


RESEARCH ARTICLE

Tangled crises in Turkana: investigating the spread of *Prosopis* in Kenya's northern drylands

Samuel F. Derbyshire¹ , Acacia Leakey^{2,3} and Lucas Lowasa³

¹Samuel F. Derbyshire, International Livestock Research Institute, Nairobi, Kenya, ²School of Geography and the Environment, University of Oxford, Oxford, UK and ³Turkana Basin Institute, Nairobi, Kenya
Corresponding author: Samuel F. Derbyshire; Email: samuelfderbyshire@gmail.com

Abstract

Following a severe drought in the late 1970s and early 1980s, the invasive shrub *Prosopis*, a kind of mesquite native to South America, was introduced by international organizations to locations across Kenya's drylands, including the Turkana region in the far north. *Prosopis*, known as *etirae* in Turkana, was envisaged as a solution to a range of problems, including deforestation, fuelwood shortages and general environmental deterioration. While exacerbated by drought, these problems were perceived to reflect a much more fundamental crisis, with prevalent views at the time envisaging pastoralism as unsustainable, destructive and in need of overhaul – a narrative dating to colonial times that has since been discredited. Since its introduction, *etirae* has spread relentlessly, invading riparian land, encroaching on cultivation plots and growing to new heights and thicknesses. Investigating its entanglements with Turkana livelihoods and economic relationships is also a process of understanding how it has braided its way through contested processes of social change, and how it has come to be intertwined with conceptions of cascading crisis quite distinct from the narratives that led to its initial introduction. Implications emerge regarding both the complicated biological residues of past development interventions and the totalizing crisis-oriented narratives that shape drylands development in the current era of climate change.

Résumé

Après une période de grave sécheresse à la fin des années 1970 et au début des années 1980, des organisations internationales ont introduit le *Prosopis*, un arbuste envahissant de type mesquite, natif d'Amérique du Sud, dans des régions arides du Kenya comme le Turkana, dans l'extrême nord du pays. Le *Prosopis*, connu sous le nom d'*etirae* au Turkana, se voulait comme une solution à de nombreux problèmes comme la déforestation, le manque de bois de feu et la dégradation générale de l'environnement. Bien qu'exacerbés par la sécheresse, ces problèmes étaient perçus comme le reflet d'une crise bien plus fondamentale, les opinions répandues à l'époque jugeant le pastoralisme non viable, destructeur et à réformer, un discours datant de la période coloniale et désormais discrédité. Depuis son introduction, l'*etirae* n'a cessé de se propager, envahissant les terres riveraines, empiétant sur les terrains cultivés et gagnant en hauteur et en épaisseur. L'étude de ses imbrications avec les moyens de subsistance et les

relations économiques dans le Turkana permet également de comprendre comment il s'est tressé dans des processus contestés de changement social, et comment il en est venu à s'entremêler avec des conceptions de crise en cascade nettement distinctes des discours qui ont mené à son introduction initiale. Des implications émergent concernant les résidus biologiques compliqués d'anciennes interventions de développement et les discours totalisants orientés sur la crise qui façonnent le développement des régions arides à l'ère du changement climatique.

Resumo

Após uma grave seca no final da década de 1970 e início da década de 1980, o arbusto invasor *Prosopis*, uma espécie de mesquite nativa da América do Sul, foi introduzido por organizações internacionais em locais das terras secas do Quênia, incluindo a região de Turkana, no extremo norte. A *Prosopis*, conhecida como *etirae* em Turkana, foi encarada como uma solução para uma série de problemas, incluindo a desflorestação, a escassez de lenha e a deterioração geral do ambiente. Embora exacerbados pela seca, estes problemas eram vistos como reflexo de uma crise muito mais fundamental, com as opiniões prevalecentes na altura a considerarem a pastorícia como insustentável, destrutiva e a necessitar de uma revisão – uma narrativa que remonta aos tempos coloniais e que, desde então, tem sido desacreditada. Desde a sua introdução, a *etirae* espalhou-se implacavelmente, invadindo terras ribeirinhas, invadindo parcelas de cultivo e crescendo a novas alturas e espessuras. Investigar os seus envolvimento com os meios de subsistência e as relações económicas da Turkana é também um processo de compreensão da forma como a *etirae* se entrelaçou com processos contestados de mudança social e como se entrelaçou com concepções de crise em cascata bastante distintas das narrativas que levaram à sua introdução inicial. Surgem implicações relativas tanto aos complicados resíduos biológicos de intervenções de desenvolvimento passadas como às narrativas totalizantes orientadas para a crise que moldam o desenvolvimento das terras secas na atual era das alterações climáticas.

Introduction: tangled crises

In the late 1970s and early 1980s, drylands across Africa, from the Sahel to the Horn, experienced an acute environmental crisis. Severe and protracted drought provoked large-scale emergency responses from international development organizations; these were initially oriented around the provision of relief food but came, in many contexts, to encompass more expansive and longer-term programmes seeking to engender radical reconfigurations in drylands livelihood and land use practices. It was in this context of urgent intervention that the invasive species *Prosopis juliflora* was first introduced to Kenya's drylands, including to the Turkana region in Kenya's far north-west.

This shrub, commonly called mesquite and known in Turkana as *etirae*, is a genus of plant native to South America and the Caribbean and widespread throughout the tropics (Alvares *et al.* 2017; Catalano *et al.* 2008). Its introduction via a 'wave of projects' to northern parts of Kenya in the 1980s was driven by rising concerns about resource scarcity (Mwangi and Swallow 2005: 130), the shrub itself being envisaged as a solution to a range of problems afflicting arid and semi-arid areas, including deforestation, fuelwood shortages and general environmental deterioration, all of which were perceived to indicate a crisis much broader than the acute drought that

was galvanizing international action. In other words, the drought itself, like a contemporaneous drought in the Sahel (which began in the early 1970s), was seen as ‘a catalyst which exposed the deleterious effects of long-term degradation by people’ (Thomas and Middleton 1994: 27). Thus, while *etirae*’s introduction was stimulated and indeed facilitated by funds raised in response to serious drought, it was also spurred on by a much longer-standing narrative of widespread degenerative crisis in Africa’s drylands. One of the most central concepts within this narrative was ‘desertification’, a broadly construed term that (at the time) envisaged a linear process of human-induced progressive land degradation.¹ In 1977, as part of its response to severe drought in the Sahel, the United Nations convened a conference on desertification in Nairobi (UNCOD). Kenya’s country position paper at this conference made it clear that the principal causes of desertification in Kenya were envisaged to be ‘improper livestock and range management’ (Republic of Kenya 1984: 5).²

While it was known in 1977 that Turkana, like other African dryland areas, was prone to unpredictable rainfall and recurrent drought, the question of how pastoral livelihoods and economies operated within these contexts of volatility remained unclear. It was only during the 1980s and 1990s that answers to this question began to solidify, with pioneering research leading to Turkana’s characterization as a ‘disequibrial’ ecosystem, within which pastoralism operates as a fundamentally fluid subsistence procurement strategy whose dynamics fluctuate in line with the unpredictability of the broader environment (Ellis and Swift 1988). This was part of a much wider shift in thinking in relation to African drylands and pastoralist livelihood systems, one that led to a radical reassessment of previous models and assumptions, including the longstanding preoccupations with carrying capacities, overgrazing and desertification that had contextualized responses to drought (and the introduction of *etirae*) in the late 1970s and early 1980s. All of these past models and assumptions had been based on the view that pastoral ecosystems were, by their nature, essentially stable, and in need of being re-stabilized. More recently, studies of drylands pastoralism have gone even further to emphasize its unique capacity for being productive by means of uncertainty (not despite it) and the corollary need for development interventions and programmes to support this capacity (i.e. Scoones 2019; 2021).

Etirae, which has spread rapidly in Turkana since its introduction roughly forty years ago, is in this sense a physical remnant of an era of development intervention now superseded by new ways of thinking – although, as we explain later, not completely superseded. It endures like the abandoned and derelict factories, agricultural schemes and other architectures and infrastructures built during the era of high-modernist, technocratic development that swept across Africa after colonialism (i.e. that critiqued by Ferguson 1990). Such remnants, though, are never

¹ It was in association with the Sahel drought of the mid-1970s that desertification first ascended to its prominent position as an overarching frame of analysis and intervention in drylands development. UNCOD in 1977 gave rise to the Plan of Action to Combat Desertification (PACD), which was later supplanted by the UN Convention to Combat Desertification (UNCCD), which came into force in 1994. Since 1977, the UN’s version of desertification has been a target of sustained scientific criticism (Behnke and Mortimore 2016).

² Similar diagnoses had been proffered in relation to the Sahel drought (see, for example, Le Houérou 1977).

closed off, even when the ideas and rationalities they once encapsulated disappear. Instead, they come to participate in new physical and social relations and ultimately to play significant roles shaping futures in which they were never envisaged to become implicated. This is one of the themes explored in Geissler *et al.*'s (2022) volume on the afterlives of African modernism, Derbyshire and Lowasa's (2022) contribution to which examines how architectures left over from a large-scale intervention into Lake Turkana's fisheries in the early 1980s have been repurposed in multiple ways by local fishing populations to shape a new industry.³ Unlike such remnants, though, *etirae* cannot be said to have ever become ruined or derelict; instead, it has relentlessly invaded riparian land, encroached on cultivation plots and grown to new heights and thicknesses. Its impact on practices and social relations has been a constantly evolving one.

To fully account for this impact, it is necessary to situate *etirae*'s introduction and growth within a much longer-term and more detailed understanding of regional livelihoods than that which characterized perspectives in the early 1980s. In attempting to do so in this article, we draw on roughly eight years of fieldwork, which itself has transformed in scope as *etirae* has expanded and thickened around our primary fieldwork site. Considering extracts from key interviews, we draw attention to some of the unintended yet lasting social and economic impacts of the crisis-oriented narratives that have shaped development planning and practice in African drylands. However, we also outline some of the ways in which *etirae*'s spread has been negotiated proactively by local communities in Turkana, as part of an ecological context which, as we noted above, has never been characterized by equilibrium and has always provoked highly dynamic strategies, institutions and practices. To many, *etirae* has become a critical resource within new livelihoods, oriented towards new commercial possibilities and connections. We outline how the emergence of these new livelihoods has taken place within a long-established context of flexibility and adaptation, and in doing so has served as a means for the reconfiguration and reassertion of more fundamental economic relationships such as that connecting mobile herders with sedentary communities previously involved in riverside cultivation.

Like those pursued by the wild mushroom pickers in Anna Tsing's *The Mushroom at the End of the World* (2015), these new livelihoods enabled by *etirae* are, in many respects, precarious, but precarity itself is no new phenomenon in Turkana, where resources have always lain under the threat of decimation and success has always emerged not from stability but from constant rethinking and movement – an ability to continually reimagine and recreate past relations and practices. Moreover, like Tsing's mushroom pickers, those who have come to grapple with *etirae* in Turkana have done so not as placid actors disengaged from past habits and experiences, but by intertwining this new shrub with their life stories and collective histories. The result is not a picture of homogeneity, but of tangled and complicated interactions, a 'multi species cloud' comparable in some ways to that described by Cecilia Lowe (2010) in West Java following the outbreak of the Orthomyxoviridae virus H5N1. As *etirae* has

³ This industry, which was established by the Norwegian Agency for Development Cooperation, was not unconnected to the drought that contextualized *etirae*'s introduction. The NORAD fishing scheme envisioned fishing to be a more sustainable alternative to pastoralism (for an overview, see Derbyshire 2019).

spread, and as it has shaped new forms of subsistence, so too has it come to be physically entangled with much broader processes of economic change, not only as a commodity (in the form of charcoal) but also, in recent years, as a building material used to construct houses and shops in settlements that increasingly encompass new ambitions and subjectivities.⁴ As a result of its physical implication with new infrastructures, buildings and geographies, *etirae* has also come to be figuratively entangled with contested conceptions of social change, interacting with a range of narratives, rumours and perspectives in complicated ways, much as the Covid-19 virus did following its emergence, albeit on a much grander scale (Kirksey 2020). In Turkana, as we discuss below, *etirae* has taken root amidst accounts of cascading moral crisis that are quite distinct from the narratives that led to its initial introduction; indeed, they reframe this introduction not as a solution to perceived social and economic problems but as a primary cause.

The contexts of invasion

For the most part, life in Turkana is oriented around a region-wide pastoral economy. While centred on livestock, this regional economy has nevertheless always comprised a range of subsidiary livelihoods, including fishing (primarily in Lake Turkana), hunting, riverside cultivation, and increasingly various forms of wage labour and business activity. The constitutions of the populations involved in these diverse livelihoods and the social and economic relationships that exist between them have always been highly changeable. They should not be construed as discrete, inflexible occupations that correlate with clear social boundaries. It has always been – and, indeed, remains – common for individuals and families to engage in a multitude of subsistence procurement strategies from season to season, depending on a variety of contextual factors.

Since beyond living memory, one of the key nexuses for seasonal livelihood interaction in southern Turkana has been the Kerio River, which is seasonal in its lower course. Along the banks of the Kerio, communities have been involved in a form of flood recession cultivation that sees quick crops of sorghum (and, more recently, other crop varieties) raised along the river's meander scars following inundations (Figure 1). Prior to the significant economic and infrastructural development that has shaped northern Kenya over the past few decades, the economic relationships forged between herders and cultivators at these riverside locations were a critical enabling feature of Turkana pastoralism's dynamic adaptability. Not only were these relationships of immense nutritional value to the population at large, allowing livestock to be distributed to families settled permanently or semi-permanently in riverside locations and sorghum to be distributed to the herding sector, but they also constituted avenues through which destitute herding families, afflicted by drought or other catastrophic episodes, could seek refuge.⁵

⁴ Elsewhere in Kenya, it has been exploited with varying degrees of success in schemes and programmes at the cutting edge of renewable energy-based development, from gasification to beekeeping (see Tabe-Ojong 2023).

⁵ The longstanding nature of sorghum cultivation in Turkana is clear from oral histories, and a prominent origin story narrates its proliferation south from secretive farms in enemy Merile (Daasanach) territory, with a clever Turkana trader using his foreskin as a pouch to convey it to Turkana's rivers. Having said this, small riverside plots are also mentioned in early colonial and

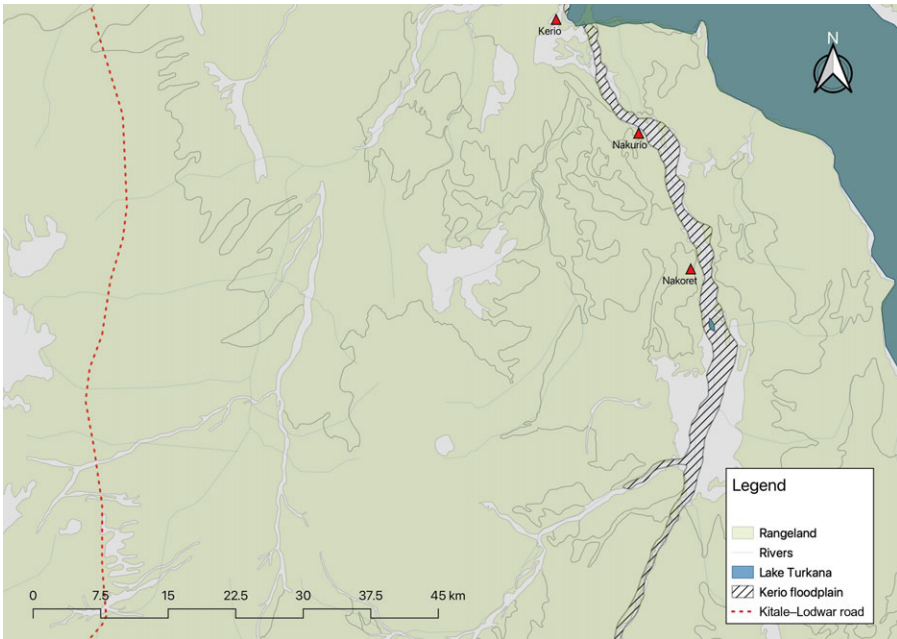


Figure 1. Map showing the Kerio's lower course, its flood plain and the location of key riverside settlements, including Nakurio.

It was not until recently that the complexity and dynamism of these economic interactions came to be fully apprehended; indeed, the sense of drought-related urgency that abounded in the late 1970s and early 1980s – the context of *etirae*'s initial introduction – stimulated responses that took a very different picture of pastoralism for granted. The level of urgency that characterized drylands development during this era was in many respects unprecedented, but the ideas about pastoralism's inherently destructive nature that lay at its heart were altogether much longer-standing (Boles *et al.* 2019; Scoones 2018). The context in which *etirae* was first introduced to northern Kenya was thus one of conflated forms and scales of crisis, some of them tangible and immediate, others much more ambiguous and longer term. The shrub was introduced amidst a series of hasty and incautious projects that, with their foothold in an immediate catastrophe, sought rapidly to deal with a suite of much broader and more complicated problems, without a detailed understanding of their socio-economic or ecological contexts. Preliminary reports of afforestation schemes that involved *etirae* planting are included in the proceedings of the Kenya National Seminar on Agroforestry (an event that took place in November 1980). They divulge a sense of

precolonial texts, including both von Höhnel's (1894: 235) account of his expedition to Lake Turkana with the infamous Count Teleki and Austin's (1903) description of later journeys. Similarly, Ernest Emley, a colonial officer stationed in Turkana in the early 1920s, mentions gardens in which 'imumwa' (*ngmumwa* – sorghum) is grown in his socio-economic overview (1927: 169).

haphazardness corroborated in informal conversations we have had with other individuals involved in planting schemes at the time:

The research approach was influenced by the general lack of experience in arid and semi-arid afforestation in Kenya, i.e. the lack of guidelines on correct species and planting methods and on sources of readily available seed. Thus, any species of potential value for which we could obtain seed (whether exotic or indigenous) was planted as and when seed became available and when staff, funding and logistics allowed. (Herlocker *et al.* 1981: 514)

Having said this, the conceptual imbrication of short-term punctuated environmental crisis with much longer-term notions of decline (and therefore of aid intervention with longer-term development programmes) was not only a result of misapprehension. Arguably more than anything else, it was part and parcel of a much broader set of ‘imaginative structurings’ that have shaped engagements with rural Africa since early colonial times and remain influential to this day (Moore 2018: 1504). Henrietta Moore recently set out how the ‘crisis of peasant agriculture, its failing productivity and its debilitated prosperity’ has remained a prominent and instrumental imaginative lens over recent history in Africa, connecting with an array of more general conceptions about developmental time, progress and modernity (*ibid.*: 1504; cf. Latour 1993). In Turkana, where region-wide drought engendered widespread hunger between 1980 and 1982, longstanding notions of overgrazing and over-accumulation were perhaps inescapably entangled with corollary conceptions, regularly reproduced in the popular press at the time (and indeed today), of the Turkana people themselves as representative of a past lifeway, unable to cope with new rates and scales of change (as critiqued by McCabe 2004). Writing about sedentarization in Ethiopia’s Somali pastoral periphery, Alene *et al.* (2021: 1159) have recently underlined the enduring power of such stereotypes in shaping the ‘sedentary metaphysics of the Ethiopian state’ – a set of presuppositions that position nomadic pastoralism as an inherent obstacle to modernity and development.

In Turkana, the intervention that was established to deal with the 1980–82 crisis was called the Turkana Rehabilitation Project (TRP). It emerged from an agreement between the government of Kenya and the European Economic Community and comprised a five-year relief programme. The scale of suffering this programme sought to address was severe. Hogg (1982: 164) notes that, at the time, ‘over 90% of cattle herds, nearly 80% of small stock flocks and 40% of camels were lost in north Turkana’. However, the TRP did not aim only to relieve immediate hunger; it also sought to implement a ‘land rehabilitation’ plan (Hogg 1982; Adams 1986). This plan entailed an array of new agricultural schemes and food-for-work programmes, which sought to encourage herders away from the pastoral sector and into other livelihoods, such as fishing and farming – forms of subsistence that were envisaged to be more sustainable. New farms and correlating water management systems and technologies were some of the largest-scale aspects of the programme.

Alongside new irrigation projects, the TRP also radically scaled up the planting of various drought-resistant species (which had begun in the years leading up to the 1980–82 famine in Lokitaung and along the lakeside). It was at this time that communities along the lower courses of both the Kerio and the Turkwel first

encountered *etirae*. Significantly, *etirae* was introduced not only to Kenya's far north at this time, but also to a range of disparate locations within short succession, including parts of Baringo and Mombasa. The dynamics of its spread across and between different regions in Kenya (let alone Eastern Africa) are thus difficult to ascertain with certainty. What is nevertheless clear is that in the decades since its introduction it has spread rapidly, impacting biodiversity and, by extension, pastoralist herd compositions and livestock health (Kyuma *et al.* 2016; Vehrs 2016; Mbaabu *et al.* 2019). Mbaabu *et al.*'s (2019; 2020) work has tracked in detail the substantial changes in land use and land cover (LULC) that have occurred in Baringo, where *etirae* has increased more than twentyfold since 1988, pointing to associated radical livelihood transformations. They explain how 'local communities have been losing land cover classes that form part of their key livelihood support system, such as grasslands and irrigated croplands, at an alarming rate' (Mbaabu *et al.* 2019: 16).

In some notable instances, these transformations have come to align with and perhaps even exemplify much broader political questions and struggles vis-à-vis representation and development intervention. For example, in 2003, representatives of the Il-Chamus community of Baringo attempted to sue the Food and Agriculture Organization (FAO) for the destruction caused by *Prosopis* following its introduction to their homeland in the 1980s. This case ultimately failed because the FAO, as a UN agency, had diplomatic immunity. The Il-Chamus then targeted their case against the government of Kenya, and after several years won a major and unexpected victory in December 2007 (see Odhiambo 2015; Little 2019).⁶ In his discussion of this case, Little (2019) pointed to the fact that its necessity is one of many other socio-political symptoms of northern Kenya's enduring alienation, a problem that is extremely longstanding.

Fieldwork

The fieldwork discussed in this article took place over the course of roughly eight years, amidst a much broader research project exploring socio-economic and political change in southern Turkana (see Derbyshire 2020; Derbyshire *et al.* 2021). As part of this project, we have investigated historical livelihood dynamics and agrarian change on a continual basis with cultivating communities in key locations along both the Kerio and the Turkwel River (although in this article we focus primarily on the settlement of Nakurio; see Figure 1). In seeking to relate our understandings of riverside cultivation to the regional pastoral economy, and to understand the shifting economic relationships that have served to entangle riverside communities with kin in the wider herding sector, we have also pursued extensive research among surrounding semi-mobile groups and family members who regularly move between riverside settlements and locations further out on the plains.

Our methodology has primarily been ethnographic in nature, comprising a mixture of interviews, focus group discussions and participant observation. It has also, at regular intervals, involved photo-elicitation activities oriented around an assemblage of historical photographs (see Derbyshire 2019). In pursuing this research

⁶ See also 'Republic of Kenya in the High Court of Kenya at Nairobi (Nairobi law courts). Petition 466 of 2006, Kenya law' at <<http://kenyalaw.org/kl/>>, accessed 27 February 2023.

for a protracted period of time, we have sought to align our interests with shifting community concerns, and to engage with themes and narratives that encompass as many locally significant issues as possible. Our work on *etirae* has thus emerged collaboratively over the years, moving further towards the centre of our overall agenda as the shrubs themselves have increased in quantity and size. Since the beginning of this research project in 2014, the impact of *etirae* on river-dwelling communities in Turkana has radically increased in severity. Many farms have been completely abandoned due to unmanageable encroachment, and more recently new ways of capitalizing on *etirae* timber have emerged. For us, coming to terms with these far-reaching impacts, and the wider socio-economic contexts in which they have occurred, has also meant exchanging a unilinear perspective for an interest in the unsettled and complicated nature of *etirae's* story, including the ways in which it serves to tangle different, often conflicting, narratives and processes together.⁷

Several hundred interviews have been collected during the course of our research in Turkana to date, and many of these have shaped the interpretations and analyses proffered in this article. Nevertheless, we focus in particular on sixty-five interviews that specifically cover shifting cultivation practices and the spread of *etirae*. Of these, thirty were undertaken between September and December 2014, fifteen were undertaken between August and September 2019, and twenty were undertaken in February 2022. Together, these interviews encompass the full temporal span of our research activities to date, referencing a variety of key events and processes that have shaped farming practices over the last decade. Alongside these interviews, our analysis of shifting dynamics in trade and exchange has also been informed by regular market inventories and household object inventories undertaken both in riverside areas and among more mobile communities further out on the plains.

Change: biological, economic and social

As we have already noted, the agricultural interventions of the TRP in the early 1980s did not in any meaningful sense comprise the advent of farming in Turkana. They did, however, represent some of the first situations in which a sole reliance on riverside farming was encouraged as an alternative to what was perceived to be a livelihood that was primarily oriented around livestock on a continual basis (and one that was catastrophically susceptible to drought). In encouraging this transition, the TRP schemes were bucking a longstanding trend of subsistence flexibility (for an overview of this, see Widgren and Sutton 2004; Davies 2015). It is therefore somewhat ironic that they were envisaged to be a pathway towards more sustainable economic activity. In reality, an overdependence on riverside farming was a dangerous narrowing of horizons. This was clear to the drought-affected herders who engaged in the food-for-work programmes, with many of them returning to the herding sector as soon as conditions improved (Broch-Due 1999).

⁷ Robbins (2001) insisted on the impossibility of definitively characterizing or categorizing the same shrub in Rajasthan, India, where conflicting accounts of environment (local and expert) reveal satellite imagery to be not an impartial tool but rather largely resultant from old debates vis-à-vis the subject of nature.



Figure 2. *Etirae* growing along the banks of the Kerio at Nakurio in 2014, surrounding native *doum* palm trees, with wood cut in preparation for charcoal burning in the foreground.

The abiding ecological legacy of these schemes – *etirae*, whose inflexible characteristics contrast to this day with the environmental variability for which Turkana is otherwise well known – has endured in the absence of the kind of economic stability and inflexibility they sought to engender. Throughout consecutive wet and dry seasons, *etirae* shrubs remain green, their extremely deep tap roots giving them a substantial competitive advantage over other native vegetation during times of little or no rain (Patnaik *et al.* 2017; see Figure 2). To those engaged in riverside cultivation, whose plots require regular clearance, this inflexibility has become a serious problem. During an interview in October 2014, Jeffrey Eyangon, a cultivator from Nakurio, explained this while describing a series of key ecological changes that had affected his livelihood:

The first change is the seasons. They do not come in a systematic way any more. They are completely unpredictable these days, so no one knows when cultivation will be. The second change is that the bush has become almost uncontrollable because of *etirae*. Before, it would rain and clearing would require little work, cultivation would be relatively easy. Now, *etirae* means that we have to constantly clear because it grows so quickly. Other species of trees are disappearing. The third change is that before cultivation time would coincide with the time we have a lot of milk, therefore we would eat our crops with milk. This has changed.⁸

⁸ Interview with Jeffrey Epiron Eyangon, Nakurio, 1 October 2014.

Two of the changes Eyangon discusses are likely to be linked. The breakdown of the Kerio's regular flood regime, certainly in Nakurio, is plausibly associated with the spread of *etirae* along its key meander scars (although it is also largely attributed to heightened irrigation activity upstream in the Kerio Valley). Le Maitre *et al.* (2015) have highlighted the significant hydrological impacts of invasive woody plants (including *etirae*) in similar riparian dryland settings, primarily in Southern Africa. Considering their research, it is reasonable to posit that, in Nakurio, *etirae*'s deep root system has affected groundwater recharge rates, potentially resulting in an inconsistency in flooding. Either way, in the years since *etirae*'s initial introduction to Turkana, it is clear that flood recession cultivation has become increasingly untenable.⁹ As a result of these significant restrictions in cultivation activities, broader economic relationships have also been threatened. Emeri Lowasa, who has cultivated plots along the Kerio for over sixty years, has emphasized to us time and again the size and significance of harvests in the deeper past, and the importance of the seasonal exchanges they would stimulate between more specialized herders and those without extensive stock, like her, who were settled along the river. During an interview in 2014, she explained as follows:

They [cultivators] would only sell when there was an especially big harvest. The news would spread during these times, people would come especially to trade. Otherwise, crops would only be eaten by the family . . . People traded a lot of sorghum in those days [1965–70], but after that last big harvest things have gradually got worse and people have not exchanged very much since.¹⁰

The disintegration of seasonal livestock and sorghum exchanges constituted a serious threat to health and nutrition across both herding and cultivating communities, the former experiencing restrictions in access to grain and the latter finding themselves unable to accrue livestock. The response to these threats, as discussed during many of our interviews in Nakurio and other settlements along the Kerio, involved cultivators turning to new activities from the early 1980s onwards as a way of earning cash, and often deploying this newly earned cash to purchase grains from external agricultural contexts via nearby urban centres, which they in turn began selling to visiting herders at weekly markets. As part of this shift, recent decades have seen a significant growth of basketry and charcoal production in riverside contexts throughout Turkana, the solidification of cash markets for both livestock and other imported agricultural produce, and the growth of associated permanent settlements, including enhanced transport links and infrastructures (Lind 2017; Derbyshire *et al.* 2021). These wider socio-economic transformations are, of course, much more diverse in their origins than the ecological and hydrological factors impacting cultivation. Agrarian change in Turkana over the recent past is as much a result of the seismic political reconfiguration that has taken place following the Kenya-wide devolution of power

⁹ This narrative of recent hydrological degradation fits within a much broader narrative, prevalent throughout cultivating communities, which frames the decades following c. 1970 – and specifically a year known as *Ekaru a Atchaka Ekipul* (the Year of the Lost Padlock) – as increasingly inhospitable and uncertain.

¹⁰ Interview with Emeri Lowasa, Nakurio, 9 October 2014.

from national to local governments from 2012 onwards after a national constitutional referendum in 2010.

Either way, it would be inaccurate to envisage such broader economic processes as forces of unmitigated and intractable change. To fully account for how these processes have been co-opted and harnessed, and indeed generally experienced by communities in southern Turkana, it is necessary to appreciate the above outlined context of seasonal economic interactions and exchanges that prefigured them (cf. Fontein 2015: 7). As we discuss later, *etirae* has become emblematic of the radical economic overhaul that Turkana has begun to experience in recent decades, literally supplanting, at least in certain riverside locations, previous forms of seasonality and variability with homogeneity and stable vegetative growth. However, it has not shaped the dynamics of subsistence procurement on its own terms, and indeed is not envisaged to have done so by many of the communities who have historically pursued their livelihoods on the banks of the Kerio in Turkana. The economic reconfiguration we set out above has involved the re-establishment of longstanding patterns of exchange and interaction (between herders and cultivators) as much as it has served to provoke new livelihoods and activities. Riverside locations continue to serve as integral nexuses facilitating the exchange of livestock and grains, galvanizing various socially prescribed networks and relationships, albeit nowadays via cash markets and with produce from external agricultural zones. This process of economic development has not only been fundamentally shaped by local knowledges and familiarities with riverine resources (and the aspirations that, in part, arise from these), but it has also been navigated via the active exploitation of *etirae*.

In 2014, this was the case largely by means of the charcoal trade, which relied heavily on *etirae* as a primary raw material and earned many farmers an income in the absence of reliable floods or space to cultivate. However, by 2022, and following a period of maturation for many of the newly established thickets around Nakurio, many community members had also begun to utilize *etirae* in the pursuit of other new economic opportunities. Simon Konyen, for example, who has lived in Nakurio for most of his life, explained to us that while most farmers had recently abandoned clearing older plots and were now continually searching for new cultivation areas that were not yet overrun, areas of established growth closer to the settlement had become vital resources for those involved in a burgeoning new construction industry. This industry sees women cut posts from trees and shrubs in communal areas and carry them to construction sites for a pre-negotiated fee. Multiple new houses, fences and kiosks have been constructed from *etirae* timber in Nakurio in the last few years (Figure 3).¹¹

Taking all of this into account, it is clear that the impact of *etirae* on livelihoods and regional economic dynamics in Turkana is not straightforward to evaluate. Connections might be drawn to a process of similar socio-ecological change that has taken place several hundred kilometres to the south-west in the Lake Victoria

¹¹ It is significant to note that this new *etirae*-oriented construction industry incorporates the labour of women for cutting and carrying but relies solely on the labour of men for building. This is in direct contradiction to longer-standing construction practices in Turkana, which see women alone building houses. The ways in which new forms of construction run contra to tradition in this sense further accentuate both *etirae*'s foreignness and its representation of novel practices and social contexts.



Figure 3. House construction in Nakurio using *etirae* timber in 2022.

area, which has experienced massive biodiversity loss and concomitant economic growth following the introduction of Nile perch in the 1950s. Writing in this journal, Pringle (2005) outlined the ways in which Nile perch, or *mputa*, has shaped livelihood activities in multiple areas surrounding Lake Victoria since its introduction, but warns against simplistic interpretations both of its overall value and of community concerns about (or disregard for) ecological degradation. Significantly, Pringle (*ibid.*: 519–20) also points to a similar figurative entanglement of *mputa* with economic development and particularly the construction of new architectures envisaged by his interviewees to be less ephemeral than and superior to what came before. In southern Turkana, *etirae*'s association with growth and construction is less to do with its economic value within broader commercial industries and more to do with its literal function as a construction material. Having said this, the association of *etirae* with recent heightened socio-economic change would be ill construed merely as related to its physical properties (i.e. what it makes impossible in the farm and what it makes possible in the village). Its prominence within the core processes of radical change that have been experienced over recent decades, both as a serious constraint and as a resource replete with opportunity (including the production of charcoal and the construction of new buildings), has led to its symbolic implication in a range of other interconnected phenomena. What we mean by this is that the economic reconfigurations that have taken place around and by means of *etirae*, from shifting engagements with riverine resources to the construction of new houses and kiosks and the subsequent seizure of new socio-material possibilities associated with southern Turkana's post-TRP development, are generally conceptualized as being part and parcel of a much wider pattern of reconfiguration within social institutions and value systems.

Etirae's physical growth – and its spread through daily lives and livelihoods in Turkana in the years since its introduction – is, in this sense, a process characterized by increasing complexity. The shrub's entanglements with both hopes and frustrations, with broader environmental phenomena and with an ever widening array of dissonant agendas, render it comparable not only to case studies exploring the aftermaths of ecological interventions like *mputa* in Lake Victoria but also to a range of other case studies explored by Africanist anthropologists concerned with what is left behind by modernist visions, physically, historically, socially and politically, and how all of these organic legacies grow more and more complicated as the years go by. For example, Kilroy-Marac's exploration (2019: 8) of the long and complicated life of the Fann psychiatric clinic in Dakar, Senegal, and of its ongoing legacy of confusion, has outlined the 'unsettledness and uncontainability' of its past. Similarly, Mususa's (2012; 2021) ethnography of mining communities on the Zambian Copperbelt after privatization pays attention to the ways in which people have come to 'villagize' urban settings through particular forms of sociality and through the reconfiguration of material landscapes. In ways comparable to both these examples, *etirae* has grown far beyond the social, physical and conceptual limits demarcated during its initial establishment without dislodging its roots.

To understand this, it is necessary to examine current conceptions of why and how *etirae* was first introduced to Turkana, and how it failed to fulfil local anticipations that were, from the outset, much more expansive than the TRP's interest in desertification, deforestation and fuelwood shortages. During an interview in Lokoyo in February 2022, Arupe Amunae recounted his memories of *etirae's* initial introduction, describing the sense of expectation that was actively stirred up by local leaders to encourage acceptance of the new planting schemes:

It began during the time of chief Ekwar, chief Ekwar was the one who accepted the planting of this tree called *etirae*. He convinced people to accept it by saying forest brings rain. He told people that we must plant so many trees for rains come where there is a lot of forest. It was then planted at Nakurio before the time of *Ekaru Asur* [c. 1981] and later taken to other places like Kalokol. During *Ekaru Eumbi* [c. 1990–95] it was only trees of *etirae* that were here and it was called *Etirae kapa ekol*. That time people could make soup of its fruits but later they found it not that good to drink.¹²

From the outset, *etirae* clearly came to be associated with climatic phenomena that affected a much broader area than the immediate vicinity of the plots in which it was planted. It is important to note that rain in Turkana is often directly correlated with God (*Akuj*), the work of powerful diviners (*ngimurok*) largely being oriented around bringing about its (and his) return, or indeed counteracting the rain-related work of other diviners for the sake of gaining spiritual and political paramountcy (Derbyshire *et al.* 2021). In the decades following *etirae's* introduction, the seasonality of rainfall is widely reported to have altered, with less pronounced periods of rainfall occurring on a regular basis and thus a far less clear division between the wet season (*akiporo*) and the dry season (*akamu*) becoming the norm; this is a shift reported across northern

¹² Interview with Arupe Amunae, Lokoyo, 15 February 2022.

Kenya's drylands over recent years and is likely to be associated with climate change (Conway 2009; Dabasso and Okomoli 2015; Watson *et al.* 2016). The fact that *etirae* was not only unable to deliver pronounced and protracted rainfall, as per the promises of local leaders during its introduction, but that also in the years after its introduction such rainfall seems to have become altogether less common goes some way to explaining why the shrub has come to be so closely associated with much broader rates and scales of socio-ecological change than those with which it is directly and tangibly connected.

During recent research in Kayapat, to the south-west of Nakurio (behind the Moru Sipo hill range), many of those we interviewed linked recent changes in rainfall dynamics with wider demographic shifts, suggesting that an increase in the number of diviners (due to general population growth) has led to more regular and widely spread power contestations and a more systematic frustration of various individuals' efforts to engender pronounced rainy seasons. To Aemun Lowasa, who was born in Nakurio and whose mother used to raise crops of sorghum in riverside plots in the decades preceding the introduction of *etirae*, these changes in the relationship between humans and God were much more firmly oriented around the growth of the settlements that previously served as seasonal places of exchange between herders and cultivators but that are now burgeoning market centres (partly built out of *etirae* timber) with transport links to urban centres. We interviewed Lowasa in Nakurio in May 2022, when she was preparing to migrate from the Kerio with her livestock onto the plains, where it had rained. She explained as follows:

In the past, people believed in God and livestock. Then people came with this noise, with Christianity, with the banging of drums and God went far away. Before, he was close, you could have better access, but since these recent changes he has been chased far away . . . in the past, elders would decide they wanted rain and they would go together to see the *emuron* [diviner/seer], they would perform the rituals and the rain would come. These days you do that and there is another *emuron* who will come in the night and ruin what has been done . . . This is the time of being in-between. I think in the future things will have all gone to one side, the side of development, school, Christianity. That means losing a lot of things. Looking back at this time we are in, people will say look there were still animals, there was livestock, it was still important. It was good.¹³

Lowasa's account succinctly encapsulates not only how recent economic growth has come to be implicated in wider social and spiritual reconfigurations in southern Turkana, but also how new landscapes and indeed soundscapes (the banging of industry and the noise of Christianity, not to mention the splutter of *piki piki* motorbike taxis) have literally driven away a whole livestock-oriented value system, with its attendant relationships and institutions, that is seemingly incommensurate with the subjectivities encompassed by new architectural forms, infrastructures and religious rituals. God's distance from the bustling settlements that have emerged in places that were previously grounds for seasonal exchanges reflects the

¹³ Interview with Aemun Lowasa, Nakurio, 1 May 2022.

disintegration of the very seasonality around which these exchanges used to take place but also underlines the substantial social impact of new forms of valorization and commoditization. To Lowasa, and to many others (particularly from the herding sector), this is not just an economic concern, but also a moral one. Places like Nakurio are associated with forms of sickness that escalate from the biological to the social. The excessive consumption of *etirae* by livestock carries with it a suite of adverse health implications, including weight loss and death (William and Jafri 2015). In Turkana, the most common afflictions in small stock tend to be gastric complications and jaw disease, as is the case with livestock in southern Afar, Ethiopia (Rogers *et al.* 2017). This livestock ill health has straightforward impacts on human herd owners, who by extension have less access to animal products or attain a much lower price for their stock at market: diets are restricted and there is less money for supplementing them with other purchased food products. During many of our conversations with temporary residents of Nakurio from the herding sector (i.e. those waiting for the rains to return), these forms of ill health were closely interwoven with a range of other social ills commonly associated with permanent settlements. In particular, theft and alcoholism were commonly cited as issues that have increased in prevalence in direct association with disease.¹⁴

Etirae's association with these integrated biological and social ills in southern Turkana bears a clear resemblance to the ways in which the shrub has come to be apprehended in parts of north-eastern Ethiopia, where it was introduced at roughly the same time by a host of government agencies and non-governmental organizations (NGOs). Having now swept across much of the Afar region, many local populations have come to associate it with a *Gini*, or 'devil spirit', on account of its implication with various economic obstructions, sicknesses and forms of social disintegration (Rogers *et al.* 2017). Such complicated and unsettled entanglements between *etirae* shrubs and wider moral crises across the African continent (Afar is by no means the only other example) resonate with recent anthropological work that has sought to understand the biosocial roles of the living residues of past interventions, and the active implication of these very residues in processes of emergence, transformation and mutagenicity. Tousignant's (2020) recent exploration, for example, of the toxic residues of Senegal's peanut economy (particularly aflatoxin contamination and associated human disease) emphasizes the impossibility of determining and explaining a past that is still so intensely present and active. 'Peanut residues,' Tousignant (*ibid.*: 8) argues, 'stick to – or maybe, more accurately, have become – so many Senegalese things, persons and places, forming drought, rust, dead trees and perhaps cancerous cells, but also cuisine, entrepreneurship, authority and vigor.'

In Turkana, *etirae's* obstructive and corrosive connotations place it at the heart of wider perceptions of recent economic shifts (broadly oriented around the emergence of permanent settlements with cash markets) as the abnegation of a livestock-oriented moral economy in which stock value and ownership are inseparable components of status, largely via their central roles within ceremonies such as *asapan* (a rite of passage marking men's transition into elderhood) and marriage. The rights

¹⁴ One of the most successful forms of business in weekly markets along the Kerio is the sale of alcohol and the stimulant *khat*. Both Nakurio and Kerio have widely come to be associated with alcoholism among surrounding herding communities in line with recent population growth.

and responsibilities that arise within this moral economy designate theft as an extremely uncommon activity, largely associated with external or unintegrated economic actors. Aemun Lowasa's identification of God with livestock is revealing in this regard, as is her integration of development, school and Christianity as conjoined phenomena that occupy an opposing place to her on a socio-economic spectrum that balances semi-mobile herders with those more permanently settled in places like Nakurio.

Exploring how the balance of power has shifted between these two interconnected worlds, and what this means, is an extraordinarily complex task that is impossible to achieve within the confines of this article. This is particularly the case when one considers the fact that those who are perceived to be benefiting from development, school and Christianity – those permanently located in riverside locations, exploiting riverine resources, with few or no stock – were historically referred to as *ngikebotok*, a term that literally means 'those who have nothing'. The irony of their perceived economic ascendancy is often cause for humour in more remote herding contexts today, among populations now routinely referred to as *raiya*, a term that stems from the Swahili word for 'citizens' but which, in Turkana, carries a meaning more similar to 'countryfolk'.¹⁵ However, it is also complex because the divisions between these two kinds of subjectivities, and their attendant forms of aspiration and citizenship, fall *within* families, clans and sectional groupings. In other words, in the same way that cultivation and herding were never discrete, self-contained subsistence strategies, but rather always intimately interwoven and extremely flexible and open-ended pursuits, the detachment that Aemun Lowasa describes between those exploiting the new connections and opportunities of permanent settlements and those still procuring their subsistence further out on the plains is a detachment that is experienced within everyday familial interactions.

Nevertheless, what is unambiguously discernible from Aemun Lowasa's account – and indeed from many of the other accounts we have collected over recent years – is the causal relationship she infers between the spread of *etirae*, population growth, ecological degradation, climate change and a suite of other interconnected biological and social ills. What is significant about this is that it directly contravenes the narrative that justified *etirae*'s introduction in the first place. To the organizations operating within the TRP in the early 1980s, and to those responding to a perceived crisis of sustainability across Africa's drylands at the same time, *etirae*, along with numerous other farming-oriented livelihood interventions, was seen as a solution to socio-economic and environmental problems that were imagined to have been caused by pastoralism. To many in Turkana today, these past interventions are remembered as quite the opposite – that is, as the primary causes of multiple ensuing interconnected ecological and moral crises. In this sense, while it is important to recognize that *etirae* has been co-opted and exploited by river-dwelling communities to play a part in assembling a future that was not envisaged at the time of its introduction (i.e. the reconfiguration of a longstanding economic relationship

¹⁵ The term *raiya* also often brings with it (certainly in urban contexts) the connotations of allegiance to tradition, truculence and indifference to or incomprehension of the benefits of economic development. It is also widely deployed in a self-referential manner by herding populations, as a means of expressing pride in one's background and culture.

between herders and cultivators), it is also imperative to acknowledge the radical dissimilarities between the narrative that led to its introduction and that with which it has become entangled, on the ground, in the ensuing years. The discord between these two opposing narratives perhaps reflects a wider dissonance between the imaginaries structuring development intervention and the unique conceptions of prosperity, well-being and economic success that shaped, and continue to shape, pastoral economies in drylands contexts. The growth and spread of *etirae*, and the ways in which various communities have grappled with the constraints and possibilities it has brought, is a story that demonstrates the enduring open-endedness of livelihoods and relationships in Turkana, and the innovative ways in which skills, knowledges and networks are deployed to negotiate substantive material and economic changes. However, it is also a cautionary tale, underlining the long-term consequences of ill-considered and hurried interventions, the escalating power of crisis, unscrutinised and unquestioned, in policymaking contexts and the incongruity of moralizing development narratives when assessed in relation to conceptions of socio-economic change that emerge from pastoralist rationalities and strategies.

Conclusions: climate change, resilience and futures in crisis

If *etirae* is to be imagined as a leftover from past ways of thinking in the humanitarian/development sphere, what should we make of its enduring vitality? Its sprawling, tangled web of social implications and economic repercussions? In the years after the drought of the early 1980s subsided, so too, it seemed, did the last vestiges of colonial-era assumptions about overgrazing and pastoralism's inherently destructive nature (for the most part). Yet with new forms and scales of crisis – new droughts and, more recently, the global threat of climate change – the stubborn shoots of something more fundamental have resprouted. Nowadays, the 'all-embracing mobilizing metaphor' (Pain and Levine 2012: 21) is no longer the drive to return to stability and halt human-induced land degradation, but rather to achieve 'resilience'. In their recent analysis of the renewed attention currently being placed on places like northern Kenya in the context of climate change, Semplici and Campbell (2023) have highlighted the ways in which the language of policy surrounding 'resilience building' in African drylands continues to be coloured by a powerful and longstanding imaginary that frames these regions as unproductive, empty and, ultimately, in need of transformation. They set out how 'the same goal of transforming herders into something else has been reiterated since colonial days, time and again. No longer (necessarily) because pastoralists are "irrational" or "disruptive", rather because they are "vulnerable" to their own environment' (*ibid.*: 6).

In Africa's drylands, immediate crisis continues to cultivate a much deeper and more intractable perspective – a version of the 'imaginative lens' highlighted by Moore (2018: 1504) through which rural African agriculture in general tends to be envisaged – which is partly a conflation of new and more immediate problems with conceptions of innate inadequacy and partly a preponderance for simplification in light of urgency. The ways in which this is the case in African drylands today are unique to the particular social, political and ecological contexts, and indeed historical

legacies by which such places are formed. And yet, clear comparisons can be made to urgent, climate change-related projects that have taken shape elsewhere across the globe. For example, Camelia Dewan's (2021) recent exploration of climate adaptation intervention in coastal Bangladesh, a region that has experienced monumental catastrophe (and associated investment) in recent years, highlights the ways in which the assumptions behind colonial-era modernizing projects have been repackaged to grapple with new climatic concerns, with multiple negative consequences for rural farmers. Ultimately, Dewan argues, many of these new interventions have been based on 'mistaken causal explanations, such as misreading floods, sea level rise, food insecurity, and coastal vulnerabilities' (*ibid.*: 150).

The spread of *etirae* throughout Africa has not brought with it a uniform set of biological or ecological implications, nor have its social entanglements and economic repercussions been homogeneous across the multiple (largely pastoralist) populations concerned. To use Tousignant's (2020: 8) words, today these living residues 'form a past that is intensely present but unknowable as the past, certainly not through neat narratives of succession and transformation'. The same defiance of neatness and uniformity is arguably true of climate change, which is predicted to have heterogeneous impacts on Africa's drylands (although it is broadly projected to entail heightened temperatures and more variable rainfall) and diverse, site-specific repercussions for pastoral production (Herrero *et al.* 2016; Sloat *et al.* 2018). Like *etirae*, climate change is already being grappled with proactively in Turkana, with communities remaking relationships, institutions and networks to find new ways of endogenizing variability in a manner somewhat comparable to the 'villagization' described by Mususa (2012). The primary barriers to this process arguably do not stem from any particular degree or scale of variability but rather from decisions made in the political sphere. Either way, the case of *etirae*'s incursion throughout northern Kenya is a reminder of the importance of taking stock of how new biological and environmental phenomena are not necessarily transformative on their own terms, but rather braid their way through contested processes of social change (with attendant vocabularies and rationalities) that are prefigured by complex socio-economic and political histories. Coming to terms with some of the ways in which this entanglement takes place, even in one discrete case study, is also, by its converse implication, a process of drawing attention to the continuing hegemony of totalizing narratives (often oriented around crisis and still deeply susceptible to the power of old views), and the continuing failure of such narratives to make room for perspectives that emerge from the unique ways of imagining and being in the world that prevail in drylands regions.

Acknowledgements. We would like to thank the British Institute in Eastern Africa and the Turkana Basin Institute for administrative and technical support. The research explored in this article was undertaken with funding from St John's College, Oxford, the Royal Geographical Society, the National Geographic Society, the Wenner-Gren Foundation, the Endangered Material Knowledge Programme and the British Institute in Eastern Africa. We are grateful for the extensive time in the field this funding has allowed us over the years. We are also grateful to Loura Ekaale and his family for hosting us in Moru Sipo and to the Lowasa family of Nakurio for their longstanding support of our research. We are grateful to all our interviewees and wider research participants for the patience they have accorded us and are particularly grateful for the support of Chief Vincent Kamais in Kerio, Peter Eregae Ikaru, Assistant Chief of Nakurio sub-location Johnathan Epan, Mariko Ekeno, Francois Tangare, Longoria Moses, Petro Echulukum Ima and Petro Apetet Maria.

References

- Adams, M. (1986) 'Merging relief and development: the case of Turkana', *Development Policy Review* 4 (4): 313–24.
- Alene, G., J. Duncan and H. van Dijk (2021) 'Development, governmentality and the sedentary state: the productive safety net programme in Ethiopia's Somali pastoral periphery', *Journal of Peasant Studies* 49 (6): 1158–80.
- Alvares, M., P. Leparmarai, G. Heller and M. Becker (2017) 'Recovery and germination of *Prosopis juliflora* (Sw.) DC seeds after ingestion by goats and cattle', *Arid Land Research and Management* 31 (1): 71–80.
- Austin, H. (1903) *With Macdonald in Uganda: a narrative account of the Uganda mutiny and Macdonald expedition in the Uganda Protectorate and the territories to the north*. London: Edward Arnold.
- Behnke, R. and M. Mortimore (eds) (2016) *The End of Desertification? Disputing environmental change in the drylands*. Heidelberg: Springer.
- Boles, O., A. Shoemaker, C. Mustaphi, N. Petek, A. Ekblom and P. Lane (2019) 'Historical ecologies of pastoralist overgrazing in Kenya: long-term perspectives on cause and effect', *Human Ecology* 47: 419–34.
- Broch-Due, V. (1999) 'Remembered cattle, forgotten people: the morality of exchange and the exclusion of the Turkana poor' in D. Anderson and V. Broch-Due (eds), *The Poor Are Not Us: poverty and pastoralism in Eastern Africa*. Oxford: James Currey.
- Catalano, S., J. Vilardi, D. Tosto and B. Saidman (2008) 'Molecular phylogeny and diversification history of *Prosopis* (Fabaceae: Mimosoideae)', *Biological Journal of the Linnean Society* 93 (3): 621–40.
- Conway, G. (2009) *The Science of Climate Change in Africa: impacts and adaptation*. Grantham Discussion Paper 1. Grantham: Grantham Institute for Climate Change.
- Dabasso, B. and M. Okomoli (2015) 'Changing pattern of local rainfall: analysis of a 50-year record in central Marsabit, northern Kenya', *Weather* 70: 285–9.
- Davies, M. (2015) 'Economic specialisation, resource variability, and the origins of intensive agriculture in Eastern Africa', *Rural Landscapes: Society, Environment, History* 2 (1): 1–18.
- Derbyshire, S. (2019) 'Trade, development and destitution: a material culture history of fishing on the western shore of Lake Turkana', *African Studies* 78 (3): 324–46.
- Derbyshire, S. (2020) *Remembering Turkana: material histories and contemporary livelihoods in north-western Kenya*. London: Routledge.
- Derbyshire, S. and L. Lowasa (2022) 'The ruins of Turkana: an archaeology of failed development in northern Kenya' in P. Geissler, N. Berre and J. Lagae (eds), *African Modernism and Its Afterlives*. Bristol: Intellect.
- Derbyshire, S., J. Nami, G. Akall and L. Lowasa (2021) 'Divining the future: making sense of ecological uncertainty in Turkana, northern Kenya', *Land* 10 (9): 885.
- Dewan, C. (2021) *Misreading the Bengal Delta: climate change, development, and livelihoods in coastal Bangladesh*. Seattle WA: University of Washington Press.
- Ellis, J. and D. Swift (1988) 'Stability of African pastoral ecosystems: alternate paradigms and implications for development', *Rangeland Ecology and Management* 41: 450–9.
- Emley, E. (1927) 'The Turkana of Kolosia District', *Journal of the Royal Anthropological Institute of Great Britain and Ireland* 57: 157–201.
- Ferguson, J. (1990) *The Anti-Politics Machine: 'development', depoliticization, and bureaucratic power in Lesotho*. Cambridge: Cambridge University Press.
- Fontein, J. (2015) *Remaking Mutirikwi: landscape, water and belonging in southern Zimbabwe*. Oxford: James Currey.
- Geissler, P., N. Berre and J. Lagae (eds) (2022) *African Modernism and Its Afterlives*. Bristol: Intellect.
- Herlocker, D., E. Barrow and P. Paetkau (1981) 'A preliminary report on trial plantings of woody species in arid and semi-arid northern Kenya' in L. Buck (ed.), *Proceedings of the Kenya National Seminar on Agroforestry*. Nairobi: ICRAF.
- Herrero, M., J. Addison, C. Bedalian, E. Carabine, P. Havlik, B. Henderson, J. van de Steeg and P. Thornton (2016) 'Climate change and pastoralism: impacts, consequences and adaptation', *Revue Scientifique et Technique de l'OIE* 35 (2): 417–33.
- Hogg, R. (1982) 'Destitution and development: the Turkana of north-west Kenya', *Disasters* 6: 164–8.

- Kilroy-Marac, K. (2019) *An Impossible Inheritance: postcolonial psychiatry and the work of memory in a West African clinic*. Oakland CA: University of California Press.
- Kirksey, E. (2020) 'The emergence of Covid-19: a multi species story', *Anthropology Now* 12 (1): 11–16.
- Kyuma, R., R. Wahome, J. Kinama and V. Wasonga (2016) 'Temporal relationship between climate variability, *Prosopis juliflora* invasion and livestock numbers in the drylands of Magadi, Kenya', *African Journal of Environmental Science and Technology* 10 (4): 129–40.
- Latour, B. (1993) *We Have Never Been Modern*. Cambridge MA: Harvard University Press.
- Le Houérou, H. (1977) 'The nature and causes of desertization' in M. Glantz (ed.), *Desertification: environmental degradation in and around arid lands*. Boulder CO: Westview Press.
- Le Maitre, D., M. Gush and S. Dzikiti (2015) 'Impacts of invading alien plant species on water flows at stand and catchment scales', *AOB Plants* 7: 1–21.
- Lind, J. (2017) *Governing Black Gold: lessons from oil finds in Turkana, Kenya*. Falmer: Institute of Development Studies (IDS).
- Little, P. (2019) 'When "green" equals thorny and mean: the politics and costs of an environmental experiment in East Africa', *African Studies Review* 62 (3): 132–63.
- Lowe, C. (2010) 'Viral clouds: becoming H5N1 in Indonesia', *Cultural Anthropology* 25 (4): 625–49.
- Mbaabu, P., W. Ng, U. Schaffner, M. Gichaba, D. Olago, S. Choge, S. Oriaso and S. Eckert (2019) 'Spatial evolution of *Prosopis* invasion and its effects on LULC and livelihoods in Baringo, Kenya', *Remote Sensing* 11 (10): 1217.
- Mbaabu, P., D. Olagu, M. Gichaba, S. Eckert, R. Eschen, S. Oriaso, S. Choge, T. Linders and U. Schaffner (2020) 'Restoration of degraded grasslands, but not invasion by *Prosopis juliflora*, avoids trade-offs between climate change mitigation and other ecosystem services', *Scientific Reports* 10.
- McCabe, T. (2004) *Cattle Bring Us to Our Enemies: Turkana ecology, politics, and raiding in a disequilibrium system*. Ann Arbor MI: University of Michigan Press.
- Moore, H. (2018) 'Prosperity in crisis and the longue durée in Africa', *Journal of Peasant Studies* 45 (7): 1501–17.
- Mususa, P. (2012) 'Mining, welfare and urbanisation: the wavering urban character of Zambia's Copperbelt', *Journal of Contemporary African Studies* 30 (4): 571–87.
- Mususa, P. (2021) *There Used to Be Order: life on the Copperbelt after the privatisation of the Zambia consolidated copper mines*. Ann Arbor MI: University of Michigan Press.
- Mwangi, E. and B. Swallow (2005) *Invasion of Prosopis juliflora and Local Livelihoods: case study from the Lake Baringo area of Kenya*. Nairobi: World Agroforestry Centre.
- Odhiambo, M. (2015) 'Il Chamus verses the state: vulnerability, litigation and resilience building in the Baringo lowlands of Kenya'. PhD thesis, University of Cologne.
- Pain, A. and S. Levine (2012) *A Conceptual Analysis of Livelihoods and Resilience: addressing the insecurity of agency*. London: Overseas Development Institute (ODI).
- Patnaik, P., T. Abbasi and S. Abbasi (2017) '*Prosopis (Prosopis juliflora)*: blessing and bane', *Tropical Ecology* 58 (3): 455–83.
- Pringle, R. (2005) 'The Nile perch in Lake Victoria: local responses and adaptations', *Africa* 75 (4): 510–37.
- Republic of Kenya (1984) *Kenya's Experiences in Combatting Desertification: Kenya's country position paper*. Nairobi: National Environment and Human Settlements Secretariat.
- Robbins, P. (2001) 'Fixed categories in a portable landscape: the causes and consequences of land-cover categorisation', *Environment and Planning A* 33: 161–79.
- Rogers, P., F. Nunan and A. Fentie (2017) 'Reimagining invasions: the social and cultural impacts of *Prosopis* on pastoralists in southern Afar, Ethiopia', *Pastoralism* 7: 1–13.
- Scoones, I. (2018) 'Review of *The End of Desertification? Disputing environmental change in the drylands* by Roy H. Behnke and Michael Mortimore', *Pastoralism: Research, Policy and Practice* 8: 1–3.
- Scoones, I. (2019) *What Is Uncertainty and Why Does It Matter?* STEPS Working Paper 105. Brighton: STEPS Centre.
- Scoones, I. (2021) 'Beyond the "balance of nature": pastoralists' alternative perspectives on sustainability', *Nomadic Peoples* 25 (1): 114–17.
- Semplici, G. and T. Campbell (2023) 'The revival of the drylands: re-learning resilience to climate change from pastoral livelihoods in East Africa', *Climate and Development* 15 (9): 779–92.

- Sloat, L., J. Gerber, L. Sanberg, W. Smith, M. Herrero, L. Ferrerra, C. Godde and P. West (2018) 'Increasing importance of precipitation variability on global livestock grazing lands', *Nature Climate Change* 8 (3): 214–18.
- Tabe-Ojong, M. (2023) 'Action against invasive species: charcoal production, beekeeping, and *Prosopis* eradication in Kenya', *Ecological Economics* 203: 107614.
- Thomas, D. and N. Middleton (1994) *Desertification: exploding the myth*. Chichester: Wiley.
- Tousignant, N. (2020) 'Toxic residues of Senegal's peanut economy', *Anthropology Today* 36: 5–8.
- Tsing, A. (2015) *The Mushroom at the End of the World: on the possibility of life in capitalist ruins*. Princeton NJ: Princeton University Press.
- Vehrs, H. (2016) 'Changes in landscape vegetation, forage plant composition and herding structure in pastoralist livelihoods in East Pokot, Kenya', *Journal of Eastern African Studies* 10 (1): 88–110.
- von Höhnel, L. (1894) *Discovery by Count Teleki of Lakes Rudolf and Stefanie*. London: Longmans.
- Watson, E., H. Kochore and B. Dabasso (2016) 'Camels and climate resilience: adaptation in northern Kenya', *Human Ecology* 44: 701–13.
- Widgren, M. and J. Sutton (eds) (2004) *Islands of Intensive Agriculture in Eastern Africa*. Oxford: James Currey.
- William, K. and L. Jafri (2015) 'Mesquite (*Prosopis juliflora*): livestock grazing, its toxicity and management', *Journal of Bioresource Management* 2 (2).

Samuel Derbyshire is a research fellow at the Jameel Observatory, International Livestock Research Institute, Kenya. His research and publications have focused on socio-economic and political change in the drylands of northern Kenya. He is currently leading research into early warning systems and drought management in Africa's drylands.

Acacia Leakey is a doctoral candidate at the School of Geography and the Environment, University of Oxford, and a research affiliate at the Turkana Basin Institute, Kenya. Her research focuses on the systems and socio-economic structures that govern water extraction and management in northern Kenya, building on her earlier work in the region at the water, energy and food nexus.

Lucas Lowasa is a researcher with the Turkana Basin Institute, Kenya. His research and publications focus on history and economic development in the Turkana region of northern Kenya. He is currently leading documentation activities in Turkana for the 'Lake Turkana, in the Making' project, funded by the Endangered Material Knowledge Programme.

Cite this article: Derbyshire, S. F., Leakey, A., and Lowasa, L. (2023). 'Tangled crises in Turkana: investigating the spread of *Prosopis* in Kenya's northern drylands'. *Africa* 93, 652–673. <https://doi.org/10.1017/S0001972023000773>