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Interventions for mitigating drought-related livestock mortality in Africa's pastoral areas: a review of their relevance and effectiveness with special reference to Kenya

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Key words: Drylands; drought impacts; livelihoods; pastoralists; pastoral livestock production

Abstract

One of the key challenges facing pastoral livestock production in Africa's drylands is the recurring drought which triggers shortage of grazing resources and massive losses of livestock. Though the pastoralists have traditional drought coping mechanisms, the changing land use, insecure land-tenure arrangements, and the declining natural resource base, have undermined the effectiveness of the mechanisms and worsen the drought impacts. Several interventions have hence been implemented over the years to mitigate the increasing drought impacts and to create more resilient pastoralist societies. Focusing on Kenyan pastoral areas, this study reviewed the relevance and effectiveness of various interventions in reducing the drought-related livestock mortalities. The results show that drought interventions such as destocking programs, supplementary feeding, provision of early warning information, water development, and veterinary services were commonly implemented, but often at the late stage of drought cycles with little emphasis on sustainability.

Introduction

Drought is a deficiency or lack of rainfall over an extended period, often accompanied by high or above-normal temperatures (Dai 2011). It occurs in nearly all agro-ecological zones, but is commonly reported in drylands (Begzsuren et al. 2004; Kazianga et al. 2006; Vetter 2009; Biradar and Sridha 2009; Coppock 2011; Twidwell et al. 2014) and found to cause huge livestock losses in pastoral production systems (Oba 2001; Catley et al. 2014; Rao et al. 2015). Owing to the drought-related livestock losses, pastoral herd growths are defined as "boom and bust" cycles, in which there are years of gradual herd increase, followed by sudden and widespread livestock mortalities caused by long-lasting droughts (Desta and Coppock 2002; Coppock et al. 2008).

Despite the drought-driven shocks, pastoralists have been living with droughts since time immemorial and employed elaborate coping strategies including livestock mobility across landscapes, herd splitting, establishing grazing reserves, building of friendship and social alliances, and supplementary feeding of weak and lactating animals (Oba and Lusigi 1987; Butt et al. 2009; Farrell et al. 2009; Lengarite et al. 2014). Pastoralism itself can be understood as *sui generis*, a highly reliable production system that intelligently uses unreliable environments through coping mechanisms such as herd mobility (Kratli and Schareika 2010). Nevertheless, the effectiveness of pastoralists' practices for coping with droughts has eroded over time (Ouma et al. 2011), due to changing land use that limits the livestock mobility for opportunistic utilization of variable grazing resources (Lengaiboni et al. 2010; Smalley and Corbera 2012). The situation is likely to be aggravated by changing climate, which is generally assumed to increase drought frequencies (Dabasso and Okoti 2015) though the implications of climate change on weather patterns may also vary with regions (Touchan et al. 2011). The increased drought frequencies imply that pastoralists have little time to build herds during the post-drought periods and therefore the recovery effort from drought stress is compromised (Ahmed et al. 2002).

Increasing drought-related livestock mortalities in pastoral areas call for appropriate interventions that can create more resilient pastoral societies. However, drought interventions are often implemented *ad hoc* by state or non-state actors with little understanding of their relevance, effectiveness and long-term sustainability. More often than not, the focus has been responding to crisis rather than developing integrated long-term programs for managing drought risks (Wilhite 2000). This study reviewed the relevance and effectiveness of various drought interventions implemented by development actors in pastoral areas. The purpose is to identify appropriate intervention(s) that development planners and decision-makers could consider in their effort to reduce the drought-related livestock losses in pastoral production systems. The study focuses on the pastoral system of Kenya, one of the livestock production systems, where several state and non-state actors have dedicated a colossal amount of resources to avert drought impacts and build the resilience of pastoral societies to the climate variability, yet the losses have persisted. For example, in northern Kenya where pastoralism is the dominant livelihood, humanitarian organizations spent USD 2,502,200 in implementation of various livestock interventions during the drought of 1999-2000 (Aklilu and Wekesa 2001). In spite of the huge financial investment, the impacts of drought, particularly on livestock losses have continued unabated and even become more devastating in recent years. For instance, the drought of 2005/2006 caused 14 to 43% livestock mortality (depending on locations and livestock species) in the southern rangelands of Kenya

(Nkedianye et al. 2011). In northern Kenya, the drought of 2008/2009 caused about 60% and 40% cattle and shoats (sheep and goats) mortality, respectively (Zwaagstra et al. 2010). In spite of the economic losses, the country lacked clearly defined interventions for reducing the drought impacts and the stakeholders usually implemented short-term initiatives on an ad-hoc basis to salvage the livelihoods.

Methods

The study was based on a comprehensive analysis of peer reviewed journal papers, reports and other literature, to identify and examine various drought interventions. Using keywords such as drought, interventions, programmes, and livestock loss/mortality, the literature were searched in the internet database including Google Scholar and Web of Science. The results are important in drawing lessons on the relevance, effectiveness and sustainability of drought interventions in pastoral production systems.

Results

Destocking programs

Destocking is a drought intervention in which pastoralists are facilitated to sell lean animals and so that they have some cash to buy food or feeds that can maintain the remaining animals during the period of a drought. In destocking programs, lean animals can be purchased (in exchange of cash, feeds or drugs), slaughtered locally and the meat distributed to the most vulnerable households or local schools (Morton et al. 2005). Alternatively, transport subsidies are offered by non-governmental organizations to traders who may purchase animals from remote areas at the peak of a drought period and transport the animals to terminal markets for sale (Morton and Barton 2002). In addition to providing financial assistance to pastoralists, destocking programs helps in matching the available pasture with the livestock population. However, a study by Watson and Binsbergen (2008) evaluated the effectiveness of an emergency livestock off-take implemented by the Veterinaries Sans Frontieres (VSF)-Belgium in Turkana (Kenya) during the drought of 2005 and observed that several limitations including too low prices (ranging from Kshs 350 to 800) offered that have little financial help to the pastoralists. They further observed that the program was done on “first-come” basis and those with little social and political contacts were left out.

Destocking programs are also likely to fail if there is no reliable avenue in which the pastoralists can restock in the post-drought period (Ahmed et al. 2002). In most cases, pastoralists have limited avenues to restock and therefore they prefer to keep animals through a drought especially if there is uncertainty how long the drought could take as it is costly to destock and later restock when the condition improves (Campbell et al. 2006), although they resort to stress-sale syndrome when the condition deteriorates (Barret et al. 2003).

Supplementary livestock feeding

Supplementary livestock feeding is the supply of additional feeds to aid in maintaining the body condition of livestock especially during periods of feed scarcity. Its benefits are numerous and including salvaging breeding stocks which are crucial in the post-drought recovery process. A study by Bekele and Abera (2008) conducted an impact assessment of the supplementary livestock feeding programs implemented by the USAID Pastoralist Livelihoods Initiative in southern Ethiopia during the 2007/2008 drought and concluded that there were lower mortality rates, high calf survival and milk supply in the supplementary-fed cattle compared unfed cattle. They further indicated that the benefits of the supplementation program outweighed the costs.

However, there are some challenges associated with supplementary livestock feeding as a strategy for minimizing the drought-related livestock mortality. Based on the experiences of the development agencies in northern Kenya in their response to the drought of 1999/2000, Aklilu and Wekesa (2001) concluded that supplementary feeding was costly, labour intensive and has other challenges associated with feed spoilage. In their analysis of opportunities and challenges of supplementary livestock feeding in drylands, Muller et al. (2015) also observed that although the strategy has potential in keeping livestock numbers constant under variable grazing conditions, it could decouple livestock-vegetation dynamics and eventually lead to overgrazing and decreased rangeland productivity. They concluded that it is important to continue providing feed supplements even after the drought to allow pasture regeneration and avoid environmental degradation.

Moreover, when supplementary feeds are cultivated alongside crops, there could be a possibility of compromising food security (FAO 2009; Erb et al. 2012). About 33% of world croplands are already under feeds cultivation (FAO 2012), and with the growing demand for livestock products (Delgado 2003), feeds production could take up more land as the demand presents livestock producers with an opportunity for

intensified production in the tropics and sub-tropics (McDermott et al. 2010; Millar and Photakoun 2011; Stür et al., 2013).

Drought early warning information systems

One of the key interventions for reducing the drought impacts is the provision of early warning information that provides a prediction of future climatic conditions so that appropriate actions are taken. It was on this understanding that the Arid Lands Resource Project, a World Bank-supported project, implemented in about 11 arid districts of Kenya, employed local monitors to report the status of pasture, water, animal health and production, and markets, among other indicators, to provide early and coordinated drought responses. Although, the World Bank reported the project performance as “satisfactory” (World Bank 2005), a study by Sinange (2007) indicated that most of the food security and the early warning information systems used in East Africa are unreliable due to weak data and governance structure for effective communication (Pulwarty and Sivakumar).

Water provision

The water scarcity in drylands usually worsens during the period of a drought and becomes a threat to livestock survival. In such circumstances, government and non-governmental organizations often resort to providing water tankering, or drilling of emergency boreholes. One main challenge that could emanate from such initiatives is the degradation of the environment. Studies (Sasaki et al. 2005; Hoshino et al. 2009) have shown that rangeland ecosystems around frequently used water sources would likely experience high grazing intensity which can negatively impact vegetation composition and cover. To avoid localized rangeland degradation around frequently used water sources, development planners should evenly- distribute water points so as to allow uniform grazing of the rangelands. Nevertheless, the rangeland degradation around major or frequently used water sources is a contested view. A study by Fernandez-Gimenez and Allen-Diaz (2001) suggested that there would be urines and faeces deposition by the grazing animals which could enrich soil nutrients and thus help in regeneration of the rangeland.

Water development as a drought response initiative in pastoral areas has significant cost implications. A study by Morton et al. 2005 suggested drilling boreholes as a drought response is only justifiable if the value of livestock saved is comparatively higher than the cost of drilling the borehole. The authors further indicated that many pastoralists do not afford the cost of maintaining a water source such as a borehole unless they get external support and therefore it is important to understand the cost involved to drill and maintain a borehole. A similar opinion was echoed in a study by Oba and Lusigi (1987) in which it was indicated borehole development in pastoral production systems should consider the ability (both technological and economic) of the pastoralists to maintain and service the borehole. The authors further suggested that hand-dug wells could be more suitable in pastoral areas as they are cheap and easy to maintain and also have little impacts on the adjacent grazing areas compared to boreholes.

Provision of veterinary services

Provision of veterinary services is also one of the key drought interventions in pastoral areas. This is premised on the fact that the risk of livestock diseases could increase with drought and in the immediate post-drought period as weak animals are vulnerable to disease and parasitic infections. A study conducted by Catley et al. (2014) in the pastoral regions of Ethiopia concluded that about 28% of total livestock mortality experienced during periods of drought is caused by diseases. Veterinary interventions are thus provided to support pastoralists to protect or treat their animals, especially the breeding stock. During the drought 1999/2001, several organizations supplied drugs to pastoralists in Moyale, Marsabit and Samburu areas of Kenya and asked them to pay in form of goats which were also slaughtered and the meat distributed to villages and schools (Morton et al. 2005). A study by Catley et al. (2004) observed that whereas provision of veterinary services is one of the important drought interventions, it is being constrained by the limited number of professional staff, poor infrastructure, insecurity and the high transaction costs. To overcome the challenge of limited professional personnel in the delivery of veterinary services in the pastoral areas, the government of Kenya trained community-based animal health workers (CBAHWs) who are tasked with the responsibility of primary animal health care. This notwithstanding, the statutory body concerned with veterinary services in Kenya has opposed to the service delivery by CBAHWs claiming that the approach is not in-line with the existing legal structure (Mugunieri et al. 2004). This may jeopardize the provision of the veterinary services as drought intervention in the pastoral areas of Kenya.

Conclusions/Implications

Interventions for reducing the drought-related livestock mortality in pastoral production systems practised in Africa's drylands include destocking programs, supplementary feeding, provision of early warning information, water development, and veterinary services. While these interventions are useful in salvaging pastoral livelihoods in drought emergencies, there might be shortcomings that result from poorly designed methodological approach, high costs involved, negative environmental consequences, and inconsistency with the pastoralists' livestock production objectives and the existing legal structure. The study recommends analyses of the pros and cons of each drought intervention prior to their implementation so as to undertake sustainable and more effective intervention approaches.

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