Original Research Article

Red meat finishing management strategies and pasture production for drought adaptation as alternative business in Kajiado and Isiolo counties, Kenya

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Abstract

In Isiolo and Kajiado Counties, red meat offers an opportunity for increasing household food, nutrition and income security. KCSAP groups were involved in different finishing management strategies to add value before marketing. Hence this activity focused on determining the economic practicability of the various management practices in order to identify and recommend the most appropriate opportunity.

The broad activity was to conduct economic analysis of finishing management strategies and pasture production as a business in the red meat value chain. The data were collected from 451 households belonging to KCSAP groups Community Interest Groups and Most Venerable Groups (CIGs and VMGs) using semi structured questionnaire. Ten (10) Focus group discussions (FGDs) of 120 participants (30 men and 90 women) within the groups, Eighteen (18) key informant interviews (KIIs) with public and private sector actors.

Priority livestock production constraints in Kajiado were; diseases, pastures, while in Isiolo were; pastures, limited access to water and diseases. Priority livestock technology needs; pasture production technologies. water harvesting, drugs and vaccines.

Fenced plot Management strategies for finishing Sahiwal bulls, zebu cattle and shoats were profitable. Pasture in fenced plots and livestock being confined hence reduced long distances enabled weight. Open grazing management strategies for finishing Sahiwal bulls and shoats was not profitable, degradation of rangelands, spread of transboundary diseases and un-controlled invasive plant species. In Isiolo , land is communally owned hence fenced grazing systems cannot be practiced. Nevertheless, finishing of zebu cattle on hired ranches was practiced in Oldonyiro ward-but may not be sustainable since land privately owned in Laikipia county. Pasture production on a fenced plot as an input in red meat value chain and a business, fencing using locally available materials (acacia thorns), removing invasive plant species, has huge gross margins in a normal rainfall year.

Key words: Cost benefit management strategies and pasture production.

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Introduction

In Isiolo and Kajiado Counties, red meat offers an opportunity for increasing household food, nutrition and income security. However, past interventions have not been successful in delivery of livestock technologies to address perennial constraints due to single organization approach, often each with its own interests (Simon et al., 2014, Thomas et al., 2003, Reyes et al., 2005).

Availability and accessibility to livestock technologies, and information sharing for enhancing red meat production and marketing is a major challenge, despite numerous research and development interventions undertaken in the ASALs (Thomas et al., 2003, Simon et al., 2014).). Productivity and commercialization are constrained by inadequate extension services, long distances to access production inputs like drugs and vaccines, and information (Gelan, 2017) as reported also in other livestock sectors (Mochabo et al., 2022). There is need to determine priority livestock technology needs, establish cost and benefit associated by the inputs and promote availability and access to

technologies, promote information sharing platform. The partnerships between livestock technology providers and Kenya climate Smart Agricultural Production groups (KCSAP) are likely to create more awareness among pastoralists on the types of livestock technologies available from various providers. In order to enhance information sharing such as disease reporting, availability of drugs and vaccines, feeds and feed conservation methods, breed improvement, water technologies, this requires a robust and efficient mechanism in facilitating information flow (Kidali et al., 2023). Development of a mobile platform was thus prioritized for purposes of information sharing among institutions and partners. Increased awareness and access to technologies will be a key adaptation strategy against drought and livestock pests and diseases and market information which often result in loss of livelihoods due to death of livestock.

Materials and Methods

The study was carried out in Kajiado County, Dalalekutuk ward, and in Isiolo County, Oldonyiro and Ngaramara wards.

The study used exploratory study designs to assess the livestock inputs and technologies needs of pastoralists in both Isiolo and Kajiado counties. These were done through obtaining insights from various stakeholders who include: livestock keepers, sub county administration, input suppliers, and other actors in the red meat value chain.

Sample size and sampling

The sample size needed was determined using formula suggested by (Mugenda and Mugenda, 2003) and (Kothari, 2017, Kothari, 2008).

For known target population sizes---------- $n = \frac{N}{1+N\,(e^2)}$

Where n = required sample size, N = Estimated population size, e = Acceptable marginal error, which is 5% or 0.05

The human population for Isiolo Sub-County was estimated to be 88,000, while the number of household is 17,600 (ICIDP, 2018). The human population for Kajiado Central Sub- County where Dalalekutuk ward is located was estimated be 255,000, while the number of household were 33400, (KCDPI, 2018). Hence the total number of households where the study was carried out was 51000. Therefore, using the above formula

For known target population sizes---------- $n = \frac{N}{1+N\,(e^2)}$

The sample size was $51000/1+51000(0.05^{2)} = 400$. The number of households sampled from this population was proportional to the population of the sub-counties.

Therefore, the number of household sampled in Isiolo Sub- County was 17600/51000*400 =138, while in Kajiado Central Sub-County was 33400/51000*400= 262

Data Collection

The study utilized both secondary and primary sources of data and information in the two counties of Kajiado and Isiolo. A Planning meeting was held to introduce the project and sites.

Identification of pastoralists livestock technology needs

Household baseline survey

The semi-structured questionnaires were developed to collect household who were randomly selected among KCSAP groups of the red meat value chain. Focus group discussions and Key informant interviews Ten (FGDs) with a total of 120 participants (30 men and 90 women) were conducted in KCSAP red meat value chain groups, four FGDs in Kajiado and six Isiolo counties Fourteen (KIIs) in Kajiado and Isiolo counties with the following stakeholders: County directors of livestock production-2 and Animal health services providers-3, County KCSAP –coordinator-1, ward administrators-3, area chiefs-3, KCSAP group leaders (CIGs and VMGs) -3, NGOs -3.

Costs and benefits associated with open grazing and fenced grazing finishing strategies for secondary livestock markets.

Focused group discussions and interviews were used to determine costs and benefits associated with open grazing and fenced grazing finishing strategies. Fifteen KCSAP red meat value chain groups were assessed. In Kajiado County, 7 groups were assessed out of which two (2) groups were involved in pasture production as a business to support the red meat value chain (80 members) while 5 groups had pasture for their livestock (52 members). In Isiolo, 8 groups were assessed consisting of Oldonyiro ward (6 read meat groups out of these 2 groups were involved in pasture as a business) while in Ngaramare ward 2 red meat groups were assessed.

Key Informant interviews were conducted among the County directors of livestock and veterinary services, County KCSAP –coordinators, ward administrators, area chiefs, county coordinators and Non-Governmental Organization (NGOs).

Commented [WU4]: Consistency in Terminology: Ensure consistent use of terms such as "KCSAP groups" and "red meat value chain" throughout the section for clarity. Provide a more detailed breakdown of the costs and benefits of grazing strategies, highlighting specific findings from the discussions and interviews.

Data cleaning, analysis

Data collected were cleaned. Quantitative data were analyzed using SPSS Statistics (Version 20)(Statistics, 2013). Proportions and means for Isiolo and Kajiado were compared using Chi-square and t-test at 95% confidence interval ($p < 0.05$). Qualitative data from KII and FGDs were analyzed based on thematic areas.

Results

Livestock constraints

The major priority livestock production constraints in Kajiado were; diseases, pastures, limited access to water and inadequate veterinary services. In Isiolo were; pastures, limited access to water, diseases and inadequate (Table 1). From this study, it showed that livestock production constraints are similar. These constraints are not new and have been persistent for many years. Various studies have found similar constraints(Ndathi et al., 2011, Manyeki et al., 2015, Syomiti et al., 2015, Mbae et al., 2020, Onduso et al., 2020).

Table 1: Livestock Production Constraints

Rank	Kajiado county	Isiolo county
1	Diseases	Pasture
2	Pasture	Water
3	Water	Diseases
4	Inadequate veterinary services	Inadequate veterinary services
5	Poor management of grazing land	Cattle rustling/Insecurity
6	Invasive plant species	Poor management of grazing land
7	Human-wildlife conflict	Invasive plant species

Livestock production constraints

Livestock production constraints in pastoral were lack of prioritization by stakeholders, Inadequate funding for disease control, deployment of veterinary personnel, Lack of business approach to pastoral livestock keeping, dependence-syndrome on external support by pastoralists. Other studies have shown reasons for livestock constraints (Mohamed, 2018, Shanguhyia, 2008, Kidali et al., 2021). Additionally, other studies have shown the service providers such as research institutions and vaccine producers and other relevant livestock service institutions experienced constraints at institutional levels that impacted on the effective animal health management (Kidali, 2020).

Priority livestock technology needs

The priority livestock technology needs by KCSAP groups were identified as shown in Table 2. Based on the priority livestock technology needs the requirement of a public/private partnership was of essence based these needs. Hence a multi-intuitional livestock delivery model was essential.

Table 2: Priority livestock technology needs

1	Technologies on pasture management
2	Water technologies on water harvesting technologies
3	Drugs and vaccines accessibility
4	Training of community disease reporters and Paravets
5	Technologies on how to control invasive plant species
6	Business approaches on low cost finishing strategies for red meat (cattle, goats, steers)
7	Marketing infrastructure e,g holding grounds
8	Training on management of rangelands

Costs and benefits associated with open and fenced grazing finishing strategies for secondary livestock markets.

Open and fenced grazing management finishing system

KCSAP groups were involved in different livestock finishing management strategies to add value before marketing. During FGDs pastoralists estimated the costs and benefits of the two management systems. One-year-old Sahiwal bulls were bought from the market and finished using open grazing system for 12 months before sales. Table 3 shows the inputs and output of the two systems when used to finish 15 Sahiwall bulls. The results indicated that the open grazing finishing management system had negative gross margin. However, pastoralists normally do not quantify nor cost the value of natural pasture. In this analysis, the value for pasture was based on what pastoralists pay when they hire land to graze their animals during the dry season. Fenced plot Management strategies for finishing Sahiwal bulls, zebu cattle and goats and sheep were profitable. Availability of pasture in fenced plots enabled cattle to increase weight faster and at 12 months had a higher market value of approximately KES 70,000. In addition, cattle were confined hence do not move long distances. The findings of this economic analysis revealed that open grazing management strategies for finishing Sahiwal bulls and male goats and sheep ware not profitable. Furthermore, it led to degradation of rangelands, spread of transboundary diseases and un-controlled invasive plant species.

In Isiolo land is communally, fenced grazing systems cannot be practiced. However, five-year-old local zebu bulls were bought and finished on hired ranches for 3 months before sales. This

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system is practiced in Oldonyiro- Isiolo county since the Ward borders Laikipia ranches. The results indicate a positive gross margin though access to pasture is limited to a few.

Table 3: Costs and benefits of open verse fenced grazing

Open grazing system inputs for 15 Sahiwal bull inputs	**12 Month –costs (KES)**	**Fenced grazing finishing inputs (Standing hey for drought adaptation)**	**12 Month – costs (KES)**
Estimated value for 1 year bulls 15@KES 3,500	525,000	Estimated value for 1 year bulls 15* 3,500	525,000
Labour- herding	120,000	Labour- herding	0
Acaricides & labour	36,000	Acaricides plus labour	36,000
Veterinary care services	12,000	Veterinary service care	6,000
Estimated cost of pasture * hire	180,000	Cost of uprooting weeds to manage pasture	35,000
Mineral supplements	1,800	Mineral supplements	1,800
Maturity at 2 years variable costs	**874,800**	Maturity at 2 years variable costs	**653,800**
Output		**Output**	
Stock value 15@50,000 from sales	750,000	Stock value from sales15@5 70,000 from sales	1,050,000
Gross margin = Outputs-Inputs	**-124800**	Gross margin	**396,200**

Pasture production on fenced plot (Harvested natural hay for drought Adaptation)

Harvested natural hay for drought adaptation is a management practice, pastoralists often face drought during dry seasons, therefore this management practice is to enable pastoralists produce pasture for business and feeding their livestock as an adaptation strategy against drought. During drought pastoralists do not conserve pasture but this technology will enable them. to harvest about 300 bales for 2 seasons in normal year.

Pasture production as an input in red meat value chain, ten acres of land are fenced with local materials (acacia thorns) and other shrubs. Invasive plant species and unwanted shrubs are removed. The fenced plot is left for about 3 months for natural grass to grow then harvested. Results indicated that pasture production as business for input in the red meat has huge gross margins of KES 626,000 in a normal rainfall year. Hence pasture production on fenced plots is profitable and adaptation strategy which ensures that pastoralists have pasture during dry season for livestock and market therefore negates the effects of climate change.

Table 4: Harvested natural hay for drought Adaptation – A management practice
- Management Practice

Pasture production			
Inputs	**No of units**	**Unit cost (Kes)**	Amount (Kes)
Land preparation- fencing with thorns	10	2000	20000
Removal of	10	1500	15000
Sisal twine	10	900	9000
Hire hay harvester motorized	2	25000	50000
Fuel for harvester (litres)	200	140	28000
Baling and transportation to store- labour	2000	50	100000
Construction of hay store with iron sheets	1	50000	50000
Baling boxes	5	3000	15000
Total Value Cost			**287000**
Output(10*200*300)	2000	300	**600000**
Gross Margin (1 season)			**313000**
GM 2 seasons			**626000**

Standing hay for drought adaptation
Standing hay for drought adaptation is a management practice which involves pastoralists fencing part of the land, remove weeds and shrubs in order to allow pastures grow. Livestock are introduced to graze on fenced pasture paddocks on rotational basis. This management practice i enable pastoralists produce enough standing hay for their livestock as an adaptation strategy against drought, it enhances livestock productivity –growth, body weight and market value hence providing pastoralists with an adaptation practice against climatic changes.

Discussion
The livestock production constraints are similar and not new as reported by past studies in pastoral production systems (Kidali, et al 2023.; Onduso et al.2020.; Ndathi et al.2011.; Manyeki et al.2015.; Syomiti et al.2015.; Mbae et al 2020.)**.** The diseases in two counties are similar, broadly categorized into endemic and transboundary diseases, similar findings reported diseases as number one constraint affecting goat production (Kidali et al 2023.; Kipronoh, et al.2015). Livestock production constraints were Lack of prioritization by stakeholders, Inadequate funding for disease control and Lack of business approach to pastoral livestock keeping (Table 3). Other studies have shown livestock constraints persistence reasons (Mohamed, 2018, Shanguhyia, 2008, Kidali et al., 2021, Kidali, 2020).
Pastoralists estimated the costs and benefits of the two management systems, in which open grazing finishing management system had negative gross margin. Fenced plot Management strategies for finishing was profitable. In Isiolo County, land is communally owned hence fenced grazing systems cannot be practiced.
Pasture production in a ten acres of land are fenced with local materials, results indicated that a huge gross margins of KES 626,000 in a normal rainfall year.

Some of the VMGs have physical challenges, Standing hay for drought adaptation as a management practices were conducive because it saves on labour for herding and able to monitor their animals since they graze in restricted paddocks

Conclusion

The findings of this economic analysis reveal that open grazing management strategies for finishing Sahiwal bulls and male shoats was not profitable. Additionally, it leads to degradation of rangelands, spread of transboundary diseases and un- controlled invasive plant species.

Fenced plot Management strategies for finishing Sahiwal bulls, zebu cattle and shoats were profitable. Finishing strategies of zebu cattle on hired ranches practiced in Oldonyiro Isiolo County though profitable may not be sustainable since large number of pastoralists cannot access because it is privately owned.

Pasture production as an additional enterprise and input to support the red meat value groups was more profitable business compared to cattle and shoats rearing business alone.

Standing hay for drought adaptation enable pastoralists produce enough standing hay for their livestock as an adaptation strategy against climate changes such as drought hence enhances livestock productivity.

Recommendations

i. Finishing management strategy using fenced plots system has improved natural resource management (NRM) which leads to availability of pasture hence faster animal growth and weight gain leading to high value at marketing.
ii. Production of pasture on fenced plot (Harvested natural hay for drought Adaptation) as an input to strengthen red meat value chain enhances resilience against drought by practicing pastoralists who now become sedentary unlike those in other groups who either lost animals during the dry season or had to migrate long distances in search of pasture.
iii. Harvested natural hay enables pastoralists (Men, women, VMGs and children) not travel long distances with livestock in search of pastures, saving time for other chores.
iv. Harvested natural hay for drought adaptation enhances income and livestock productivity thus enabling VMGs to have food and nutrition security and saves labour.
v. Standing hay for drought adaptation enables men, women and youth to save labor since for not travelling long distances in search of pastures.

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