that the sustainability – or resilience – of livelihoods had been undermined.

5 Sustaining livelihoods in the face of climate change

Today in many parts of the world, climate change, exacerbated by other factors, is undermining the capacity of people – and particularly poor people living in marginal areas – to cope with change and sustain livelihoods over the long term. What have been the responses to this unfolding situation? At the local level, many responses have been observed, as people rethink livelihood strategies reducing dependence on risky agriculture or livestock production. Changes in livestock species mix (from cattle to goats), crop choice (from maize to sorghum) and overall livelihood strategy (from agriculture to migration or off-farm income diversification) have been observed in many settings in Africa and elsewhere (Ellis 1998; Scoones 1998; Reardon 1997; Bryceson *et al.* 2000).

But often, development responses from external agencies – whether governments, donors, or non-governmental organisations (NGOs) – have not caught up with this dynamic. They remain stuck in a static and stable vision of a full-time farmer or livestock keeper, rather than seeing the more dynamic, diversified livelihoods necessarily emerging. Again the equilibrium thinking of control, predictability and managerialism prevails. Rather than thinking in more holistic livelihood terms (in parallel to the changing tactics and strategies of rural people themselves), development thinking often remains in an old-style sectoral mode, where the baggage of equilibrium thinking holds sway.

And intriguingly, this even occurs with interventions designed to respond to climate change specifically. While not originally seen as a direct response to global climate changes, but now firmly part of the adaptation/response menu, the plethora of early warning systems that have been set up across Africa in particular often fall into the same trap. Using the most sophisticated of satellite technology, Geographic Information Systems and predictive models, early warning systems attempt to predict droughts (or other climate events) and offset the likelihood of – or at least warn people about – imminent food crises and potential famines. Yet evaluation after evaluation shows how such technologies do not give the results hoped for. There is a "missing link" between the information provided (often increasingly accurate) and responses on the ground (Buchanan-Smith and Davies 1995). Farmers or pastoralists just do not believe such results and fail to respond accordingly.

For example in the 1997–98 drought period, the result of a long predicted El Niño–Southern Oscillation (ENSO) event, in Zimbabwe, the warnings produced by the national early warning systems and promulgated by extension workers, local councillors and in the newspapers and on the radio, went unheeded. People did not sell their livestock, nor switch change their cropping choices. Farmers said they just did not trust the government and the aid agencies. They knew how to deal with drought and would do it in their own way. Yes, they had heard of this "ENSO thing", but this was 'a hot wind originating from western countries which prevents cloud formation. It is believed to be 'made by some scientists' or 'a wind originating in South Africa which is laden with disease' or 'a strange animal living in the waters ... when it comes out it causes a strong wind disturbing cloud formation and resulting in lack of rain' (Scoones *et al.* 1998: 43). These are not intended to trivialise our informants' lack of scientific understanding of the impacts of the southern oscillation. It instead highlights the importance of taking local understandings of how to respond to uncertainty seriously and link formal, external response mechanisms to that, rather than impose an externally driven, science-based culture of prediction and control. Even if the predictions are correct – and for this particular ENSO effect, they were reasonably so overall for the region, but less so at the micro-scale, the scale where livelihoods are played out – then it does not mean that people will respond in the way suggested. Rather than

struggling to achieve certainty in an uncertain world, perhaps the best response is to embrace the consequences of uncertainty and rethink responses more radically.

6 Non-equilibrium thinking: challenges for development thinking and practice

Opportunism, complexity, flexibility and dynamic adaptive responses, however, are not part of the standard development lexicon. Conventional bureaucratic responses find such concepts difficult to deal with. Weberian bureaucracies require prediction and control, where top-down direction driven by centralised expertise is the rule. The alternative centred on more local-level, integrated, participatory learning and adaptation, with responses evolved through trial-and-error and sequential adaptation is seen as messy and complex and difficult to administer (Keeley and Scoones 2003). The problem is that fuzzy logic, complexity theory, scenario/future search analysis, learning approaches and adaptive management are not part of standard civil service or development agency skill base and so do not inform the bureaucratic response. Plans and projects exist through log-frames and milestones with all the assumption of prediction and control. Uncertainty is eliminated from the frame, hidden beneath a mirage of surety and precision. It is perhaps no wonder that projects and plans fail. The lessons from the drylands discussed in this article suggest that with climate change, this problem is going to increase. Surprise will always creep up on the best-laid plans. Planners, managers and policy makers, just as dryland farmers and pastoralists in Africa, must learn to live with uncertainty.

Note

1. Two workshops were held to discuss these issues, the first dealing with ecological questions (Behnke *et al.* 1993) and the second dealing with the institutional and policy implications of non-equilibrium thinking (Scoones 1995). This followed on from much important earlier work on a similar theme (e.g. Sandford 1983).

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