

Climate adaptation partnerships for enhanced adaptive capacity: The case of fodder production among the communities in the lower Eastern Kenya

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Abstract

Crop and livestock production are major subsectors of agriculture upon which most rural households in Kenya depend for their livelihoods. However, these subsectors are the most affected by climate variability and change, especially in the dry lands. Drought which is one of the major manifestations of climate change has become more common and frequent with adverse effects, leading to massive crop failures and livestock mortalities. Various stakeholders and institutions have been involved in a number of multi-sectoral and multi-disciplinary programs aimed at enhancing adaptation to climate change among the local communities particularly in the dry lands of Kenya. A desktop based study was adopted for in-depth literature review to evaluate partnerships that various stakeholders and institutions have adopted and how they have impacted adaptation to climate change in Kibwezi sub-county, in the lower eastern dry lands of Kenya. This study found that the local community members, KALRO, FAO of the United Nations, and the national and county governments have collaborated and partnered at various levels in not only to enhance fodder production and marketing for improved spatial-temporal availability of pastures for livestock but also as an alternative source of income through the sale of hay and grass seeds. This intervention will enhance adoption of fodder technologies and productivity.

Keywords: *adaptation, climate change, fodder production, marketing, partnerships*

Introduction

Climate adaptation partnerships focuses on adaptation to impacts of climate change in order to facilitate response through collaboration and partnerships with diverse organisations and stakeholders. IPCC (2001) define adaptation as adjustment in natural or human systems responding to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Within adaptation are many possible responses such as change in crop and fodder management practices, choice of fields, planting dates, crop varieties, livestock feeding and health (Bryan, *et al*, 2011).

Dealing with climate change adaptation is for the present, as impacts of changing climate often demand immediate response. Studies done by the Centre for European policy studies (CEPS, 2008) on adaptation to climate change underscored the usefulness of adaptation policy and how to implement it. The results showed that economic impacts of climate change are reduced by adaptation, and in some cases, adaptation was seen to lessen the impacts or turn climate change into an opportunity with a positive outcome.

With regards to effective adaptation approaches, Clements *et al.* (2009) identified two approaches through which adaptation is executable namely: - responding to impacts of climate change or reducing vulnerability to it.

Key component of adaptation is involvement of local community in assessing their own climatic situations and needs and includes location-specific options that help people and ecosystems reduce their vulnerability to minimize the costs of natural disasters (Clements *et al.*, 2009; Calvosa *et al.*, 2009). The adaptation strategies are developed to reduce poverty, diversify livelihoods and empower local people to manage their own vulnerability.

Notably, Reeds(2006) recommends the process such as careful analysis on the adaptation strategies that exist, fortifying policies through awareness creation, strengthening institutions, natural resources management, funding, viable adaptation strategies choices and stakeholders' involvement. Such process is important because unlike mitigation, adaptation is location-specific and provides direct benefits at the local and regional levels.

Dryland farmers more often than not engage in autonomous adaptation whose costs and benefits are too unclear to inform subsequent adaptation and policy direction.

The agricultural subsector accounts for about 26% of total national agricultural production – second largest after crop production. In relation to this, livestock production has been practiced by ASAL communities for decades as a major source of livelihood providing more than 90% of livelihood to the local communities (GoK, 2005).

However, climate variability and change has in the recent past posed serious challenges to this key means of livelihood. Communities in these areas have become more vulnerable and less reliable due to the effects of climate change, mainly droughts which have become more frequent with more devastating effects (Osbahe and Viner, 2006; Orindi *et al.*, 2007; IPCC, 2014). The situation is compounded by demographic factors such as growing human population which is higher in the developing world, as well as the land use changes, for example expansion of urban centers into formally agricultural areas (Wasonga, 2009). These occurrences have rendered pastoral and agro-pastoral production practices less practicable and unreliable for livelihoods among the communities living in the drylands of Kenya (Omollo *et al.*, 2018).

The Government of Kenya in collaboration with community based-organizations, county and national governments, private sectors, and non-governmental organizations have developed and implemented innovative development programs. This necessitated uptake and sustained use of development innovations require multi-sectoral and multi-disciplinary engagements in order to consolidate both financial and technical resources (Orindi *et al.*, 2007). These development strategies target to create sustainable ways to enhance the adaptive capacity and resilience of a majority of vulnerable households, particularly in rural setups that are more dependent on smallholder agriculture – crop production and livestock production.

In southern dry lands of Kenya, for instance, fodder production technologies have been developed by the Kenya Agricultural and Livestock Research Organization (KALRO). This aimed at addressing perennial scarcity of livestock feeds especially during the dry periods, as well as to provide an alternative means of livelihoods through the sale of hay and grass seed (Mnene 2004; Kidake *et al.*, 2017).

This innovative program is multi-sectoral – requires both technical support and capacity on production practices, as well as market access for the produce. This, for example, shows the roles of government to provide enabling environment to access production inputs and marketing facilities for the producers.

Additionally, Omollo *et al* (2017) indicates that fodder production and marketing in these areas is influenced by a wide range of stakeholders who have significant and compounding roles.

Rationale of the study

The government of Kenya working with development agencies have invented and implemented several innovative interventions to address the challenges that result from climate change in the ASAL regions. The interventions have taken an approach of diversifying livelihoods as a way of reducing over dependence on livestock production, while others have been focused at increasing and stabilizing livestock production especially in the dry seasons (Mnene *et al.*, 1999; Omollo *et al.*, 2017). In the southern dry lands of Kenya, fodder production was introduced to the pastoral and agro-pastoral communities in order to enhance pasture availability and access especially in the dry season. This approach has also been identified to have high potential of providing alternative livelihood for the locals through market-oriented hay and grass seed production (Omollo *et al.*, 2017).

For instance, Omollo *et al* (2017) conducted a comprehensive fodder value chain analysis in the southern rangelands of Kenya, indicating their economic profitability to the chain actors. Omollo *et al*, (2018) also assessed the factors that determine households' participation in fodder production in the southern rangelands of Kenya as a way to inform policy on which approaches would facilitate uptake and up-scaling of fodder production among the communities living in the drylands of Kenya.

Despite such studies, no studies have been conducted to create empirical information on the existing partnership among the stakeholders and key organization as well as their roles in enhancing contribution of fodder production to the adaptive capacity and resilience of pastoral and agro-pastoral households in such areas. This study aimed at evaluating the current and past partnerships of various participants and stakeholders in adoption and how and how they impacted adaptation to climate change in Kibwezi sub-county in the Lower Easter Kenya.

Objective of the study

The general objective of the study was to assess the climate adaptation partnerships in development projects with the aim of creating an understanding of their roles in enhancing sustainable development among the communities in Kibwezi Sub-County in the Lower Eastern Kenya.

Specific objectives;

- i. To identify existing climate adaptation partnerships in Kibwezi Sub-County in the Lower Eastern Kenya.
- ii. To identify the roles and influences of the climate adaptation partnerships in Kibwezi Sub-County in the Lower Eastern Kenya.

Research question;

What climate adaptation partnership projects exist in Lower Eastern Kenya and how they influence adaptive capacity of the communities in the study area?

Conceptual framework

In any agricultural production and marketing systems, it is key to have a clear understanding of the roles and social-economic outcomes of participating institutions and stakeholders. The roles include governing the utilization and

management resources, those bringing the players together in market exchange, as well as those assisting in enforcement of policies and terms of operation (Dorward *et al.*, 2009). It is key to identify institutions and stakeholders' effectiveness in performing their roles and contribution to the sustainability of the whole production and marketing chain (Dorward *et al.*, 2009). The conceptual framework in Figure 1 provides a unifying structure for the analysis of various institutions and stakeholders with specific interest on their interconnectedness. With specific attention to fodder production and marketing as an intervention to enhance adaptation to climate change, the framework technically reveals the various aspects within which the institutions and stakeholders fall – policy and governance, physical infrastructure and socio-economic elements.

The structure and the behavior of the action domain is not only influenced by the elements within it but also those in the policy and governance, socio-economic and physical infrastructures and indicated in the wider environment. The interactions and interconnectedness between institutions, actors and activities involve actions that lead to outcomes, which is enhanced adaptive capacity to climate change in our case. The four major parts of action domain include institutions, activities, actors and outcomes. In the action domain one would be interested in identifying which institutions, activities, actors, and outcomes are important and their influences. Also, the domain is insightful in knowing the attributes of institutions, activities and actors that are influencing the interactions between them and the wider behaviors in the domain (Dorward *et al.*, 2009).

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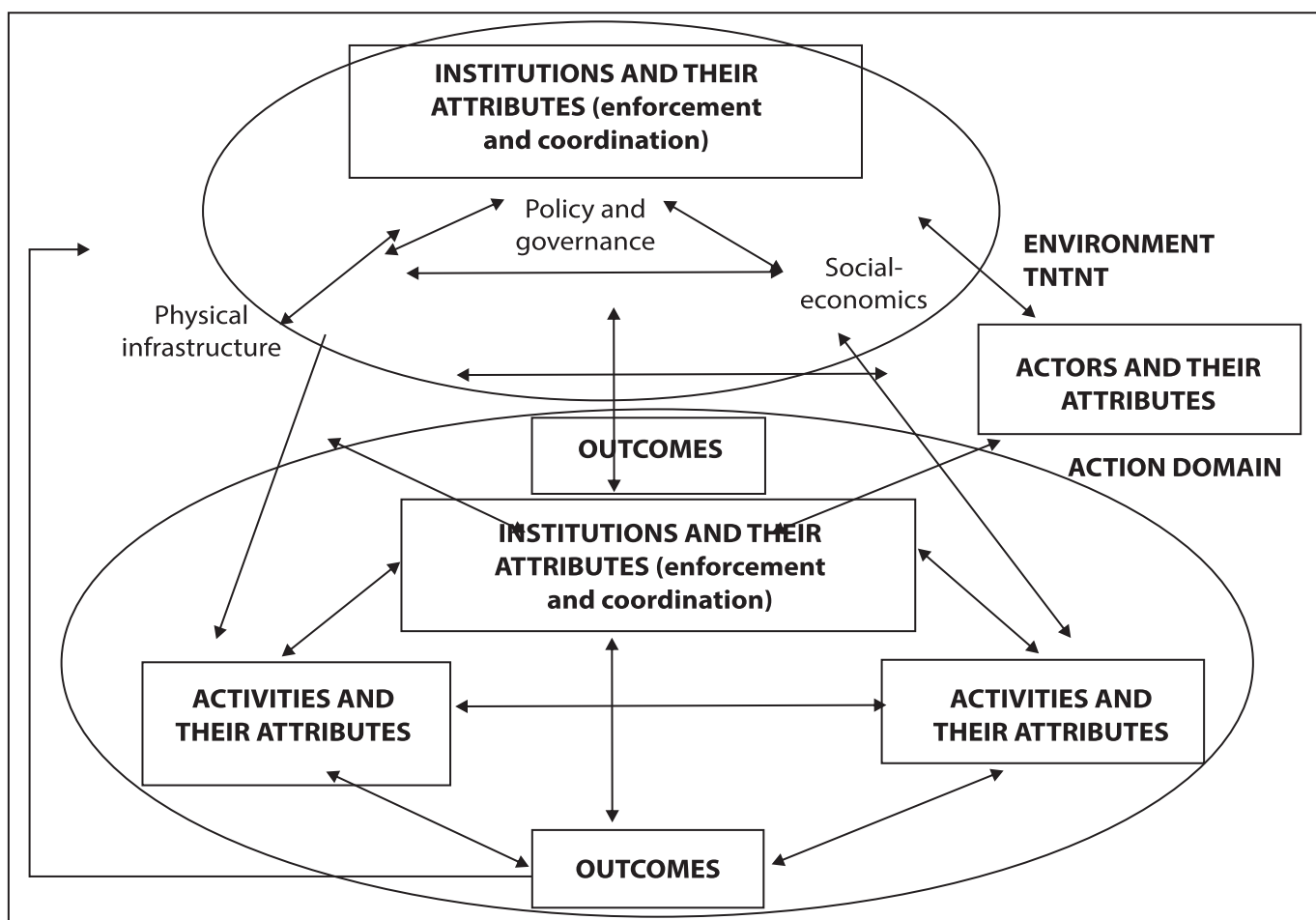


Figure 1: Conceptual framework for institutional analysis

Source: Adopted from Dorward *et al.* (2009)

Methodology

This study was conducted in Kibwezi sub-county located in the Lower Eastern Kenya. The areas experience highly variable and unpredictable rainfall patterns, dry periods and long and frequent droughts typical of ASALs (Gikaba *et al.*, 2014; Amwata *et al.*, 2015). These areas are located a few degrees South of the equator and are thus exposed to strong seasonal and bimodal distribution of rainfall leading to high temporal and spatial variability between the seasons (Mganga *et al.*, 2013).

The area experiences long rains between March and May, and short rains between October and December (Gikaba *et al.*, 2014; Amwata *et al.*, 2015). They receive annual rainfall ranging from 300mm to 1250mm (County Government of Makueni, 2013).

The temperatures range from 12°C to 35°C, depending on the time of day, season and topography (Berger, 1993; County Government of Makueni, 2013; Gikaba *et al.*, 2014). There is a wide diversity of vegetation in the study areas, which arise from heterogeneity of soil types and rainfall patterns and amounts and other climatic factors (Kidake *et al.*, 2016). The main soils in the area include Ferrasols, Cambisols and Luvisols attributed to strong surface-sealing characteristics that lead to run-offs when heavy rains occur. The vegetation mainly comprise *Commiphora* and *Acacia* species and related genera notably of shrubby species, with dominant grasses being *Cenchrus ciliaris*, *Eragrostis superba*, *Chloris roxburghiana* and *Enteropogon macrostachyus* (Mganga *et al.*, 2013).

Majority of the people living in Makueni County are agro-pastoralists belonging to the Akamba ethnic community, (Gikaba *et al.*, 2014; Mganga *et al.*, 2013). Livestock production is the main source of livelihood in the area (Mganga *et al.*, 2013).

Majority of the households in the sub-county are also small-holder subsistence farmers and/or livestock keepers who depend on rainfall for their livelihoods (Amwata *et al.*, 2015). The main food crops produced in the County are maize, green grams, pigeon peas and sorghum (County Government of Makueni, 2013).

This was a desktop-based study involving literature review. Desktop research is appropriate method because it is used to gather facts and current research data that aids to respond to aspects of the study. The literature review was conducted to gather information on various stakeholder involvement and participation in fodder production projects in Lower Eastern Kenya. The reviewed documents included published peer reviewed papers, research and development reports, donor reports, institutional reports (research and development), academic theses, government (national and county) agricultural and development reports, web-based data sources, among others. The data was collated and analyzed, then used to develop this article.

Findings

Local and international development agencies that have been working in collaboration and partnership on fodder projects include Kenya Agricultural and Livestock Research Organization (KALRO), Food and Agriculture Organization of the United Nations (FAO), Red Cross society of Kenya, Netherlands Development Organization (SNV).

These agencies have provided financial and technical support including startup grass seeds, capacity building for local trainers and farmer groups, and facilitate access to key inputs such as tractors seeds and fertilizers.

The role of such organizations has been significant in promoting the adaptive capacity of various households in the ASALs of Lower Eastern Kenya (Kibwezi subcounty) the target project area for implementing interventions aimed at enhancing livestock production and diversification of livelihoods for the local pastoral and agro-pastoral communities.

The frequency and intensity of drought occurrence has increased significantly over the last one decade with much more negative effects on the livelihoods of the agro-pastoral communities in the Lower Eastern Kenya. To address these challenges, various stakeholders have been working closely with the aim of not only reducing the impacts of climate change but also to upscale the adaptive capacity of the local community through stable and diversified livelihoods (Kidake *et al.*, 2016).

With specific attention to fodder production and marketing as an adaptation strategy, the following stakeholders have put their efforts separately and jointly both financially and technically (Omollo *et al.*, 2017)

The local community members

Households in Kibwezi sub-county have over time developed indigenous ways and approaches to address drought and other disasters within their localities (Orindi *et al.*, 2007). Being agro-pastoralists, they have always kept livestock of different species alongside crop cultivation. They are the main target and at the center of the partnerships.

Following capacity building programs that have been offered by various government and non-governmental organizations, such as KALRO, ASDSP and FAO, such households have adopted fodder production practices and technologies, mainly pasture reseeding and enclosure of natural pastures to allow regeneration (Amwata *et al.*, 2007; Mutua, 2007). The community members have participated in project activities such as demonstration farms, acting as model farms, working as trainers to other farmers and offering their technical indigenous knowledge regarding different grasses and their adaptability and preference (Mnene *et al.*, 2006; Manyeki *et al.*, 2015). Most farmers in the study area have learnt about fodder production and picked up the idea from other farmers.

More particularly, the social groups of farmers have been effective through their platform in reaching out to many households and provided training on fodder production thus enhancing adoption.

Research institutions

The leading research institutions with significant effects on fodder and livestock production in the study area include; KALRO through the Arid Lands Research Institute (ALRI), at Kiboko and the University of Nairobi through its Kibwezi research station. These institutions have been instrumental on various aspects of fodder and livestock research in influencing adoption of fodder production not only in the study area and other ASAL regions in the country.

KALRO has been working with selected model farmers, extension officer, as well as farmer groups within the sub-county and elsewhere to offer training to the locals on agronomic practices for fodder production. In addition, through the Kenya Arid and Semi-Arid Lands (KASAL) and Arid and Semi-Arid Lands-Agricultural Productivity Research Programs (ASAL-APRP), the Organization has been involved in pasture seed multiplication for the different rangeland grasses (Mnene, 1999; Gitunu *et al.*, 2003; Dolan *et al.*, 2004; Mnene *et al.*, 2006; Manyeki *et al.*, 2013).

These include *Enteropogon macrostachyus* (bush rye), *Eragrostis superba* (Maasai love grass), *Chloris roxburghiana* (horsetail grass) and *Cenchrus ciliaris* (African foxtail grass) which are the main key species for reseeding and pasture improvement in Kenyan rangelands (Kidake *et al.*, 2016). A significant number of households in the study area have embraced pasture production, with reseeding and fencing of natural pastures to allow regeneration being the most adopted technologies (Omollo *et al.*, 2018); thus demonstrating a significant improvement in their livestock production and management especially during the dry periods as they are able to store hay which they then use during the dry period (Omollo *et al.*, 2017).

National and county governments

The national government has facilitated the process of fodder production through policy formulation and the county of Makueni has played a key role in implementation of such policies.

Extension officers in Makueni county play a leading role in the process of creating awareness and capacity building of the local community members on issues of fodder production and marketing (Omollo *et al.*, 2017). Although the marketing of grass seed in Kenya is informal, the government of Kenya through Kenya Plant Health Inspectorate Services (KEPHIS) is at an advance stage of certifying the seeds of range grasses (Manyeki *et al.*, 2013).

Relevant policy documents enacted by the government of Kenya include:

- i. Vision 2030 Development Strategy for Northern Kenya and other Arid Lands of 2012. The document is aimed at complementing and deepening Vision 2030 by explaining how its goals will be realized in the specific context of Northern Kenya and the country's arid and semi-arid lands (GoK, 2012)

- ii. Government of Kenya, Sessional Paper No. 8 of 2012 on National Policy for the Sustainable Development of Northern Kenya and other Arid Lands
- iii. Ministry of Livestock Development, Session Paper No 2 of 2008 on National Livestock Policy
- iv. National Climate Change Response Strategy (NCCRS), 2010
- v. National Climate Change Action Plan (NCCAP) 2013 – 2017
- vi. Agriculture Sector Development Strategy Program (ASDSP) 2010 – 2020
- vii. Draft Kenya Climate Smart Agriculture Strategy, 2017)

The policy documents recognize the role of livestock production in local and national economies as well as indicate the need for interventions that facilitate sustainable exploitation of diverse resource in the ASALs of Kenya, fodder production being one of the major approach (AFIDEP and PAI. 2012; GoK, 2017).

Non-governmental organizations (NGOs)

Some local and international development agencies have been playing fundamental role in facilitating adoption of fodder production and marketing in the study area. For example, the Red Cross Society of Kenya and FAO of the United Nations. These organizations have provided services such as free start up seed to the farmers, training on fodder production agronomic practices, creating marketing links for hay and grass seed. They have been playing a key role of buying grass seed from farmers and distribution to other farmers elsewhere in an effort to facilitate adoption of fodder technologies.

In these processes, they have been working in collaboration with the county government of Makueni, extension officers, as well as farmer social groups (Kidake *et al.*, 2016). Production of good quality pasture seeds depend on good pasture establishment management, harvesting and storage. The training offered by these NGOs on seed quality has helped in producing high quality seeds for range grasses in the ASALs (Mnene *et al.*, 2006). Non-governmental organizations also form important actors of the fodder and pasture value chain in the ASALs. Most of the pasture seed is sold to Government departments and NGOs for distribution to farmers for pasture establishment or reseeded degraded areas.

Private Sector

Private entities such as Rehabilitation of Arid Environments (RAE Trust) (Kidake *et al.*, 2016) are important seed sources for planting and rehabilitating the ASALs. Major commercial fodder producers have depended on input supply from the private sector, especially the grass seed. Kenya Seed Company is the major source of seed, for instance the *Chloris Gayana*, which is the most commercialized grass in Kenya, has available seed in the formal market.

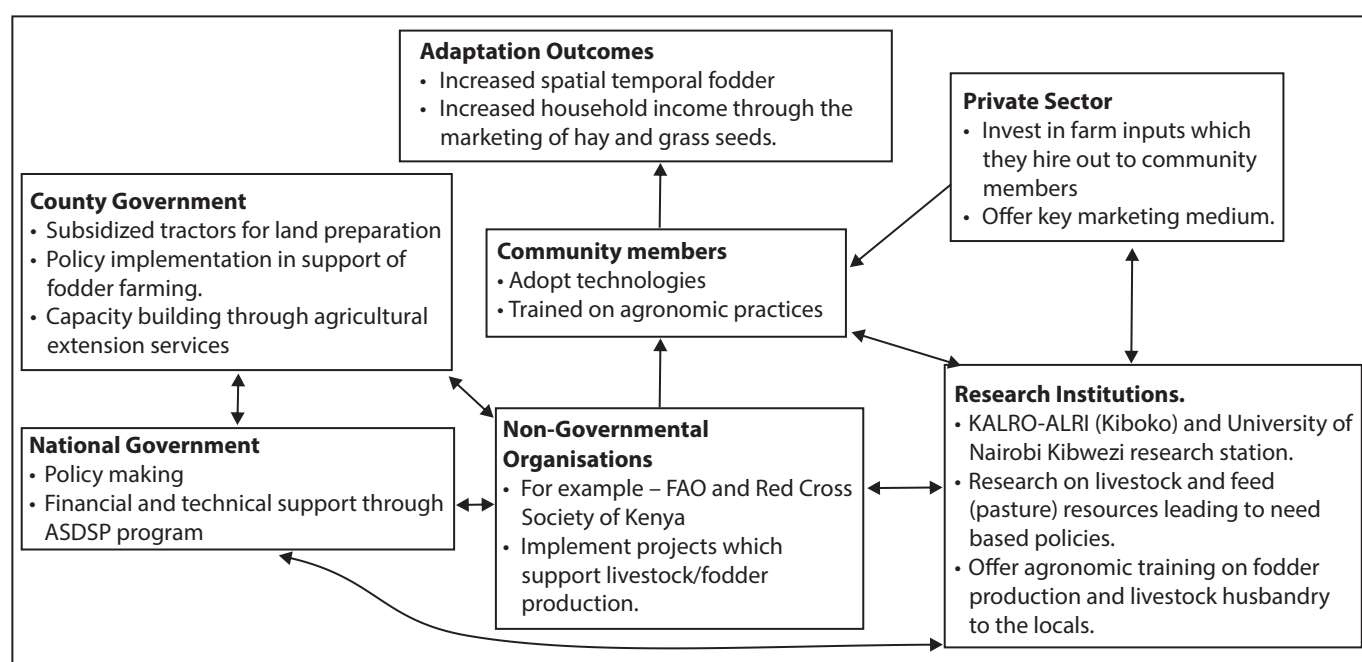


Figure 2: Various stakeholders working on fodder value chain in Kibwezi Sub-county, Kenya

Figure 2 above, demonstrates that collaborative partnerships play a key role in enhancing adaptive capacity in fodder production.

Notably, the community members provide labor and are also recipients of knowledge and technology from research institutions, government institutions, NGO's and private sector in order to attain adaptation outcomes i.e. fodder production, increased income and adaptive capacity.

Conclusions

The Kenya Agricultural and Livestock Research Organization (KALRO) is a key partner for enhanced adaptive capacity in the fodder production and marketing system in the study area. It develops and disseminates technologies and promotion of fodder production among the communities in the area. Other agencies that contribute to the adaptive capacity include government institutions which provide education, information and encourage behavioral change, private sector provides marketing, while NGO's support resource mobilization.

Participation in social groups and access to extension services are the major factors that determine engagement in fodder production by the community members. However, rainfall scarcity, poor seed quality and lack of seed harvesting skills are the main challenges in fodder production partnerships.

Recommendations

To increase adoption of fodder production and enhanced adaptive capacity in the study area, more service providers particularly county government and development agencies should partner with KALRO in providing technical support and capacity building.

This will enhance adaptive capacity thus spreading the benefits to a wider population in the study area and other ASAL regions of Kenya.

The ultimate benefit will be improved livestock production as well as enhanced livelihoods. Promotion of public-private partnership will encourage more service provision in the fodder value chain.

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