



**ENVIRONMENTAL DETERMINANTS OF CHOICE OF SUSTAINABILITY
STRATEGIES ADOPTED BY GROUP RANCHES IN SAMBURU COUNTY, KENYA**

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ABSTRACT

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The group ranch system is one of the best land ownership and livestock production strategies in the dry lands of the world where the potential for rain-fed agriculture is limited. This has resulted in numerous studies on the establishment of group ranches, their dissolution and coping strategies but with less focus on the sustainability of the group ranches. It is against this background that this study investigated environmental characteristics influencing choice of sustainability strategies adopted by group ranches in Samburu County, Kenya. The investigation adopted a descriptive survey research design employing use of Questionnaires, Key Informant Interviews, Focus Group Discussions and observation as primary data collection methods. The study used content validity and Cronbach's alpha methods to measure validity and reliability of the research instruments, respectively. The target population for the study was the 16,611 registered members in 38 group ranches spread out in the County. The study sampled twelve group ranches with approximately 5,643 members from which 374 respondents were systematically sampled. Purposive sampling was used to select Key Informants and the participants in the Focus Group Discussions. The study employed Multi-linear Regression to analyse environmental characteristics determining choice of sustainability strategies. The Analysis of Variance (ANOVA) was used to test the hypothesis and p-value of 0.00 was obtained, indicating that environmental characteristics significantly determined choice of sustainability strategies adopted by group ranches in the County. Overall, rainfall patterns were the predominating environmental characteristic with a regression coefficient of 0.317 while diseases had the least influence on choice of sustainability strategies adopted by group ranches in Samburu County, with a regression coefficient of 0.029. The study recommended integration of environmental characteristics in formulating policies for sustainability of group ranches.

Key words: Environmental determinants, Environmental characteristics, ranching, choice, sustainability strategies, group ranches, Samburu County.

INTRODUCTION

Ranching is the practice of raising livestock on large tracts of land and occurs mostly in the climatically marginalized rangelands where potential for rain-fed agriculture is limited due to environmental challenges (Huho *et al.*, 2010; Hatfield & Davies, 2006). It is the main land-use in the rangeland ecosystems the world over (Hussey, 2010) and a livestock production system that is practised by over 200 million people worldwide (United Nations Environment Programme [UNEP], 2015). In Kenya, ranching remains the best sustainable production system in the semi-arid and arid lands (ASALs) with considerable cultural, economic and ecological importance. Sustained ranching in the rangelands is therefore critical in uplifting the living standards of the ranching communities as well as generating rapid economic growth (Ntiati, 2002).

The group ranch system of land ownership and livestock production was introduced in the late 1960s and early 1970s in the ASALs of Kenya to promote commercial ranching and to secure communal land rights. This was after it had been realized that the ecology of the rangelands favoured communal land ownership in form of group ranches instead of individual land ownership. This allowed mobility of livestock in search of pasture and water within the group ranches and their neighbours (Mule, 2010). Group ranches were the main sources of livelihood in Samburu County providing about 90 per cent of employment and more than 95 per cent of family incomes (Food and Agriculture Organization [FAO], 2004). Besides, they provided livestock for cultural and religious roles like dowry payment, symbol of prosperity and prestige (Noor *et al.*, 2013). However, by the 1980s most of the group ranches had dissolved and sub-divided into very small land holdings that were ecologically and economically unviable for ranching (Mule, 2010). This coupled with mismanagement practices, left members staring at economic ruin (Masharen, 2015) hence raising questions about the future of group ranches in Kenya (Gaitho, 2014; Veit, 2011). It is against this background that this study investigated the environmental factors that determined choice of sustainability strategies adopted by group ranches in Samburu County, Kenya. Sustainability in this study refers to holding together (without dissolving and sub-dividing) of group ranches in Samburu County.

OBJECTIVE OF THE STUDY

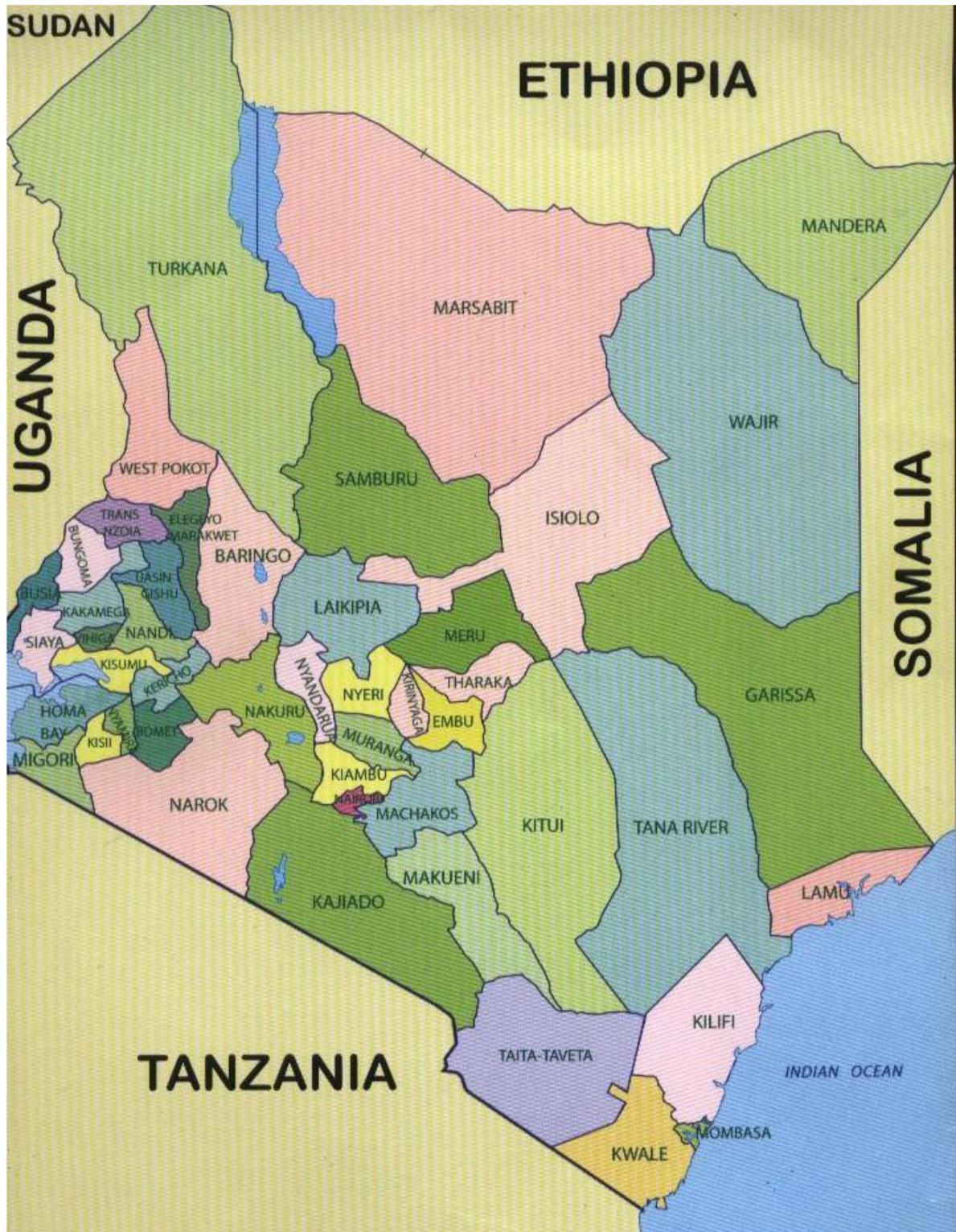
The objective of the study was to determine environmental characteristics influencing choice of sustainability strategies adopted by group ranches in Samburu County, Kenya.

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STUDY AREA AND METHODOLOGY

The study was carried out in Samburu County, Kenya. The County is located in the northern part of the great rift valley within the ASALs of Kenya, about 300km north of Nairobi. It borders Turkana County to the North West, Baringo County to the South West; Marsabit County to the North East, Isiolo County to the East and Laikipia County to the South. Climatically, Samburu County is hot, dry with cool nights with an average annual maximum temperature of 30°C and minimum annual temperature of 20°C. It receives between 150 and 750 mm of rainfall annually, concentrated in two rainy seasons in March, April and May (MAM) and September, October, November (SON). The highland areas receive additional rainfall in July and August. The long rains are usually received between March and May

Location of Samburu County



Source: www.mapsoftheworld.com

The methods used for data collection included Questionnaires, Key Informant Interviews, Focus Group Discussions and Observations. The validity of the research instruments was determined using content validity method that measures the extent to which an instrument provides adequate coverage of the topic under study while the reliability of the research

instruments was determined using Cronbach's alpha method. During the survey, a total of 374 members of group ranches, out of a population of 16,611 members, were interviewed. The study distributed 374 questionnaires out of which 350 were filled and returned while 12 questionnaires were never returned, giving a response rate 93.6 per cent. The data was analysed using SPSS version 21.0 and complemented by Microsoft Excel. The following regression model was fitted to describe the statistical relationship between the independent variables (droughts, rainfall patterns, temperatures, diseases, floods) and the dependent variable (choice of sustainability strategies): $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + e$. Analysis of Variance (ANOVA) was used to test the hypothesis which stated that environmental characteristics had no significant influence on choice of sustainability strategies adopted by group ranches in Samburu County, Kenya.

RESULTS

Environmental Characteristics and Choice of sustainability strategies

Environmental characteristics investigated were rainfall patterns, temperatures, droughts, diseases and floods. Rainfall patterns had the greatest influence on choice of sustainability

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strategies adopted by group ranches in Samburu County, accounting for 42 per cent. It was followed by droughts at 24 per cent. The combined influence of rainfall patterns, temperatures and droughts accounted for 18 per cent. Diseases accounted for 0.3 per cent and floods at 0.3 per cent.

Influence of environmental characteristics on choice of sustainability strategies

Environmental Characteristics	Frequency	Percentage
Rainfall patterns	148	42
Temperatures	6	1.7
Droughts	83	24
Diseases	1	0.3
Floods	1	0.3
Rainfall patterns and Temperatures	21	6.0
Rainfall patterns , Temperatures and Droughts	63	18.0
Rainfall patterns , Temperatures , Droughts and Diseases	16	4.6
Rainfall patterns, Temperatures, Droughts, Diseases , Floods	11	3.1
Total	350	100

The results revealed that rainfall patterns and droughts were the main environmental characteristics that influenced choice of sustainability strategies. Diseases, floods and temperatures had the least influence on choice of sustainability strategies adopted by group ranches in Samburu County.

Regression analysis

The relationship between independent variables (droughts, rainfall patterns, temperatures, diseases, floods) and dependent variable (choice of sustainability strategies) was described by use of the following regression model: $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + e$. Where, Y=

Choice of sustainability strategies; X_1 = Droughts; X_2 = Rainfall patterns; X_3 = Temperatures; X_4 = Diseases; and X_5 = Floods (Table 2). The results indicated that rainfall patterns had the greatest influence on choice of sustainability strategies with a regression coefficient of 0.317. It was closely followed by droughts, 0.225; temperatures, 0.200; floods, 0.029 and diseases, 0.196, in that order.

Regression Coefficients for environmental characteristics

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.135	0.024		-5.601	0.000
Droughts	0.225	0.006	0.189	39.908	0.000
Rainfall patterns	0.317	0.005	0.279	59.384	0.000
1 Temperatures	0.200	0.001	0.851	195.601	0.000
Diseases	0.029	0.007	0.019	4.093	0.000
Floods	0.196	0.007	0.126	26.595	0.000

- Dependent Variable: Choice of Sustainability Strategies
- Independent Variables: Droughts, rainfall patterns, temperatures, diseases and floods

The model indicates that when environmental characteristics (rainfall patterns, temperatures, droughts, floods and diseases) were at zero, choice of sustainability strategies was at 0.135. This means that when other factors were held constant, a unit change in droughts resulted in a 0.225 unit change in choice of sustainability strategies like livestock mobility. For example, the study established that during droughts, the ranchers were forced to drive their livestock to areas with pasturage and water. Similarly, holding floods, diseases and droughts constant, a unit change in rainfall patterns resulted in a 0.317 unit change in the choice of sustainability strategies like conservation. For example, a unit change in rainfall patterns resulted in a 0.317

unit change in establishment of a conservancy to conserve wildlife and to protect group ranches from intruders. The model further indicates that holding other factors constant, a unit change in temperatures led to a 0.200 unit change in choice of sustainability strategies. For example, herders constructed shelters to protect their livestock, especially kids, from the

effects of high temperatures. Finally, the study established that a unit change in diseases resulted in a 0.029 unit change in choice of strategies like veterinary services while holding other characteristics, constant, a unit change in floods led to a 0.196 unit change in the choice of sustainability strategies such as keeping off livestock from the flood prone sections of the group ranch.

Testing of Hypothesis

The Analysis of variance (ANOVA) was used to test the null hypothesis which stated that environmental characteristics had no significant influence on choice of sustainability strategies adopted by group ranches in Samburu County, Kenya.

Analysis of Variance (ANOVA)

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	428.210	5	85.642	10881.463	0.000 ^b
Residual	2.707	344	0.008		
Total	430.917	349			

Dependent Variable: Choice of Sustainability Strategies

Predictors: (Constant), Diseases, Temperatures, Droughts, Rainfall patterns and floods

The study established a significance value of $p= 0.000$ which was less than 0.05. The null hypothesis was therefore rejected and the alternative hypothesis, which stated that environmental characteristics significantly influenced the choice of sustainability strategies adopted by group ranches in Samburu County, Kenya, was accepted.

Sustainability strategies

A growing trend toward subdivision of group ranches into individual land holdings was evident in many of the group ranches in Kenya, Samburu County not being an exemption.

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However, the rate of subdivision was relatively lower in Samburu County compared to many other counties with most the group ranches in the County being sustained. The sustainability of the group ranches was affected by various social, economic and environmental factors. As a result, the choices of sustainability strategies were dependent on the causes of the dissolution. Sustainability strategies refer to the practices adopted by group ranches to hold together (without dissolving and sub-dividing) the group ranches for the present and future generations. With regards to environmental characteristics, the survival of group ranches dependent on the following adopted strategies:

i. Migration

During droughts, the ranchers were forced to drive their livestock to areas with pasturage and water especially in the highlands of Mathews Mountains in Wamba. In addition, livestock were let to roam over the extensive areas within and outside the County in search of pasture and water. Migration patterns within the County included the following: from Girgir group ranch to Losesia group ranch; from Samburu East to Samburu Central, that was Lodogokwe, Kirimun, Kanampiu; Baragoi to Marti; Masikita to Suyani; Nachola to Lomeroko, Turkana border; Tuum to Mt. Nyiro in Samburu North; Wamba to Laresoro; and Lorroki lowland towards Kirisia hills in Samburu Central. Migration patterns outside Samburu County included: from Samburu East Sub County to Laikipia North Sub-County; Merille area in Marsabit County; and Merti area in Isiolo County. It was established that livestock migration was often preceded by scouts who moved ahead of the livestock to assess the resource availability and quality, and to collect information on the grazing potentials of the area to which the livestock were moving. This strategy ensured that livestock got adequate pastures, accessed water supplies, avoided overgrazing, and also avoided disease-carrying insects in some instances. Hence, stock mobility increased resilience of livestock to adverse climatic conditions reducing the risks of livestock mortality. The survival of livestock had a direct bearing on the sustainability of group ranches because livestock keeping was the main

livelihood activity among the group ranchers. Therefore, reduction of livestock losses held the fabrics of group ranches together lowering the rates of group ranch dissolution.

Page | 162 *ii. Herd Maximization and Diversification*

Herd maximization strategy entailed keeping as many animals as possible to ensure their survival despite losses incurred during adverse environmental conditions. Given the unpredictable exposure of livestock to harsh environmental conditions, group ranches in the County also adopted diversification of livestock types and breeds. The strategy involved combining different livestock types such as cattle, goats, sheep, donkeys, camels, indigenous chicken and commercial chicken under the same management. This provided a wider variety of livestock products. Furthermore, different animal species enabled the ranchers to efficiently use available pasture resources as different species had non-competitive grazing and browsing habits. Different animal types and breeds are affected differently by harsh climates with some being more resilient than others. Rearing different type of stock acted as an insurance against adverse environmental shocks cushioning the ranchers against huge livestock losses.

iii. Herd dispersion

Interview with the members of group ranches revealed that during adverse environmental conditions, they separated and moved their livestock to areas of different ecological zones. The strategy entailed dividing stock into two or more herding units or splitting whole households between two neighborhoods. It also involved spreading one's livestock to several localities to counteract localized risks of livestock losses due to environmental conditions and also reducing competition among herds for forage and water resources, optimizing pasture use. For instance, members living in the lower parts of Mbaringoni group ranch dispersed their livestock to the upper parts of the group in search of pasture. The strategy was common to many group ranches in the county.

iv. Establishment of feed reserves

Another strategy adopted by group ranches in Samburu County to counter the effects of environmentally related shocks was the reservation of rich-patch vegetation (feed reserves). During the wet seasons the ranchers set aside grazing areas for use as a "bank" during the

droughts or dry seasons. The strategy allowed regeneration of grass and other palatable vegetation suitable for grazing livestock during droughts. For instance, members of Girgir group ranch reserved areas along Ewaso Nyiro River for use during droughts.

v. Formation of alliances with neighbors

Interview with the ranchers revealed that during favorable environmental conditions, grazing in the County was confined within the group ranches. However, the ranchers had formed alliances with other ranchers outside their group ranches from whose rangelands, they grazed during droughts after the exhaustion of pasture in their feed reserves. For instances, members of Tinga group ranch had a special arrangement with Suguta Marmur group ranchers. The arrangement was that during droughts, Tinga group ranchers would move their animals to the suguta Marmur whose climatic conditions were more favorable

DISCUSSION

Numerous studies have been conducted on the establishment, dissolution and coping strategies of group ranches. Although the group ranch system was established more than forty years ago, there was a feeling among scholars that it had failed to meet its original objectives and had also jeopardized the socio-economic and cultural welfare of the members (Mule, 2010). A growing trend toward towards dissolution of group ranches has been established. However, in Samburu County most of the group ranches have remained un-dissolved to date despite the environmental challenges facing the ranches. Analysis of the sustainability strategies that have led to holding together of the group ranches in the county established that there existed a strong relationship between group ranches and environment characteristics. The survival of group ranches dependent on choice of sustainability strategies which were in turn influenced by environment conditions.

Samburu County is characterized by harsh environmental conditions that lead to loss of livelihoods. Strategies adopted were aimed at reducing livestock mortality. Due to unreliable and unpredictable rainfall patterns, periodic droughts and high temperatures in Samburu County, group ranches chose and adopted strategies such as stock mobility, livestock maximization and diversification, herd dispersion, and reservation for rich-patch vegetation. These strategies reduced the risks of livestock mortality by increasing livestock resilience to adverse environmental conditions. Constant livelihood source had a direct bearing on the

sustainability of group ranches. The survival and reduction of livestock losses held the fabrics of group ranches together lowering the rates of group ranch dissolution.

CONCLUSION

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Strategies to cushion group ranchers against adverse environmental conditions were key in holding the group ranches together. Lower risks of losing the livelihood sources led to high chances of having group ranches sustained.

RECOMMENDATION

The findings of the study revealed that environmental characteristics determined choice of sustainability strategies adopted by group ranches in Samburu County. Therefore, the study recommends integration of environmental characteristics in formulating policies for sustainability of group ranches.

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