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Reimagining invasions: The social and cultural impacts of *Prosopis* on pastoralists in southern Afar, Ethiopia

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Abstract

Whilst the environmental impacts of biological invasions are clearly conceptualised and there is growing evidence on the economic benefits and costs, the social and cultural dimensions remain poorly understood. This paper presents the perceptions of pastoralist communities in southern Afar, Ethiopian lowlands, on one invasive species, *Prosopis juliflora*. The socio-cultural impacts are assessed, and the manner in which they interact with other drivers of vulnerability, including political marginalisation, sedentarisation and conflict, is explored. The research studied 10 communities and undertook semi-structured interviews and focus group discussions with pastoralists and agro-pastoralists. These results were supported by interviews with community leaders and key informants. The benefits and costs were analysed using the asset-based framework of the Sustainable Livelihoods Framework and the subject-focused approach of Wellbeing in Development. The results demonstrate that the costs of invasive species are felt across all of the livelihood capital bases (financial, natural, physical, human and social) highlighted within the framework and that the impacts cross multiple assets, such as reducing access through blocking roads. The concept of Wellbeing in Development provides a lens to examine neglected impacts, like conflict, community standing, political marginalisation and cultural impoverishment, and a freedom of definition and vocabulary to allow the participants to define their own epistemologies. The research highlights that impacts spread across assets, transcend objective and subjective classification, but also that impacts interact with other drivers of vulnerability. Pastoralists report deepened and broadened conflict, complicated relationships with the state and increased sedentarisation within invaded areas. The paper demonstrates that biological invasions have complex social and cultural implications beyond the environmental and economic costs which are commonly presented. Through synthesising methodologies and tools which capture local knowledge and perceptions, these implications and relationships are conceptualised.

Keywords: Pastoralism, Ethiopia, Invasive species, Sustainable livelihoods, Well-being, Socio-cultural impacts

> A *Gini* (devil spirit) has come and settled in the *Prosopis* thickets. He feeds on the seed pods and then attacks us
>
> Hasoba *kebele*

Background

In spite of a highly developed and generally harmonious relationship with their local environment, pastoralist communities around the world have faced, and continue to face, a range of non-climate- and climate-related drivers of vulnerability (López-i-Gelats et al. 2016; Devereux and Tibbo 2013). These non-climate-related drivers, like natural resource, governance and policy factors, include those related to 'unfavorable development policies oriented towards pastoralists' resulting from the 'persistence of unfavourable narratives' and 'governments' desire to control pastoral groups and the resources present in pastoral land' (López-i-Gelats et al. 2016). The diversity and strength of such drivers has deepened the vulnerability of many pastoralist groups leading to reduced herd sizes, livelihood insecurity and

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reliance on remittances and aid (Devereux and Tibbo 2013; Little et al. 2008; Livingstone and Ruhindi 2013). Yet, it is also widely recognised that many pastoralist communities have multiple sources and manifestations of strength; they are often able to cope and adapt in the face of such adversity due to their local knowledge, mobility, interdependence and the existence of institutions to enable communal decision-making (López-i-Gelats et al. 2016; Barrow et al. 2007; Fratkin and Mearns 2003).

Within this context of a diversity of sources and drivers of vulnerability, the effects of invasive alien species (IAS) can be seen to further frustrate and challenge pastoralist livelihoods and well-being. IAS are species that have not only become naturalised but thrive in their non-native environment, reproducing viable offspring and spreading a considerable distance from the introduction site (Pyšek et al. 2004; Richardson et al. 2000). However, as Kull et al. (2011) discuss, how invasive species are perceived and used varies significantly depending upon ecological, social and political context. Whilst the environmental impacts and economic effects of *Prosopis juliflora* on pastoralist livelihoods in East Africa are well documented (Wakie et al. 2014; Mwangi and Swallow 2005), the breadth and depth of social impacts and responses have not been as widely reported on. The aim of the research reported on here was to address two questions: firstly, how are the impacts of *P. juliflora* perceived by pastoral communities in Afar? And, secondly, why are pastoralist communities so vulnerable to the impacts of *P. juliflora*?

To investigate the perceptions of impacts and why pastoralist communities are particularly vulnerable to the negative effects of an IAS such as *P. juliflora*, the research utilises two complementary approaches, the Sustainable Livelihoods Framework (SLF) (Scoones 1998, 2009) and the Wellbeing in Developing Countries (WeD) approach (White 2010). The purpose of drawing on both is to benefit from the structure afforded by the asset-based analysis of sources of vulnerability in the SLF to individuals or households and to deepen that analysis through generating data on how *P. juliflora* affects perceptions of well-being. The interrelationship between personal, social and environmental impacts and assets receives specific attention. This paper focuses on the five types of assets (economic, natural, physical, human and social) which shape a sustainable livelihood and whose contribution to livelihood strategies and outcomes are mediated by a range of policies, institutions and processes. It then draws on WeD, which complements the asset-based analysis found in SLF by focusing on the relational and subjective dimensions of well-being, reflecting the importance of social relations for well-being and the observation that personal perceptions affect well-being and livelihoods (White 2010).

Through this novel application of the SLF and WeD, the article makes two contributions to literature. The first is to demonstrate the depth and interconnection between impacts of an IAS on pastoralist communities, thereby illustrating their particular vulnerability to the negative effects of IAS. The second contribution is the complementary use of the SLF and WeD to enable a deeper, more holistic understanding of social impacts, implications and responses. A more nuanced understanding of how sources and drivers of vulnerability interact illuminates a wide range of interconnected impacts and implications.

The article examines the relationship between the invasive species *P. juliflora* and pastoralists in eastern Ethiopia. A very aggressive invader, *P. Juliflora* is a 'conflict species', conferring benefits (Pasiecznik et al. 2004) as well as costs, and has been present in Africa for over 100 years (CABI 2011). It was actively introduced in the 1970s and 1980s by governments and development professionals in East Africa to provide fuelwood and regenerate arid regions (Odour and Githioni 2013; Muturi 2012; Muanda et al. 2009; Mwangi and Swallow 2005), although in Ethiopia there is a lack of clear documentation relating to its exact introduction pathway (Mehari 2015). The extensive invasion in the study area in eastern Ethiopia now affects a considerable, and growing, portion of Afar (Wakie et al. 2014; Haregewyn et al. 2013; Tilahun and Asfaw 2012). Whilst studies exist on a local level stressing the environmental and economic impacts (Muanda et al. 2009; Mwangi and Swallow 2005), articulation and exploration of the social impacts are generally absent.

The Afar experience many of the challenges common to other pastoralist groups, suffering development interventions that are often culturally insensitive (Berhe and Adaye 2007) and at times wilfully deleterious to local norms and practices (Bereketeah 2014). Common pastureland in eastern Ethiopia is already under pressure, frequently appropriated by external cotton and sugarcane plantations (Behnke and Kerven 2013), with the allegation that a formal judiciary offers limited recourse for resolving grievances (Mulatu and Bekure 2013). The approach to pastoralism by successive Ethiopian governments has been to coerce or force people out of pastoralism into purportedly modern and efficient activities through the pursuit of large-scale commercial agriculture, the establishment of national parks and sedentarisation (Gebeye 2016). Gebeye (2016) claims that none of these approaches were successful or appropriate for pastoral priorities and needs. Notwithstanding the 2011 Afar National Regional State Proclamation, articulating institutional responsibilities (Chekol 2014) and establishing regulations intended to control, manage and eradicate *P. juliflora* in the region (Ali 2015), such a policy

environment frustrates the formulation of an appropriate response to the pastoral impacts of invasive species.

Drivers of pastoral vulnerability

The pastoral context in eastern Ethiopia and the characteristics which render pastoralists vulnerable to environmental change are the subject of significant study, with the concept of vulnerability used to describe 'states of susceptibility to harm, powerlessness, and marginality of both physical and social systems' (Adger 2006). There is evidence of their sensitivity to global economic shifts, including food price spikes (Makki 2012), and to changes in the domestic political economy and specifically the state's interventions in driving enclosure (Lavers 2012). However, how these broader drivers, like sedentarisation, marginalisation and fractured state relations, interact with local and regional ecological considerations is poorly understood.

Sedentarisation can be seen as both a driver of vulnerability and a solution to vulnerability for pastoralists (Galvin 2009). In terms of increasing vulnerability, when sedentarisation has been led by the state or forced upon pastoralists through land grabbing or drought, this has reduced land rights, eroded customary institutions and harmed livelihoods (López-i-Gelats et al. 2016; Schmidt and Pearson 2016). As sedentarisation erodes pastoral institutions, communities become increasingly exposed to conflict (Barrow et al. 2007). However, sedentarisation can also be adopted as an adaptation strategy in the face of climate change or incidence of livestock disease, or adopted in response to incentives (Galvin 2009).

The capacity of pastoral communities to adapt to changing ecological conditions is compromised by their diminished economic and political standing and hence marginalisation. The external imposition of change and adaptations (Tsegaye et al. 2013) drives pre-existing tension and distrust between the government and local communities (Rettberg 2010) and political marginalisation. This contributes to a diminished indigenous capacity to manage risk, and the poor accounting of social capital leads to misrepresentations of the types of risk communities face (Davies and Bennett 2007).

This disenfranchisement between state and pastoral communities is presented as a significant cause of pastoral marginalisation and vulnerability. Undermined customary institutions operate in a context which has 'diminished the strength of leaders and empowered the government' (Schmidt and Pearson 2016, p. 29). This power imbalance leads to a perception of 'declining legitimacy' (Burgess 2009, p. 96) and potentially positions the state as a cause of rather than solution to the challenges local communities face and strengthens a narrative which casts it as 'illegitimate and ignorant' (Rettberg 2010, p. 271). The state's 'nominal' (Markakis 2003, p. 452) presence compromises its ability to manage conflict and to assimilate, reflect and represent communities and the challenges they face in peripheral areas, though more attention needs to be paid to the drivers of, and solutions to, this disengagement.

Pastoralism is a source of factors which build resilience and decrease vulnerability. An abundance of indigenous local pastoral knowledge is a strength per se and in developing adaptation strategies (Luizza et al. 2016), although significant environmental change challenges an epistemology so embedded within its ecological context. In areas that are not congruent with other forms of livelihood activities (Tsegaye et al. 2013), pastoralism holds significant economic advantages, although centralised development and political processes frequently overlook these.

This brief review of drivers of pastoral vulnerability highlights the complex and nuanced relationship between environmental stress and conflict, the lack of understanding of how the erosion of pastoral institutions and sedentarisation contribute to increased pastoral vulnerability, the different framings of vulnerability to invasive species and the disenfranchisement between state and pastoral communities. The complexity of such drivers informed the research design, the data collection tools and the data analysis.

Pastoralism and *P. juliflora*

P. juliflora and the variety of impacts associated with its invasion present another driver of pastoral vulnerability. Costs include changing local environments, where reduced biodiversity translates into the loss of culturally valuable indigenous species in Kenya (Stave et al. 2007), and in southern Afar is linked to the loss of livestock forage and fodder (Mehari 2015). Drawing on participatory research, Wakie et al. (2016) also highlight the perceived loss of native species in southern Afar, in addition to increased livestock morbidity and mortality and a loss of indigenous culture. Both studies use diverse methodologies to illustrate a range of inter-related costs that contribute to pastoralist displacement and the promotion of unpopular management practices in eastern Ethiopia (Kebede and Coppock 2015).

However, *P. juliflora* is perceived as both a negative and positive introduction, and perceptions, and priorities, vary between elite agents and local communities, as the court case launched by pastoralists against the Kenyan government over the invasion of their grazing lands demonstrates (Kenya Law 2006). There is a need for evaluative frameworks with the sensitivity to arbitrate these varying perceptions (Muanda et al. 2009) and a nuance which can recognise how management strategies are mediated by issues like land tenure and how perceived impacts differ based upon livelihood activity

(Shackleton et al. 2015). The relationship is complex and at times contradictory; analysis of the impacts of *P. Juliflora* in eastern Ethiopia by Zeray et al. (2017) found the invasion increased income from crop production and off-farm activities whilst reducing income from dairy production, and in South Africa, Shackleton et al. (2015) conclude that land users accessing common property resources recognise the perceived costs but are less focused on management than private landowners. In pastoral areas of Kenya, both direct and indirect economic costs and benefits of *P. juliflora* have been studied and documented (Mwangi and Swallow 2008) and illustrate the idea of *P. juliflora* as a 'conflict' species (Haregewyn et al. 2013). Resilience is also impacted by dependencies upon specific ecosystem services (Ayanu et al. 2015), dependencies which are culturally and socially moderated. Better documentation of socio-economic impacts are said to improve understandings of pastoral vulnerability.

Pastoral environmental stewardship is not just a strength but a necessity, supporting ecosystems which demonstrate more biodiversity in grazed areas (Maitima et al. 2009), managing livestock systems which offer greater productivity over ranching (Hesse 2009) and only posing a threat to wildlife through competition when resources are forcibly shared, with no clear evidence that pastoralism per se leads to 'competitive exclusion' (Butt and Turner 2012, p. 8).

Pastoralists in Ethiopia, then, face a series of obstacles; particular focus in this article is on the social, cultural and political challenges and how these interrelate with and are complicated by the presence of *P. juliflora*. The analysis is rooted in overlooked impacts and proceeds from a methodology which neither prejudges pastoralism as a livelihood pursuit nor its inherent vulnerability to invasive species, respecting the fact that facets engender resilience as well as vulnerability.

Study area

Afar lies in the northeast of Ethiopia and is a sparsely populated region of 1.4 million with 87% of its population living in rural locations and 29.5% listed as pastoralists (Central Statistical Agency of Ethiopia 2010). Social indicators are poor for the region, with 85% of people never having attended school and only 17% being literate (M 19.4% and F 14.6%). Its hot, arid and dry climate (Kottek et al. 2006) renders productive agriculture a challenge. Southern Afar provides an informative context within which to study the livelihood impacts of IAS. *P. juliflora* coverage is extensive within the Afar region, and Haregewyn et al. (2013) estimate that by 2020, a third of Amibara *woreda* in southern Afar will be covered by *P. juliflora*, with an annual spread of at least 20,000 ha per annum, an alarmingly high growth rate (Tilahun and Asfaw 2012). Additionally, the Afar constitute one of the most significant pastoral groups in the Horn of Africa and are subjected to the marginalisation and misrepresentation which commonly confront pastoralists (Devereux and Tibbo 2013). As such, given the significant presence of *P. juliflora* and the pre-existing potential for marginalisation, the study area is apposite and timely. Within the study area, pastureland near the river Awash has been appropriated for both sugarcane and cotton plantations and taken out of the historic rangeland livestock systems, despite inconclusive economic and development benefits (Behnke and Kerven 2013).

Methods

In order to differentiate impacts and improve understanding of why they are experienced as they are by pastoralists, this section initially focuses on introducing the value of using the two frameworks, the SLF and WeD, in responding to the research question and explains how these were developed into a unified framework.

Initially, the impacts of *P. juliflora* on the lives of pastoralists are analysed across all five asset bases (economic, natural, physical, human and social) of the SLF (Scoones 1998). A focus on the human and the social develops a clearer understanding of the direct and indirect effects of *P. juliflora* on health, education, skills and capabilities and secondary impacts on community, social networks and political position and capital. White's (2010) conceptual systematisation of well-being strengthens analysis to develop an understanding of the relationship between *P. juliflora* and pastoralists in the context of 'the social structures and processes through which sustainable livelihoods are achieved' (Scoones 1998, p. 11–12). Practical components of WeD are used to focus analysis on *social* well-being (subjective perceptions of social, political and cultural identities, violence, conflict, state relations and network).

An adaptation of Bebbington's (1999) analysis (Figure 1) combined the SLF and WeD to explore both objective and subjective impacts and provided an evaluative space to phrase these appropriately. Through using both methodological approaches, there is an opportunity to synergise existing research and record economic and environmental impacts of *P. juliflora* with the social and cultural context to better understand why impacts are felt as they are. WeD's focus on the relational (White 2010) enables a language of enquiry which can capture the subjective, lived reality of those whose relationship with their environment, both physical and social, has been disrupted by *P. juliflora*, and explore how this disruption relates to other challenges and to the pastoral experience.

A cross-sectional research design resulted in interviews with 77 pastoralists between January and April 2015 within 10 purposively selected communities, 6 in

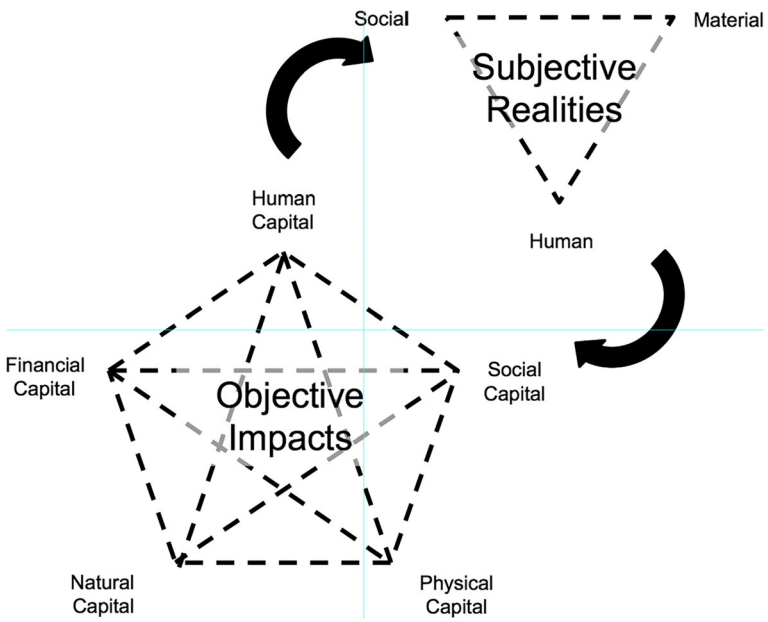

Figure 1 Measuring human impacts - the objective and the subjective

Amibara *woreda*, or district, and 4 in Gewane *woreda*. The specific locations within the study area in southern Afar were selected with socio-economists at the agricultural research centre and local pastoral development officers on the basis of *P. juliflora* incidence. Perceptions of the problem, impacted assets and management strategies were discussed with all participants. In each *kebele*, or ward, equal numbers of men and women were selected by a *kebele* development officer according to gender and availability, given the transhumant practices of pastoralists, to undertake a household questionnaire. The respondents then collectively participated in a focus group discussion which expanded and qualified specific themes. Interviews with community leaders, *kebele* administrators and 12 key informants representing intergovernmental organisations, Ethiopian government agencies and donors triangulated the household responses and established broader perspectives.

The individual interviews captured demographic data and focused on creating a comprehensive account of asset-based impacts and exploring the subjective impacts on well-being. The focus groups allowed triangulation of these impacts and how they impact capitals, well-being and relationships. Interviewing community leaders gathered qualifying data about community size and income to establish the scale of the issue and test the reported impacts at the community level. A discussion ensued about the asset impacts revealed during the interviews; the social, political and relational dimensions of the invasion; and the community's standing. Finally, proposed solutions and additional needs were discussed.

The sample of respondents was not selected on a random basis but purposively selected based on likely familiarity with *P. juliflora*. The research objectives - to gain insight and understanding of and meaning from local impacts and perceptions and not to generate replicable, empirical data - support the use of purposive sampling. Token payments were made to participants as this has been normalised and compensate community members for their time. The researcher's role and how the research could support interventions were explained to address potential interview fatigue and frustration felt by respondents, and consent was gathered and recorded.

Results

The social and human costs to pastoral communities

P. juliflora impacts the environment as a lived space and is closely associated by participants with drought; changes to the water courses, specifically the river Awash; and a lowered water table. Drought augments the competitive advantage *P. juliflora* has in water-deprived conditions to threaten indigenous species, and reduced indigenous forage and pasture forces pastoralists to travel increasing distances to find suitable grazing. Pastures have been reduced to a 'jungle' rendering grazing unsustainable in significant areas. It is not only drought but also the frequency and severity of flooding, as communities blame the weed for changes to water courses. The pastoralists view this battle as greater than the infamous struggles between Issa, a Somali clan, and Afar, and *P. juliflora* is likened to 'HIV for the environment'(Female, 40s, Melka Sadi *kebele*). This level of

pasture loss precipitates household poverty, and the increasingly barren environment threatens an abandonment of the land, with invaded areas dismissed 'as a shed for wild animals' (Male, 40s, Sarkamo *kebele*). Communities report an increasing proximity to wild animals. The presence of large carnivores, like hyenas and lions, threatens livestock and children, a threat which is exacerbated when the increasingly difficult search for pasture causes the household head to spend longer periods away from the family.

The importance of the natural context stretches beyond the provision of livelihoods and economic resources. The local environment and biodiversity underpin a cultural heritage, demonstrated by a rich vocabulary and the diverse uses for the numerous indigenous plant species. The name of the same indigenous species subtly varies between *kebele*, and those *kebele* identified scores of indigenous plant species. However, a number of key informants expressed the view that *P. juliflora* benefits the environment through greening otherwise arid areas and preventing wind erosion, impacts rarely echoed within the community.

P. juliflora's interaction with the local economy is more varied and more nuanced, with frequent acceptance that there were benefits in the form of charcoal production. This leads to economic advantages, with reports that those engaged in charcoal production were sharing the economic benefits with pastoralists. However, this benefit has to be weighed against the perceived impoverishment of soil quality, and the environment more generally, and the potential for conflict between communities over how benefits and costs are divided between charcoal producers and pastoralists. Additionally, the view that *P. juliflora* charcoal is of inferior quality indicates that benefits are not universally appreciated. Milling, or drying, the pods for livestock fodder is another proposed use for *P. juliflora*. Despite a number of high profile projects looking at this form of utilisation, both directly and in the form of flour, very few respondents raised this and one community commented that, whilst important for feed, the destruction of local species and impact on access to basic services outweighed this.

In stark contrast, the economic costs of *P. juliflora* were counted by elders in terms of clearance and diminished livestock. The extent of these economic costs was established by key informants, impacting both Afar and Ethiopian Somalia, stretching beyond Ethiopia into the wider Horn of Africa and undermining and devaluing the pastoralist 'bank', livestock. Participants reported a marked change in prospects within communities living with *P. juliflora*, with the rich becoming poor and food insecure, little milk for domestic consumption or surplus to sell at market and a consequent lack of cash to support education and food purchases. The community in Briforo summarised their own recent history as moving from being 'ignorantly rich to educated but poor', a situation to which *P. juliflora* contributes. The cost of removal of *P. juliflora* is significant and in some cases untenable, leading to fears that farmland will be reappropriated and leased to investors.

Daily livestock losses are significantly reducing herd size due to diminished and impoverished grazing; livestock is being lost and predated upon in the thickets and gastric complications and a jaw disease, known locally as *armako*, caused by the pod and thorns are presenting new ailments which the communities have little understanding or experience of. Morbidity, as well as mortality, is a critical issue, with the loss of local fodder and pasture species impacting the herd's milk yield. The thorns and pods of *P. juliflora* respectively cause blindness and lameness and digestive problems which significantly reduce the market price of cattle. Finally, diminished household capital compromises alternative livelihood investment opportunities, and the remaining options, like wage labour and horticulture, fail to generate significant income.

P. juliflora also burdens the infrastructure which supports pastoralism. Access is impeded as roads and tracks are narrowed and blocked, and the thorns render vehicles with inflatable tyres susceptible to punctures. This limits opportunities to access markets as large vehicles cannot transport the livestock long distances, and the herding options are complicated by the propensity to lose stock in the thickets as the roads become less and less clear. Both access to market and to services, including healthcare and education, are diminished. An alarming story of a woman giving birth by the side of the road as she was unable to reach the health centre was shared, and there are frequent reports of children getting lost on the way to school. The schools themselves become invaded, forcing the organisation of clearance parties to restore playing pitches and access roads.

Communities and homes do not remain unaffected. Impeded access also cuts off and cuts up communities, increasing isolation and provoking conflict. Homes are damaged, with disturbance to the cement foundations both reported and evidenced. *P. juliflora* blocks and damages the complex irrigation infrastructure, including ponds and flood and irrigation ditches, which manage both excess and exiguous rainfall, mediating floods and droughts. An external perception of *P. juliflora* as a cheap housing material was not echoed within the communities. The lack of indigenous species impacts the supply of building materials, reducing traditional fencing and construction materials and encouraging corrugated houses. These are not as environmentally sensitive as the traditional Afar housing and are not as well suited to the stifling climate.

The perceived impacts on human health cover both direct and indirect costs. Thorn injuries predominantly injure the feet due to the lack of protection given by the customary Afar open footwear, specifically to children and women whose role it is to collect firewood. These injuries, if infected, can lead to a loss of limbs and blindness if the eye is caught, reducing individual, household and community income, exacerbated by the difficulties in accessing health services. There is further evidence of a disproportionate burden. A number of respondents, including the son of a women's development officer, noted the difficulty women have in accessing healthcare particularly during pregnancy. Children remain particularly vulnerable to the ill effects of *P. juliflora* owing to a tendency to eat the pods, which causes throat infections, and their higher susceptibility to malnutrition and to suffering from a lack of milk. The health of pastoralists is further compromised by poor availability of traditional plant medicines and a reported increase in malaria in invaded areas.

As one community leader simply stated, 'if a family can't feed their children they can't attend school' (Sarkamo *kebele*, 50s). Impoverished access to schools is both physical, due to poor roads and the increasing need to move over longer distances to seek out pasture, and economic, as spending on control and eradication detracts from spending on education and other services.

Socially, dislocation, displacement and distance are undermining traditional Afar social norms and patterns of behaviour. Within communities, *P. juliflora* acts like, in the words of one inter-governmental representative, a 'barbed-wire fence' which forces a barrier between neighbours and limits the reconciliation of conflict. One community counted the cost of this displacement at 70 households who had migrated out of the community. In addition, the pressure on households forces internal displacement and short-term migration, both of which fracture community identity. The increasing distances travelled from the *kebele* to find pasture cause the household to split more frequently and strain social processes like *dagu*, a 'sophisticated system for news exchange' (Menbere and Skjerdal 2008, p. 19) which constitutes the traditional Afar means of communication across the rangelands.

Conflict is also a concern and exists on a variety of different levels. Within the community, there are tensions between different clans over access rights and how costs should be shared. Pastoralists from invaded areas can find themselves in conflict with other communities who deny herds from invaded rangelands access to their pasture, although other communities do maintain customary traditions of reciprocity. Conflicts simmer with a range of groups outside the Afar communities: with the Issa where the increasing scarcity of productive rangeland adds fuel to pre-existing tensions, with charcoal producers who are generally seen as exploitative outsiders, with commercial plantations which pitch the pastoralists against the formalised bureaucracy and will of the state and with NGOs who promote utilisation strategies perceived as inappropriate.

Pastoral perceptions of *P. juliflora* and their well-being

Well-being, and an analysis of this, provides a pallet to illustrate the differences between objective and subjective perspectives. Generally imagined as existing across three realms, material well-being, human well-being and social well-being (White 2010), this analysis focuses on elements of social well-being, as this is the area where analysis using the frames of the SLF could be best strengthened. The social well-being of the community is assessed through focusing on conflict, community standing and identity and pastoral relations with the state and other external agencies.

As discussed, conflict exists as a corollary of *P. juliflora* invasion and as a feature of Afar existence. As a phenomenon, it illustrates the importance of taking a subjective approach which analyses relationships. Within communities, the impacts of *P. juliflora*, and the conflict that flows from it, are experienced distinctly and dependent upon tribe, upon whether one is benefiting from charcoal production or not, and upon how these benefits are shared and used. Conflict between communities is influenced by the specific ecological context, the perceived risk, the strength of ties between tribe and community and the levels and effectiveness of government involvement. As a process that 'happens in relationship' (White 2010, p. 170), well-being forces appraisal of the fact that diminished access and damaged relationships between pastoralists contribute to the state of conflict and that poor communication between individuals and communities is an aggravating factor. When *P. juliflora* envelops rangelands, it is difficult to determine which land belongs to which *kebele*, undermining how the community relates to its environment, and pitching community against community. Conflict underscores a diversification of phenomenological positions that occurs within a changing landscape and creates a juxtaposition of radically varying and fractured ontologies which, under increasing pressure from an existential threat, struggle to find a unifying epistemology.

The political identity and community standing of pastoral groups is altered by reduced herd size, the need to divert resources to clearance and general impoverishment. This stark change in fortunes prompted the focus group in Gedeabora *kebele* to reminisce, 'we were once rich and able to raise a lot of capital, but now the economy is deteriorating and we are losing capital'. This is most acutely felt through the prospects for children for

whom there is little hope. As a community leader ruefully remarked, the 'children are continually asking what they fate is and their inheritance - the future of the community is at stake' (Halai Degi *kebele*, 80s). This sense of standing and stability is further undermined by displacement and resettlement of members, with those who do migrate finding it difficult to maintain their pastoral identity and those who remain living alongside charcoal producers with differing norms and practices. The changing relationship with milk, a particularly strong cultural signifier to pastoralists, was described by the Galila Dura *kebele* focus group thus:

> We previously provided milk to foreigners, but they can no longer do this as there is not even enough for our kids. We used to have to put it in the Awash as there was too much, and are now surviving on the past good times. This is a punishment from God.

The extent to which the community's standing has diminished is indicated by the fatalistic perception that this is some divine curse and the significance is marked by the conflation of two core tenets of Afar life, God and pastoral culture, symbolically represented by milk, to make some sense of this unfurling tragedy. Whilst there remains some faith in the community's capacity to respond, with support and resources from the state and NGOs, this needs to be weighted by the existential despair a significant number of pastoralists expressed, with some bemoaning their latter-day inability to be pastoralists. This diminishes their way of life and corrupts and impoverishes their culture, ultimately transforming their identity.

This cultural impasse within which the communities find themselves is rooted in the (poor) health of the indigenous biodiversity. This once rich resource underpins Afar cultural identity, from provision of fodder and grass crops to construction materials, medicines and personal hygiene aids like *adaito*, which is used as a toothbrush, and *casalto*, a leaf used to sooth and cool water to provide a refreshing tonic. The variety of species listed by the communities and the subtle differences in dialect between *kebele* over the study area indicate how important the natural resource base is in both supplying and underpinning an identity which is frequently as one with its environment. The consumption of milk, so culturally significant as a tool for social interaction, as a currency and, in the form of butter, as a product for conditioning and styling hair, is now spoken about as history, a history which, with the invasion of burial grounds and the destruction of statues by *P. juliflora*, is increasingly difficult for communities to preserve.

State relations are strained at a time when the pastoralists face increasing dependency on it for support, and it is accepted that financing a response to *P. juliflora* diverts funding from other sources. Communities do see a role for themselves, providing personnel to undertake clearance, but the government has to lead in providing technical expertise and technologies. However, *P. juliflora* limits interaction with the government and hampers access to support and representatives, diminishing both the political power, and relevance, of communities and their development prospects.

The relationship of pastoralists with the government is complicated by attempts to manage *P. juliflora* through a variety of interventions. The policy towards charcoal production was, and still is, confused, firstly allowing production as means to utilise the crop and then banning it due to the environmental and social damage and limited economic benefit. There is still some dispute over whether, and where, production is controlled and a suspicion that charcoal producers are ignoring any restrictions. On a larger scale, there are a significant number of policies, frameworks and management strategies highlighted by key informants which were not mentioned at the community level, suggesting that responses and solutions to *P. juliflora* exist at two different levels, one external and one local. Additionally, the government is required to arbitrate in conflicts and is focused on high-level conflict between the Afar and the Issa with limited success. However, they have established fora to arbitrate between aggrieved clans and communities and supported the customary fines issued for transgressions.

Interaction with NGOs focuses on clearance and utilisation projects, but notwithstanding these initiatives, and an expectation amongst pastoralists for NGOs to fill a gap left by the government, there is limited success due to scale. There is also a presiding view that as a foreign problem, the solution should come from foreigners, and an increasing openness to foreign advice and suggestions amongst the most severely affected communities. This typifies a changing and an opening of attitudes, although it is difficult to promote as a positive development given that it is neither from a position of power or of any significant choice.

Constructing pastoral vulnerability through the relationship between *P. juliflora* and other drivers and threats to well-being

Returning to the literature, there are a number of contexts within which *P. juliflora* interacts with existing threats to the pastoral system and drivers of pastoral vulnerability, including the production system itself, conflict, sedentarisation and poor state relations. These interactions collectively and holistically start to indicate why pastoralists experience the impacts of *P. juliflora* in the manner they do and how it impacts formal and informal institutions to temper the traditional coping

strategies and to (de-)construct resilience in an invaded context.

The most widely reported ill effect of *P. juliflora* is on livestock, the 'backbone' of the pastoral economy. Any threat to livestock places pastoral prosperity in peril, but few impact livestock in multiple ways like *P. juliflora.* It decreases and devalues pastureland and exposes livestock to a variety of different threats, including theft and predation. In terms of an impact on livestock value, *P. juliflora* reduces the value of the herd across a variety of measures. Economic, productive and reproductive capacities are all diminished, as livestock command less value at market, yield less milk and suffer from increased disease which harms breeding ability, and mortality reduces herd size through disease, theft and predation. This raid on all of the various accounts within the pastoral bank increases exposure, and the few alternative livelihood pursuits that do exist are themselves frequently threatened by the invasions.

Whilst normalised to a certain extent, the insecurity which conflict causes to communities means it cannot be simply dismissed as a 'right of passage' (Meier et al. 2007, p. 718) (Meier et al. 2007). *P. juliflora*, and the consequent resource scarcity and pressures, contributes to pre-existing conflict and tensions, and it exists as a *conflict* species beyond the simple conference of costs to some and benefits to others to determining and diminishing how these costs are divided and mediated. A position which normalises pastoralist conflict struggles to accommodate the variety of levels that current conflict exists on and the significant pressure that it places on both communities and arbitrating institutions, both formal and informal. It also raises a significant, and concerning, question: when the study area around the middle Awash, which was traditionally a refuge during dry periods, is the locus of conflict, is nowhere safe?

Another complex and nuanced relationship is between *P. juliflora* and sedentarisation. The majority of respondents were mixing livelihood strategies and none of the communities interviewed were fully nomadic, but pre-existing levels of sedentarisation were exacerbated by *P. juliflora*. This situation erodes and fractures the communities and traditions of pastoralism. Despite a lessening of pure, transhumant practice, communities were still able to maintain herds and move them between ranges. Political sedentarisation, with which the respondents have a nuanced relationship, pushes them down whilst *P. juliflora* pushes them in, resulting in a pressure and tension which increases susceptibility to conflict, to the point that communities feel suffocated. There is also a tendency amongst the pastoralist respondents to conflate issues, with the idea that the process of sedentarisation, and the purported benefits like education, works with *P. juliflora* to impoverish them materially. How these nuanced factors interrelate is complex, but the perception is that they are colluding to devalue the material existence of pastoralists, a perception which is enforced by the radical reduction in herd size and profitability.

Economic impoverishment, conflict and social transformation all impact the adaptive capacity of pastoralists. The diminished economic standing, social health and community well-being undermine the ability of communities to adapt to change and their resilience to environmental threats, and fuel a widespread sense of despair and questioning over their well-being. Common questions around what it means to be a pastoralist indicate the ill health of pastoralism in southern Afar, and the lack of ready answers suggests a knowledge gap which exacerbates impacts and occludes solutions. The dependence on external actors to actually call and manage any response, and provide resources and a solution, questions the vestiges of pastoralist faith in the community's ability to respond to the threats they face. In terms of the community's ability to adapt, the invocation to *Allah* to deliver them from *P. juliflora* is more telling.

One of the critical reasons why pastoralists are so vulnerable is that the state is perceived as unable to fulfil all of its obligations. The sanguine recognition that the cost of controlling and managing *P. juliflora* detracts resources from education and health represents the observation that the state's relationship with the pastoralists has limits. The idea of a centrist state disengaged from a peripheral population is supported by the promotion of confused (charcoal production), misaligned (utilisation and fodder strategies) and deleterious (land-leasing) strategies in the context of *P. juliflora*. This supports the idea of an essential competition and conflict between the 'centrifugal logic' of state-centric formalised bureaucracies and a 'centripetal logic [which] proceeds in terms of relations, movements and flows of people, animals, resources and tradeable commodities' (Korf et al. 2015, p. 885). However, there are instances where the two work together, in the form of clearance strategies and the development and testing of forms of utilisation, and the 'bureaucracy' is addressing the lack of an effective strategy. Given the extent of the invasion and perceived need, there is a case for exploring alternative options, such as biological control (van Wilgen and Richardson 2014). This requires a synergistic multi-stakeholder approach, as recognised explicitly by the key informants and inferred from the interviews with pastoralists, and presents the opportunity for meaningful, collective engagement with the issue. Whilst the state is engaged, it is essential to identify intermediaries, or *bricoleurs* (Cleaver et al. 2013), in bridging the two worlds and ensuring that the seeds of cooperation flourish and that distrust is not allowed to occlude the small shoots of hope.

The pastoralists have much to contribute to developing solutions. Their social systems and institutions, unique epistemologies and their environmental stewardship are traditional sources of strength and resilience but have all been undermined by *P. juliflora* with customary institutions critically endangered. The difficulty in sustaining *dagu* underscores deteriorating communication between pastoralists which threatens time-honoured institutions. Traditional markers, such as trees and rocks, are difficult to determine within an invaded landscape, and traditional practices, like allowing pastoralists from other areas access to pasture, are increasingly ignored. The loosening of the ties which hold pastoralists together and support the vulnerable reduce opportunities to find a solution internally. Customary institutions which manage common property are viewed as unnecessary when there are few resources to arbitrate, and increasingly, owing to distances covered and having to access unfamiliar pasture, grazing decisions are made unilaterally. However, there are still fora for making decisions related to common property, and within some communities, these have been strengthened owing to the increasing demand that scarcity places on them, and in relation to conflict, there is a recognised need for the government to support the resolution process. Government-brokered solutions tend not to offer long-term solutions and are wholly inappropriate when one of the aggrieved parties, in the case of commercial plantations and through a proxy, is the government itself.

Another traditional source of pastoral resilience is their traditional ecological knowledge. This is underpinned by the natural resource base and, as this diminishes, so too does knowledge and a sense of power over and understanding of their environment. The increasing reliance on the government, NGOs and foreigners to supply a solution reflects this decline. The willingness to embrace suggestions of a solution, like an apocryphal herbicide in Amhara, suggests how far the communities have abandoned their indigenous expertise in the face of this foreign threat. The names that the local community have for *P. juliflora*, 'devil weed' and 'Derg weed', capture the ignorance, fear and other-worldliness with which it is viewed by the local community.

One of the principal features of pastoralism is some sense of environmental stewardship, of co-existence and co-evolution with the local ecosystem. Pastoralism is a system which has been demonstrated to effectively co-exist with local environments and to support the maintenance of areas rich in biodiversity. Whilst the alternatives, mono-cropping, commercial plantations and small-scale cash crops, fail to offer the same level of environmental protection, with no incumbency upon users to preserve the unique ecosystem, they do offer the prospect of better confronting the invasion, a fact which offers the most significant threat to pastoralists. The tragedy of the invaded commons is that all of the co-evolved, ecological sensitivity and specialism is a burden rather than a boon.

Conclusion

The perceptions and perspectives of Afar pastoralists in relation to the *P. juliflora* invasion illuminate a breadth and depth of impacts on many aspects of their lives. The diversity of and relationship between impacts highlight the complexity and severity of a threat which affects every element of the pastoral system of production, from the reproductive health and success of livestock, to their ability to access food and water, to the ease with which livestock can be taken to market. The diversity of impacts is only matched by their depth. As the backbone of the pastoral economy, livestock are increasingly broken by the presence of *P. juliflora* within the rangelands. The sense of despair and disillusion that the pastoral communities frequently voiced is supported by the reported figures of livestock deaths within the communities and by the experts, and the priority with which the key informants view the issue and the environmental and economic costs as captured within the literature. What the experience of pastoralists in Afar also illustrated was a series of neglected impacts and how recognised impacts can have unforeseen consequences. The reduction in economic output is well recognised in the literature (Lovell and Stone 2005; Pimental et al. 2001) as a cost of invasive species, but this precipitates increasing difficulty in accessing basic services and a more profound impact on the standing and identity of the community. Studies into the environment and ecology generally, and IAS specifically, would benefit from adopting methods and approaches which do more to engage with these assets and capitals, particularly when investigating areas where human activity is closely dependent upon the natural resource base and sensitive to changes within its composition, as is the case with agricultural societies. There is significant value and relevance to indigenous expertise and knowledge in terms of understanding the local environment. By strengthening the analysis of impacts on society and culture, the unique epistemology of these curators of the rangelands is better appreciated, both supporting and challenging perceived truths related to the costs and benefits of *P. juliflora* as highlighted in earlier studies and as suggested by key informants. One example is the value of charcoal production; whilst pastoralists accepted that it could carry certain economic benefits, these fail to advantage the communities interviewed.

In addressing the question of why the impacts are felt in the way that they are, a number of important interactions with other drivers of change in pastoral areas need consideration. Whilst 'conflict' (Haregewyn et al. 2013) is

central to conceptualisations of many invasive species with differentiated impacts and conflict is, to a degree, normalised in pastoral areas (Meier et al. 2007, p. 718), the introduction of an invasive species disrupts pre-existing patterns of behaviour. This introduction introduces conflict across different social scales, posing a direct challenge to initiatives which look to different forms of utilisation, and different actors, as a means of *P. juliflora* management (Birhane et al. 2017). The tensions and erosion of customary norms and practices that are precipitated by sedentarisation are accelerated by the invasion of *P. juliflora*, and contentious state relations (Barrow et al. 2007) are placed under increased pressure by a call to action from all parties. All of these drivers share one feature, to existentially threaten existing institutions at a time when the dynamic and parlous context demands some ground rules. The vulnerability of pastoral institutions to external threats and how this exposes pastoralism itself is well documented (Barrow et al. 2007); what an analysis of *P. juliflora* and the Afar pastoralists suggests is the extent to which pastoral systems, institutions and local indigenous knowledge are extremely sensitive to environmental change and the depth of the symbiotic relationship between pastoralist livelihoods and the environment they inhabit. The number of external interventions, whilst necessary, do not unfailingly support pastoral interests or respond to pastoral concerns. The response from the state is at times muddied and uncoordinated, falling between deleterious policies which sponsor sedentarisation, commercial farming and the introduction of non-pastoral livelihood activities into pastoral areas (Rettberg 2010; Burgess 2009) to one where the scale of the issue and the limitations of extant resources force the state into a peripheral, 'nominal' presence (Markakis 2003). These conflicting narratives are further compounded by the number of state agencies and actors involved in pursuing a solution to the problem, a genuine pursuit which itself is inevitably hampered by narratives of dispute between the state and pastoralists. Where responses do arise, they tend to reflect an ecological conceptualisation of the issue, which is inevitably focused on management of the invasive species within a specific ecosystem, whilst the principal threats to the pastoralists all distil ultimately to a threat to their livelihood, and their identity.

In order to accommodate these varied conceptualisations of how environmental factors interact with livelihoods, and why threats are perceived and experienced as they are, current methodologies and analytical frameworks need to be synergetic and open to working across and including expertise from diverse areas of studies and disciplines. The two frameworks utilised within this paper, the SLF and WeD, recognise the specificity of social and relational contexts (White 2010; Scoones 1998, 2009) and address the poor accounting for social capital in assessments of pastoral vulnerability (Davies and Bennett 2007). Not only are local perspectives embraced and promoted, the personal and subjective are prioritised to reframe how invasive species are imagined by those who are closest to the reality. By using both the SLF and WeD together, there are two advantages. The temptation with the SLF to rank rather than to relate assets is tempered by the relational imperative of WeD, whilst at the same time preserving the fundamental ability of the SLF to bridge different ontological stances and generate a unifying epistemology, not merely across academic disciplines but also between outsiders and insiders, between expertise and experience and between the scientific evidence and the 'lived' reality. The understanding of social and cultural impacts affords a distinction between 'means' and 'meaning' (Bebbington 1999, p. 2022) and contrasts a means of life and a way of life, enabling a language which gives communities a voice. The local perspective allows researchers and practitioners to promote sustainability, empowerment and a two-way knowledge flow for improved understanding and solutions. These new epistemologies, accommodating both scientific expertise and local experience, serve to challenge pre-existing conventions and expand our frames of reference, presenting the possibility for conceptualisations of and solutions to environmental drivers of vulnerability which reflect the unique social context of those who occupy the environment. This 'reimagining' of biological invasions can accept and include perspectives, like those in Hasoba *kebele*, which find a unique meaning in the idea of a *Gini* to express the extent and consequences of natural phenomena.

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