

Research Application Summary

Fodder production for enhanced pastoral and agro-pastoral resilience in the drylands of Southern Kenya

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Abstract

Fodder production is increasingly being adopted as a way of building resilience of livestock-dominated pastoral and agro-pastoral livelihoods in the drylands of Kenya. It is not only embraced as a source of feed for livestock during periods of scarcity, but also as a means of rehabilitating the degraded environments, and as a complementary source of income. Various case studies have shown the potential of fodder production in enhancing resilience of livelihoods against drought in the arid and semi-lands (ASAL) of Kenya. This has triggered promotion and adoption of the practice among pastoral and agro-pastoral communities in the country. However, the trend calls for the role of research in supporting evidence-led development and upscaling of the value chain to ensure its sustainability. Among the prerequisites for developing a sustainable fodder value chain are, information on the productivity, nutritional quality, and drought and grazing tolerance of grass species; production and post-harvest handling practices; market structure; and challenges and opportunities in the value chain. This information is crucial in guiding selection and breeding of grass species suitable for the drylands; identification of species that require conservation; identification of the best agronomic and post harvest technologies; and market decisions. Overall, the goal of this research is to provide information to guide government and development agencies in targeting entry points for developing and strengthening fodder production, as well as exploring opportunities to ensure efficiency and sustainability of the value chain.

Key words: Fodder value chain, drylands of Kenya, pastoral and agro-pastoral livelihoods

Résumé

La production de fourrage est de plus en plus adoptée pour renforcer la résilience des conditions de subsistance pastorale et agro-pastorale dominées par l'élevage dans les zones arides du Kenya. Elle n'est pas seulement pratiquée pour le fourrage du bétail en période de soudure, mais aussi comme moyen de réhabilitation des milieux dégradés et en tant que source de revenu monétaire complémentaire. Différentes études de cas ont montré le potentiel de la production fourragère dans l'amélioration de la résilience des moyens de

subsistance contre la sécheresse dans les milieux arides du Kenya. Cela a déclenché la promotion et l'adoption de la pratique par les communautés pastorales et agro-pastorales du pays. Cependant, les tendances font appel aux rôles de la recherche dans le soutien du développement fondé sur des évidences et l'extrapolation de la chaîne de valeur afin d'assurer sa pérennité. Parmi les prérequis au développement d'une chaîne de valeur du fourrage durable, on trouve des informations sur la productivité, la qualité nutritionnelle et la sécheresse et la tolérance au pâturage des espèces d'herbe; pratiques de production et de post-récolte; structure du marché; les défis et les opportunités dans la chaîne de valeur. Cette information est cruciale pour guider la sélection et la production des espèces d'herbe adaptées aux zones arides; identification des espèces nécessitant une conservation; identification des meilleures technologies agronomiques et de post-récolte; et les décisions de marché. Dans l'ensemble, l'objectif de cette recherche est de fournir des informations pour guider les organismes gouvernementaux et agences de développement en ciblant les points d'entrée pour développer et renforcer la production fourragère, ainsi que pour explorer les opportunités d'assurer l'efficacité et la durabilité de la chaîne de valeur.

Mots clés: chaîne de valeur fourragère, zones arides du Kenya, modes de vie pastoraux et agro-pastoraux

Background

The semi-arid and arid lands (ASAL) in Africa comprise about 43% the continent's land surface and support approximately 268 to 325 million people (IIED and SOS Sahel, 2010), majority of them pastoralists and agro-pastoralists who rely to a greater extent on extensive livestock production for their livelihoods. With approximately 40% of the continent's land dedicated to pastoralism, it is the main source of livelihoods for the rural population in the vast drylands of Africa. Livestock from these areas contributes about 10 – 50% of the countries' agricultural gross domestic product (GDP) (Rodriguez, 2008). In Kenya, the drylands constitute 89% of the land surface, support 14 million Kenyans, and 70% of the total country's livestock (RoK, 2012). Pastoral livestock contributes over 50% of agricultural Gross Domestic Product (GDP) in Kenya (Rodriguez, 2008). Further, the livestock subsector in Kenya employs about 90% of the ASALs population who derive up to 95% of their households' income from livestock production (GoK, 2003).

Despite the enormous contribution to local and national economies, pastoral and agro-pastoral production system in the Horn of Africa are facing a myriad of problems among them climatic, environmental, economic, and socio-political challenges. The increasing climate extremes witnessed in the region adds another layer to problems that are already compounded by low adaptive capacity and sensitivity to the projected changes (IPCC, 2007). The broad picture is of pastoral and agro-pastoral systems characterized by drought, food insecurity and low human development index, with the finger of blame pointed at, among other factors, the changing climate, environmental degradation, population pressure and political and economic marginalization.

Food insecurity and loss of resilience of the pastoral and agro-pastoral livelihoods are linked to the recurring losses attributed to scarcity of pasture and water resources arising from climatic extremes, socio-economic and ecological change dynamics. According to the 5th synthesis report of Intergovernmental Panel on Climate Change (IPCC) (2014), floods, droughts and changes in seasonal rainfall patterns are expected to negatively impact food security and livelihoods in the vulnerable areas, especially the drylands. Drought is considered a critical risk given the extensive drylands in Africa, especially in regions that are projected to become drier due to climate change, such as the north and east and southern Africa. The report shows that increased water scarcity during dry periods would also decrease the availability of feed resources for livestock in East Africa. Livestock being the main source of livelihood in the drylands, innovative approaches towards securing fodder production should therefore be at the core of attempts to build resilience of pastoral and agro-pastoral systems. The pastoral and agro-pastoral communities in the drylands of Kenya are responding to the problem of recurrent droughts and the accompanying feed scarcity by adopting fodder production not only as a source of feed for livestock during periods of scarcity, but also as a means of rehabilitating the degraded environments, and as a complementary source of income. However, this trend calls for research to specifically inform selection and breeding of grass species suitable for the drylands; identification of species that require conservation; identification of the best agronomic and post harvest technologies; and market decisions. This will guide the government and development agencies in targeting entry points for developing and strengthening fodder production, as well as exploring opportunities to ensure efficiency and sustainability of the value chain.

The on-going research project implemented by the University of Nairobi (UoN), with support from the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), aims to inform development and upscaling of fodder production in the ASALs by evaluating the productivity and nutritional quality of priority grass ecotypes, and analyzing the fodder value chain in the drylands of southern Kenya. This paper presents a summary of the project.

Fodder production as an adaptation to drought in the drylands. Livestock is a key asset for fulfilling multiple economic, social and risk management functions particularly for the majority of the rural populace in pastoral Africa. However, these low-external input livestock production systems in the drylands are facing a number of challenges associated with the climate and environmental variability, among other factors. The impact of climate variability and change is expected to heighten the vulnerability of livestock systems and to reinforce existing constraints to the systems such as rapid rise in human population, land degradation, diminishing grazing land, and conflict over scarce resources. The major consequences of drought on pastoral livelihoods are pasture and water scarcity that consequently leads to livestock losses and conflicts over resources. Lack of grazing resources often results in loss of livestock productivity and eventual impoverishment of pastoral and agro-pastoral households. For such communities, losing livestock assets could trigger a collapse into chronic poverty that has a long term effect on livelihoods.

In Kenya, fodder production is mainly practiced by pastoral and agro-pastoral communities with the aim of increasing households' resilience to drought. The experiences from the severe droughts of 2009 and 2011 has motivated the communities living in the ASALs to engage in fodder production, which besides being an effective mechanism for coping with fodder scarcity, offers opportunity to diversify sources of income. Fodder production has significant positive impact on livestock productivity, income and food security, and therefore a potential livelihood diversification pathway for enhancing pastoralist households' resilience against drought. As indicated by Lugusa *et al.* (2016), fodder production through range reseeding has also been used successfully to rehabilitate degraded rangelands and diversify pastoral livelihoods in the drylands of Kenya. Households that practice fodder production are able to earn income from the sale of hay, grass seeds, and leasing out dry-season grazing (Mureithi *et al.*, 2015). Recent studies by Wairore *et al.* (2015) and Mureithi *et al.* (2015) have reported that pastoral households practicing fodder production in the arid and semi-arid Baringo and Turkana Counties of Kenya, benefit by leasing pasture for cash, having dry-season grazing reserves, and obtain improved livestock productivity. Besides the provision of livestock feed and income, in Baringo County, availability of forage throughout the year has been reported to reduce conflicts over grazing resources (Meyerhoff, 2012).

Current state of knowledge on grass species in the drylands of Kenya. Field research trials have demonstrated that *Cenchrus ciliaris*, *Enteropogon macrostachyus*, *Eragrostis superba*, *Chloris roxburghiana*, *Sorghum sudanense*, and *Chloris gayana* are the most appropriate grass species for the ASALs of Kenya (Mnene 2006; Opiyo 2007; Mganga *et al.*, 2010; Ogillo 2010; Ndathi *et al.*, 2012; Machogu 2013; Koech, 2014; Kirwa *et al.*, 2015; Mganga *et al.*, 2015). However, *Cenchrus ciliaris*, *Enteropogon macrostachyus*, and *Eragrostis superba* are the most commonly promoted and cultivated species in the drylands of Kenya. In a study done in the semi-arid rangelands of Makueni County, Kenya by Mganga *et al.* (2010), *Enteropogon macrostachyus* seeds were found to have the highest (85%) viability followed by *Cenchrus ciliaris* (40%) and *Eragrostis superba* (21%). *Cenchrus ciliaris* however had the highest (1026 kg ha⁻¹ of dry matter (DM)) aboveground biomass yield followed by *Eragrostis superba* (896.5 kg ha⁻¹ DM) and *Enteropogon macrostachyus* (744.0 kg ha⁻¹ DM). *Cenchrus ciliaris* has however shown a higher potential for controlling run-off than *Enteropogon macrostachyus* and *Eragrostis superba* (Mganga *et al.*, 2010). In a study conducted by Koech *et al.* (2015), the grasses were found to have varied levels of water stress tolerance. The study found that *Sorghum sudanense* and *Chloris gayana* have higher quality ratings and water use efficiency than the most preferred species (*Cenchrus ciliaris*, *Enteropogon macrostachyus*, and *Eragrostis superba*, and *Chloris roxburghiana*). Koech (2014) however reported varied nutritional quality of the species, with *Chloris roxburghiana*, *Eragrostis superba*, *Enteropogon macrostachyus* and *Cenchrus ciliaris* having relatively the same level of crude protein at the peak of their growth (week 12).

Despite the enormous research already done on the common grass species, a recent study by Kirwa *et al.* (2015) has revealed that these species actually have several ecotypes with

varying ecological requirements, as well as preference by the communities. Given the spatial and temporal heterogeneity of the dryland ecosystems, the performance of these species is likely to vary with location and season, and the preference of the communities too is expected to vary from one location to the other. This calls for further research to screen the various grass ecotypes to determine the preferred species, their productive capacity, nutritional quality, as well as drought and grazing tolerance. However, determination of performance of grass species alone is not enough to inform development of a sustainable fodder value chain. Moreover very little attention has been given to the analysis of the fodder production practices and marketing in the Kenya. The only study on fodder value chain in the drylands of Kenya was carried out by Lugusa *et al.* (2016) in Baringo County. The study revealed varying production practices, and a value chain mostly controlled by the service providers therefore denying the producers opportunity to explore external markets that offer better prices for hay and grass seed. These findings may however not apply to other areas as market structure is expected to vary depending on the actors and level and nature of interaction with local and external markets. Understanding fodder market would help build strong and reliable market linkages for fodder producers. Location-specific analysis of the fodder value chain is therefore crucial for targeting appropriate interventions aimed at enhancing efficiency and sustainability of the value chain.

The current research project “Fodder production for enhanced pastoral and agro-pastoral resilience in the drylands of Southern Kenya” was conceived against the foregoing background with the aim of guiding the development and out-scaling of fodder production in the drylands of Kenya. It is a participatory research project involving the principal investigator, graduate students and their supervisors from the University of Nairobi, working in partnership with Kenya Agricultural and Livestock Research Organization (KALRO) and fodder farmers in southern Kenya. The project compliments the County Governments’ efforts of improving livestock production and diversifying pastoral and agro-pastoral livelihoods, as indicated in the County Integrated Development Plans (CIDP) for both Makueni and Kajiado (ROK, 2013a and ROK, 2013b). Most of the farmers involved in the project are those already working with the KALRO and respective County Governments in fodder bulking and development of seed system in the region.

Conclusion

Fodder production is increasingly being adopted by communities in the dryland of Kenya, and has already shown potential for enhancing resilience of pastoral and agro-pastoral systems against drought. However, there exist knowledge gaps that call for research to inform, among others, selection of suitable grass ecotypes for the drylands, as well as best production and marketing practices to achieve efficiency in the fodder value chain and therefore feed security in the ASALs.

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