

**EVALUATING THE IMPACT OF SUBDIVISION OF GROUP RANCHES ON CROP
AND LIVESTOCK DEPENDENT LIVELIHOODS AT AIMI MA KILUNGU, MAKUENI
COUNTY, KENYA**

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A60/75935/2014

**A Thesis submitted to the University of Nairobi in partial fulfillment of the requirements
for the award Master of Science Degree in Environmental Governance.**

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NOVEMBER, 2018

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DEDICATION

This thesis is dedicated to my parents Dr. Fredrick K. Ngaruiya and Lilian Kinuthia, brothers James and Peter Kinuthia for just being that, my family. To my sister Perpetual Wangu who made this journey that much longer but also more enjoyable. It is also dedicated to Alice Wambui Mwangi a friend with whom I have shared life's ups-and- downs. Finally, to my husband Martin Wamae who fast tracked this research.

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GENERAL ABSTRACT

Failure of the ranching system in Kenya has seen a progressive decline in the number of group ranches since 1952 due to subdivision. Ranch subdivision transforms the landscape in terms of human and land use systems. Studies have generally concentrated on its effects on land productivity and biodiversity. However, ranch subdivision effects on the social wellbeing of communities have not been adequately studied, perhaps due to its broad, diverse, and complex nature. Furthermore, studies on the relationship between ranch subdivision and the resultant agricultural productivity are not conclusive. The objectives of this study were; to assess the effect of ranch subdivision on crop and livestock productivity and to assess the prevailing attitudes concerning land tenure and land use systems and the social mind set transformations seen after ranch subdivision. The study was conducted at the recently subdivided ranch, Aimi ma Kilungu (AMK) in 2006, to the former shareholders and their families, who then settled on the resulting 1530 plots. Semi-structured interviews and participant observation were used to collect data on type and quantity of assets, livelihood activities and their returns after subdivision of the ranch. There were 79 respondents randomly selected from among those who had settled in AMK after subdivision. The driving forces for ranch subdivision were; the opportunity to change their fate (about 45%) and economic empowerment (about 44%). Factors such as ownership of land (1%) and the desire for freedom (0.3%) also played a role. The results of the study showed that location of the plot had an influence on the income returns of the household. Households near water (KES 2.5 million/year) and tarmac (KES 1.8 million/year) had higher total income returns (productivity). The results also demonstrated that crop production (KES 34,369/year) had higher returns than all other livelihood activities including livestock keeping (KES 33,684). That is probably why the settlers preferentially allocated more land to crops (average of 4 acres per household) than to other

use of land. However, keeping livestock was very popular as it allowed the residents to have readily disposable assets to meet urgent needs. The study also highlighted challenges faced by the settlers of AMK, coping strategies and the transformations resulting from the subdivision. Some of the challenges included; human-wildlife conflict, lack of livestock feeds and lack of amenities in the area. Positive subsequent developments were observed including water harvesting (38%), storage of fodder (29%) and adoption of zero grazing (3.8%). These transformations in AMK were a form of coping strategies to the challenges encountered on settling in AMK. Conclusively, ranch subdivision was shown to have a significant positive impact on the prevailing attitudes, on land tenure and land use and is a preferred form of development where group ranches fail.

KEY WORDS

Ranch subdivision; Aimi ma Kilungu (AMK); driving forces; agricultural productivity; coping strategies; transformations.

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ABBREVIATIONS AND ACRONYMS

ALDEV	African Land Development Board
ASALs	Arid and Semi-Arid Lands
AMK	Aimi ma Kilungu Ranch
GDP	Gross Domestic Product
GPS	Global Positioning System
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
EMCA	Environmental Management and Conservation Act
KWS	Kenya Wildlife Service
KI	Key Informants
NEMA	National Environmental Management Agency
SDG	Strategic Development Goal
TLU	Total Livestock Unit
UNCCD	United Nations Convention to Combat Desertification

CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Ranching is an extensive system of agricultural production which involves using large tracts of land with the common practice of rearing beef cattle. In almost all cases it has been viewed as a more economic use of arid and semi-arid lands (ASALs) (Grainger, 1988; McAlpine, Etter, Fearnside, Seabrook and Laurance, 2009).

Kenya is a developing country where 16.5 million as at 2005 was reported to be poor (World Bank Group, 2018). Kenya has a population of over 44 million, with a gross development product (GDP) of \$74.94 billion in 2017 (Trading Economics, 2018). The poverty headcount ratio at national poverty lines (% population) was 45.9% in the year 2005 (Lapitskiy,2017). The main economic activity in the country is agriculture. Agriculture contributes 24% of the GDP and an indirect contribution of 27% through activities such as manufacturing and distribution of agricultural products (Food Security Portal, 2012).

Livestock contributes approximately 12% of the GDP and 40% of the agricultural GDP. 60% of the total livestock in Kenya is found in the ASALs. ASALs occupy about 80% of Kenya's total land area of 569,140 km². The ASALs house about 35% of the total population. The source of livelihood in these areas is diverse but extensive livestock production has proved to be the most suitable. This is due to the variability of weather and fragility of soils in these zones (Veit, 2011). In Kenya ranching was started by the Kenyan government in collaboration with interested parties to increase the productivity of ASALs (Veit, 2011). This was adapted very fast in the Maasai pastoral lands as a way to reduce landlessness, increase economic power of the pastoralists, reduce environmental degradation and set up a livestock production system that embraced modern animal

husbandry while at the same time preserving the traditional lifestyle. Therefore, in the same trend groups of people organized themselves into ranches within the ASALs to increase productivity either through beef ranching or communal grazing systems (Veit, 2011; Ntiati, 2002).

However, ranching has been on a decline since 1952. The quest for individual land ownership has been on the rise. Moreover, group owned ranches are no longer a productive enterprise as the dividends that get to each shareholder are very little (Nyamasyo and Gichangi, 2006). Shareholders therefore, often demand for subdivision of the ranches whereby each member is allocated a small piece of land. In addition, other commercial ranches have also been sold to land buying companies and co-operatives (Veit, 2011). Research has shown that apart from poor returns under ranching system prompting subdivision, the desire for individual land ownership has been the most highly rated reason in the recent past (Kiarie, 2014).

This research was done to evaluate the effect of ranch subdivision on livestock livelihoods in Kenya through a case study of Aimi ma Kilungu (AMK) ranch in Makueni County, Kenya which was subdivided in 2006.

1.2 RESEARCH PROBLEM STATEMENT

Ranch subdivision is now a common practice in Kenya. Quite a number of ranches have undergone subdivision to smaller plots. The main reasons cited are poor dividends for shareholders, poor management and conflicts. Because of this the decision to subdivide takes precedence with majority of the shareholders voting for it. Thereafter, an Environmental Impact Assessment (EIA) is undertaken to establish suitability and consequences of subdivision. These reports are handed to the National Environmental Management Agency (NEMA) for compliance. In all cases these reports must include substantial reasons for the subdivision and justification of how subdivision

has more advantage over non-division both on the environment and affected human population (Nyamasyo and Gichangi, 2006).

The new settlers immediately start engaging in similar livelihood like in their previous settlements such as crop and livestock farming. However, most ranches being in ASALs, crop farming is often abandoned due to low productivity. Nevertheless, livestock farming is often retained therefore playing an important role in the livelihood of these settlers.

Subdivision of ranches has an effect of increasing the level of pressure on most of the natural resources. The resultant effect has been reported in studies as a decline in agricultural productivity, water supplies and incomes. This means that subdivision of ranches increases the vulnerabilities of the shareholders (Kiarie, 2014), which is referred by the United Nations Convention to Combat Desertification (UNCCD) as land degradation. Land degradation presents a challenge for both sustenance of environmental health and poverty reduction. In ASALs this is usually as a result of the complex interaction between climate and human activities (Marcussen, Nygaard and Reenberg, 2002).

Past research has always indicated that subdivision of ranches has negative impact on the livelihoods of the residents. However, these studies have not demonstrated the relationship between ranch subdivision and some of the outcomes seen after the subdivision more so with regards to the livelihoods of those involved. This research was undertaken to identify the effects of ranch subdivision on the livelihood of the residents. The study was conducted in a subdivided ranch, Aimi ma Kilungu (AMK) in Makueni County, a ranching group that followed the stipulated rules and successfully subdivided in 2006. There was equitable sharing of land (Nyamasyo and

Gichangi, 2006). It therefore, made an interesting case for studying ranch subdivision impacts on household livelihoods and social wellbeing.

1.3 OBJECTIVES

1.3.1 General Objective

To study impacts of ranch subdivision on agricultural productivity with focus on crop and livestock dependent livelihoods and social wellbeing of households and individuals of Aimi ma Kilungu area.

1.3.2 Specific objectives

1. To assess the effect of ranch subdivision on agricultural (crop and livestock) productivity in Aimi ma Kilungu area and their contribution to household incomes.
2. To assess the prevailing knowledge, attitudes and practices concerning land tenure and land use systems after ranch subdivision in Aimi ma Kilungu.

1.4 RESEARCH QUESTIONS

The study sought to answer the following questions;

How has the community, their assets, activities and incomes on which they depend on as a source of livelihood changed since ranch subdivision?

What transformations and changes in mindsets of the society at Aimi ma Kilungu have taken place since ranch subdivision?

What are the effects of these changes and transformations on the knowledge, attitudes and practices on the residents of Aimi ma Kilungu?

1.5 HYPOTHESES

1.5.1 Null Hypothesis

1. Ranch subdivision has no effect on the distribution of livestock, assets, activities and households.
2. Ranch subdivision does not transform knowledge, innovations and practices.

1.5.2 Alternate Hypothesis

1. Ranch subdivision has an effect on the distribution of livestock, assets, activities and households.
2. Ranch subdivision transforms knowledge, innovations and practices.

1.6 JUSTIFICATION OF THE STUDY

Land use changes such as ranch subdivision in ASALs often leads to environmental degradation (Mwangi, 2007). This has been studied extensively with researchers often discouraging this trend (Kiarie, 2014). However, ranch subdivision continues to take place. Therefore, the question arises as to why people seem to favor ranch subdivision despite its negative effects on the environment, maybe there are other benefits that communities derive from the subdivision that are yet to be studied. This study focused on the effect of ranch subdivision on the livelihoods (and in particular crop and livestock) of the associated to find out the other benefits that drive the push for subdivision.

The findings of the study would contribute to several development agendas. First, by finding out the economic benefits of ranch subdivision, this would contribute to the Strategic Development Goal (SDG) number one that targets the elimination of poverty (United Nations Development Programme, 2018). Furthermore, the research would contribute to Kenya Vision 2030, Economic

and Macro Pillar through contribution to the Land Use Master Plan. This master plan targets the effective utilization of land (Kenya Vision 2030, n.d.). Finally, the research sought to contribute to the greater development agenda, Agenda 2063, which seeks for the socio-economic transformation of Africa through implementation of continental initiatives that focus on development (African Union, 2014).

The findings of the study can be used to inform shareholders undergoing similar subdivisions. They were to be used as a basis for the decision to institute better tools or improve on the existent tools of management of subdivided ranches. The information would also be used to develop a technology for keeping livestock sustainably under local conditions.

1.7 SCOPE OF THE STUDY

This study sought to establish the impact of ranch subdivision on livestock dependent livelihoods to be undertaken in the subdivided ranch of Aimi ma Kilungu, Makueni County. The target respondents for the study were the ranch members/shareholders. The study was conducted in the period of May to September, 2017.

1.8 LIMITATIONS OF THE STUDY

The study was limited to the subdivided ranch, Aimi ma Kilungu in Makueni County hence generalization of the findings must be done with caution.

1.9 ASSUMPTIONS OF THE STUDY

The researcher made the assumption that the respondents of the study recalled the details correctly.

CHAPTER TWO: LITERATURE REVIEW

2.1 LAND IN KENYA

2.1.1 Land Tenure

Tenure is a word derived from latin ‘tenere’ meaning ‘to hold’. It refers to the social relations between people with respect to the object of tenure. In this case, land tenure describes the methods by which people or groups can acquire, hold or transfer property rights in land. There are various forms of legally recognized tenure in Kenya namely; customary, statutory and public tenures. Customary tenure is land ownership in accordance with a community’s culture and practices. This is highly variable and differs from one community to another. There are several recognized statutory tenures such as freehold tenure which confers absolute right of ownership for perpetuity with no restrictions on the form of land use the owner can undertake. There is also leasehold whereby the freeholder can grant access to another party for a defined period of time for a fee accompanied by several conditions (Ogolla and Mugabe, 1996). Public tenure is also a form of statutory tenure where the government owns land for her purposes which can be unused or reserved land for future government use. This land is usually allocated under the Government lands Act Cap 280 and vested in the president. There are also other exceptions included under statutory tenure such as land reservations of other governments among others.

Since 1952, Kenya has seen dramatic changes initiated in land tenure. They were enforced mainly because they were seen as having the potential to improve land productivity, planning and decision making (Ogolla and Mugabe, 1996; Place and Hazell, 1993; Bruce and Migot-Adholia, 1994). In Kenya both customary and statutory land rights are formally recognized. Land tenure has a major influence on the type of land use and access to land. As it is the type of land tenure provides the legal framework for which all economic activities taking place on a piece of land can be

undertaken. In addition, when the tenure rights are certain it inspires sustainable land use and investment by individuals or group (Juma and Ojwang, 1996).

Kenya's economy is based on agriculture with most people engaging in agricultural based forms of livelihood. Land tenure therefore provides the chance to engage in these activities. However, in urban areas where populations are very high it has necessitated the existence of zoning laws that direct development along pre-determined regions for commercial, industrial, recreational residential and public use (Waiganjo and Ngugi, 2001). Kenya can be categorized into three zones; high, middle and low zones. The high and middle potential areas occupy 18% of the total 582, 646 Sq. Km area of Kenya while the low potential areas otherwise known as arid and semi-arid lands (ASALs) make about 82% (KNBS, 2016). Intensive crop and livestock farming are the major livelihood activities in high and medium potential areas while extensive livestock farming (pastoralism and ranching), wildlife conservation and dry-land farming are the activities in ASALs.

Studies have also been undertaken to investigate the effect of changes in land tenure on the productivity of land. There are variable views and outcomes by these studies. However, most studies conclude that transfer of land rights from traditional land rights (communal ownership) presents a constraint to productivity (Place and Hazell, 1993).

2.1.2 Land productivity in the ASALs

The productive capacity of ASALs is low because rainfall is erratic and variable. The rainfall rarely exceeds 800 mm per year with some areas receiving as low as 250 mm. In addition, there is limited and poor distribution of water resources (Keya, 1991). ASALs which were traditionally used for pastoralism are facing degradation due to increasing human population which sees pastoralists

returning to grazing areas before they have had time to recover. About 40% of ASALs have been reported to have been degraded while 2% have already been lost (National Environment and Human Settlements Secretariat, 1984)

2.2 RANCHING IN KENYA

ASALs support about 20% of the human population, 50% of the livestock and 80 – 90% of the wildlife population. The highest majority of the human population (80%) occupies the more fertile areas of the country. The less productive ASALs are more suitable for activities such as extensive livestock production (National Livestock Policy, 2008).

2.2.1 Group Ranching: The History

The group ranches system was established in Kenya after several failed attempts to make ASALs more productive. However, this was an outcry from long before Kenya got independence. In the colonial period of 1880s to 1900s, the white settlers pushed the natives from their lands. Of particular attention were the Maasai as well as other pastoralists who had their own land tenure system. This is whereby land and affiliated resources were owned by certain families. Hence, the management and ownership of these lands was solely placed on the families. In addition, ownership was through inheritance (Kibugi, 2009). The Crown Land Ordinances of 1901 and 1902 resulted to the displacement of pastoralists by the white settlers causing challenges. Native reserves that had fixed boundaries were also established and treaties negotiated by the Maasai. However, this system did not foresee the looming challenge of closing the market for the pastoralist as well as need for movement when the animal pasture was low. This eventually culminated to decline in livestock numbers more so the indigenous breeds which were despised by the settlers especially with the drought of 1933 – 1934 (Veit, 2011; Thornton, BurnSilver, Boone and Galvin, 2006). By end of World War II, the pastoralists faced forced sedentarization and destocking. However, this

was soon abandoned due to political and community uproar. Hence, the African Resettlement Board was created in 1945 but was later overtaken by the African Land Development Board (ALDEV) which was tasked with the carrying out of a 10-year plan; 1945 – 1955. (Thurston, 1987). The works of this system mainly focused on ASAL areas such as Machakos, Kajiado and Narok. The pastoralists were now directed to occupy large tracts of grazing lands. In addition, these systems received government support through initiatives such as rinderpest virus vaccination, soil conservation, construction of dams and irrigation schemes. Moreover, the stock routes and marketing increased albeit in a limited fashion (Veit, 2011).

However, the grazing plans were not well enforced by ALDEV and the pastoralists viewed the white settlers with suspicion. This system eventually collapsed while still in the pilot districts before it was opened-up in other areas. This was due the fact that the activities of ALDEV were so expensive and they covered very large areas (Thurston, 1987). 1955 saw the birth of a new land policy system borne of the Swynnerton Plan for the Reform of African Land Tenure. This policy sought to give the African farmers in the high potential area formal land rights. In addition, it supported communal grazing for the pastoralists. Moreover, it was based on 5 solid principles that would ensure proper use of the range lands; the number of animals was not to exceed the carrying capacity of the land, constant outflow of surplus stock, permanent water supply construction, controlled grazing and eradication of tsetse fly the vector for cattle trypanosomiasis (Harbeson, 1971). In response to this the British set up 40 grazing schemes in Turkana, Lower Kiambu, Machakos, Kajiado, Taita, Kitui, Samburu, Elgeyo Marakwet, West Pokot, Mukogodo, Narok, Baringo, South Nyanza, Lamu and Kwale districts (Makana, 2009). However, most of the schemes failed due to the restrictions on movement especially during dry seasons (Thurston, 1987). The 1961-1962 drought and floods caused the situation of the ASALs to deteriorate further prompting

further attention and action. With independence in 1963 the government established the Range Management division within the ministry of Agriculture. It did so with the belief that a change in land tenure in ASALs would improve productivity. Moreover, it also deemed that this would prompt the pastoralists to destock and improve investment in the rangelands, which would also act as collateral for loans, used to improve these ranches. Thus in follow up to this, the government in 1965-66 commissioned an enquiry into “Land Consolidation and Registration in Kenya” otherwise known as the Lawrence report (Makana, 2009; Harbeson, 1971). In summary, this report concluded that registration of group land in comparison to individual land registration held greater benefits in ASALs. The basis of this conclusion was the fact that land rights in Maasai land were communal. It further, propositioned that appointment of group representatives would enable them oversee the granting of private and permanent land rights. The Lawrence report formed the basis for the group ranch concept that the government readily adopted (Obwa, 1976).

A group ranch is a livestock production system owned by a group of people who have a freehold title to the land. They graze communally but own their livestock individually. The government envisioned to achieve several targets; increased productivity of ASALs, raise monetary returns for the pastoralists more so through allocating land to individual ranchers, reduce environmental degradation through overstocking as well as adopting newer systems of production which would still integrate the indigenous systems (Ng’ethe, 1993). Moreover, just like the Swynnerton plan the government also hoped to sedentarize pastoralists. In addition, the government contemplated that there would be portioning of trust land with the pastoralists holding freehold titles. There would also be a permanent register maintained for members of each ranch (Obwa, 1976). However, members from other ranches would be excluded and there would be allocation of grazing portions, which in turn would influence the number of animals kept in each ranch. There was to be the

building of facilities through loans to the ranch owners. Moreover, each member looked after their own livestock but collectively safeguarded their ranch from use by non-members. In addition, the members would also commit to payment of levies for repayments of the loans (Harbeson, 1971).

Hence, the dawn of Land Adjudication Act and the Land (Group Representatives) Act Cap 287, 1968 made ownership and dissolution of ranches upon a written application to the registrar which had been signed by the majority of the members (Laws of Kenya, 1970). However, despite these efforts challenges arose because of poor livelihood status and the failure of the group ranch system to deliver security of tenure leading to dissolution of group ranches. This is a trend that continues up to date. Moreover, subdivision is also common. In the report by Ish-Shalom-Gordon (1995), it was noted that the challenges today have to do with coping with the effects of dissolution and subdivision of ranches rather than their management (Ministry of Agriculture, 1968).

2.2.2 Group Ranches: Productivity

Ranches in Kenya have been showing variable productivity. A study done on Maasai ranches within Kajiado district in 1981/83 concluded that these ranches had an off take of 29 kg/ha from sales and slaughter. The gross income from livestock was KES 176/ha. At the time the total area studied was 1600 km² supporting about 3500 pastoralists that owned 50,000 cattle and 30,000 goats and sheep at a livestock holding capacity of 12.6 livestock units (De Leeuw, Bekure and Grandin, 1984). In conclusion this study showed that the productivity of Maasai ranches could be compared to that of commercial ranches but with a lower cost of production. The main reason why these ranches were operating at lower costs was because household labor was utilized. Aimi ma Kilungu the subdivided ranch under study was hugely a commercial ranch employing external labor. **Table 1** shows AMK's productivity. Overall it shows that the turnover per year was very high but the costs of operation were equally high resulting in very low profit margins or losses.

2.3 GROUP RANCHES IN KENYA: CHALLENGES AND DISSOLUTION

Some of the challenges that were being experienced after ranches were instituted (they were instituted in the 1960s by the Kenyan government) were the ranch boundaries becoming impractical especially during the search for water and pasture by the pastoralists. This was especially worse during droughts and dry seasons when the herders completely disregarded the boundaries (Veit, 2011). This remains a challenge even today for current and former ranches.

Currently, most ranches are used for beef production. However, the number of ranches has been declining since independence due to poor production levels and poor returns. Some are also bought by individuals who then subdivide them and use them for other uses such as; putting up buildings, resorts etc. There are over 159 group ranches in Kenya, with a majority being located in Kajiado, Narok, Samburu, Laikipia, Baringo and West Pokot Counties, 6 in Homa Bay, Migori and Siaya, 17 in Taita, Kwale and Kilifi Counties and in Embu and Kitui Counties (SOFTKENYA, 2011).

2.4 AIMI MA KILUNGU: CASE STUDY

Aimi ma Kilungu was a private ranch located in Makueni County, Kenya. In 2006 it was subdivided such that every shareholder got a piece of land. Before subdivision it was a beef livestock ranch where members communally herded individually owned livestock. However, this enterprise proved unproductive and the members saw the need to subdivide the land amongst them in an attempt to improve their livelihood.

Table 1: Productivity of Aimi ma Kilungu (AMK) for the years 1986 – 2001.

Aimi ma Kilungu Ranch Productivity per Annum			Numbers	
Year	Turn Over (KES)	Profit/Loss after Costs (KES*)	Cattle	Goats
1986	3,191,409	-162,820	2348	275
1987	3,529,675	73,539	2580	371

1988	4,718,101	174,473	2803	603
1989	4,813,414	58,503	3073	567
1990	6,276,265	573,516	3106	528
1991	7,213,046	792,759	2989	473
1992	6,315,686	269,878	2910	601
1993	9,949,565	264,719	2835	526
1994	16,654,167	678,480	2615	615
1995	16,640,439	771,345	2623	694
1996	17,023,718	114,145	2484	745
1997	17,288,774	-1,591,902	2507	690
1998	13,918,111	949,026	2718	535
1999	12,390,746	-2,178,766	2659	544
2000	14,656,721	-133,158	2614	423
2001	23,156,403	599,510	2407	448

*KES; Kenya shillings

This is the same predicament for many other ranches in Kenya. The issue of common property rights has been a major problem that confounds this situation. In his paper 'A failed land use, legal and policy for the African commons? Reviewing rangeland governance in Kenya' Kibugi (2009) explores the narrative that despite individual land ownership by groups challenges still arose with this system more so due to the fact that members are not willing to reduce their stock levels so as to reduce overgrazing and resultant environmental degradation. This in turn affects productivity of the rangelands hence poor livelihood status of the members. Eventually, disgruntled members decry dissolution and subdivision, which is also marred by irregularities, lack of surveyors regard to slope of the ranch, unfair parceling and gender inequality.

According to Environmental Management and Coordination Act (EMCA) to which Kenya is compliant, before undertaking projects like change in land use, an Environmental Audit and an Environmental Impact Assessment (EIA) must be undertaken. This is provided for in schedule 2 of the Act. It also indicates other projects that should undergo the same before inception. This provision was made because some projects may have devastating effects on the environment. This was also explored in the precautionary principle of Rio declaration, 1992 (EMCA, 1999; Rio Declaration, 1992). Under directions of EMCA, the National Environmental Management Authority (NEMA) were among the bodies that were established and are responsible for ensuring that companies and potential projects are compliant among other environmental regulatory duties. An EIA may be undertaken by an expert licensed by NEMA. AMK duly underwent an EIA in 2006 and NEMA gave the affirmative to subdivide (Nyamasyo and Gichangi, 2006).

**CHAPTER THREE: THE EFFECT OF RANCH SUBDIVISION ON AGRICULTURAL
(CROP AND LIVESTOCK) PRODUCTIVITY IN AIMI MA KILUNGU AREA,
MAKUENI COUNTY - KENYA**

ABSTRACT

Failure of the ranching system in Kenya has seen a progressive decline in the number of group ranches since 1952 as a result of subdivision. Aimi ma Kilungu (AMK) ranch was subdivided in 2006 to the former shareholders and their families who settled on the resulting 1530 plots. It is thus an interesting case study for outcomes of ranch subdivision on the crop and livestock productivity. Questionnaires, semi-structured interviews and participant observation were used to collect data on type and quantity of assets, livelihood activities and their returns from 79 respondents living in AMK after ranch subdivision. The results examine income returns as an indicator of productivity after ranch subdivision. Factors such as the location of the plot e.g. near water or near tarmac had an influence on the income returns of the household. Households near water and tarmac had higher income returns. They also show that crop production had higher returns than all other livelihood activities such as livestock keeping. This is supported by the preferential allocation of land for crops in comparison to other forms of land use. However, keeping livestock was very popular as it allowed the residents to have readily disposable assets in case of needs arising. It was concluded that ranch subdivision resulted in higher productivity and livelihood diversification.

Key Words

Ranching system; incomes; crop and livestock productivity; assets; livelihood activities; livelihood diversification

3.1 INTRODUCTION

Group ranching was encouraged by the Kenyan government through various policies such as the African Land Development Board (ALDEV) of 1945 – 55; Swynnerton Plan for the Reform of African Land Tenure and the Lawrence report of 1965 – 66 (Veit, 2011). This was because extensive livestock keeping (ranching) was seen as the only economic use of Arid and Semi-Arid Lands (ASALs) that occupy more than 80% of Kenya's land mass (National Livestock Policy, 2008). It was also a way to preserve pastoral culture in some communities, like the Maasai, while still making economic returns. However, with the enactment of the Land Adjudication Act (1968) and the land (Group Representatives) Act it became possible to dissolve group ranches, if the majority of the ranch shareholders agreed to subdivide the land (Laws of Kenya, 1970; Ng'ethe, 1993). At about this time, the group ranching systems were performing poorly with low or no dividends to shareholders.

Since then ranch subdivision has been taking place intermittently. The normal practice during ranch subdivision is to distribute land equally to shareholders. In the case of AMK, shareholders received 8 – 10 acres each. The subdivision strategy was to cause transition from open grazing to mixed farming systems necessitated by reduced availability of grazing for extensive ruminant production. It was generally believed that extensive livestock production was the best land-use system for the ASAL and subdivision would result in land degradation and reduced standard of living. But this perception was not empirically demonstrated (Ellis, Coughenour and Swift, 1993; Mulinge, Gicheru, Murithi, Maingi, Kihui, Kirui and Mirzabaev, 2016). This study was conducted to assess the effects of ranch subdivision on the crop and livestock productivity and resident livelihoods, using the case of AMK ranch. The set null hypothesis that ranch subdivision should

have no effect on size and distribution of livestock populations; the quantity and quality of assets owned; type and nature of livelihood activities for the households was tested in the study.

3.2 MATERIALS & METHODS

3.2.1 Study Area

The study was conducted in Aimi ma Kilungu which is located in Makueni and part of Kajiado Counties, *Figure 1*, 93km south-east of Nairobi County, along Mombasa road, covering an area of 8,195 ha (20,077.75 acres, using 1 ha = 2.45 acres). It borders Malili ranch to the north, the Kima-Kiu to the south-eastern side, the Stanley & Sons ranch to the South-west and the Ulu settlement on the South-western side. The GPS coordinates to the area are 1.784°S, 37.215°E to the north and 1.842°S, 37.257°E to the south-eastern side (Nyamasyo and Gichangi, 2006).

The area has bimodal rainfall ranging from 400mm to 850mm with short rains coming on November to December succeeded by a long dry season in January to March. Aimi ma Kilungu receives an average of 600mm of rainfall with the mean annual temperatures ranging from 25°C - 40°C (Nyamasyo and Gichangi, 2006). The area has black cotton soils. Gypsum is common in the area.

Aimi ma Kilungu has 1530 shareholders and supports a population of close to 10,000 people. The residents are mainly small-scale farmers practicing mixed farming. The types of livestock kept in Aimi ma Kilungu include Zebu and Boran cows, goats and local chicken.

Ranch subdivision was finalized by 2006 with equitable sharing of the plots amongst the shareholders. Notably, the surrounding ranches such as Malili, Kimakui and Stanley & Sons are still intact. The main ethnic group is the Akamba with other groups present because of sales of whole or sections of the plots in the area.

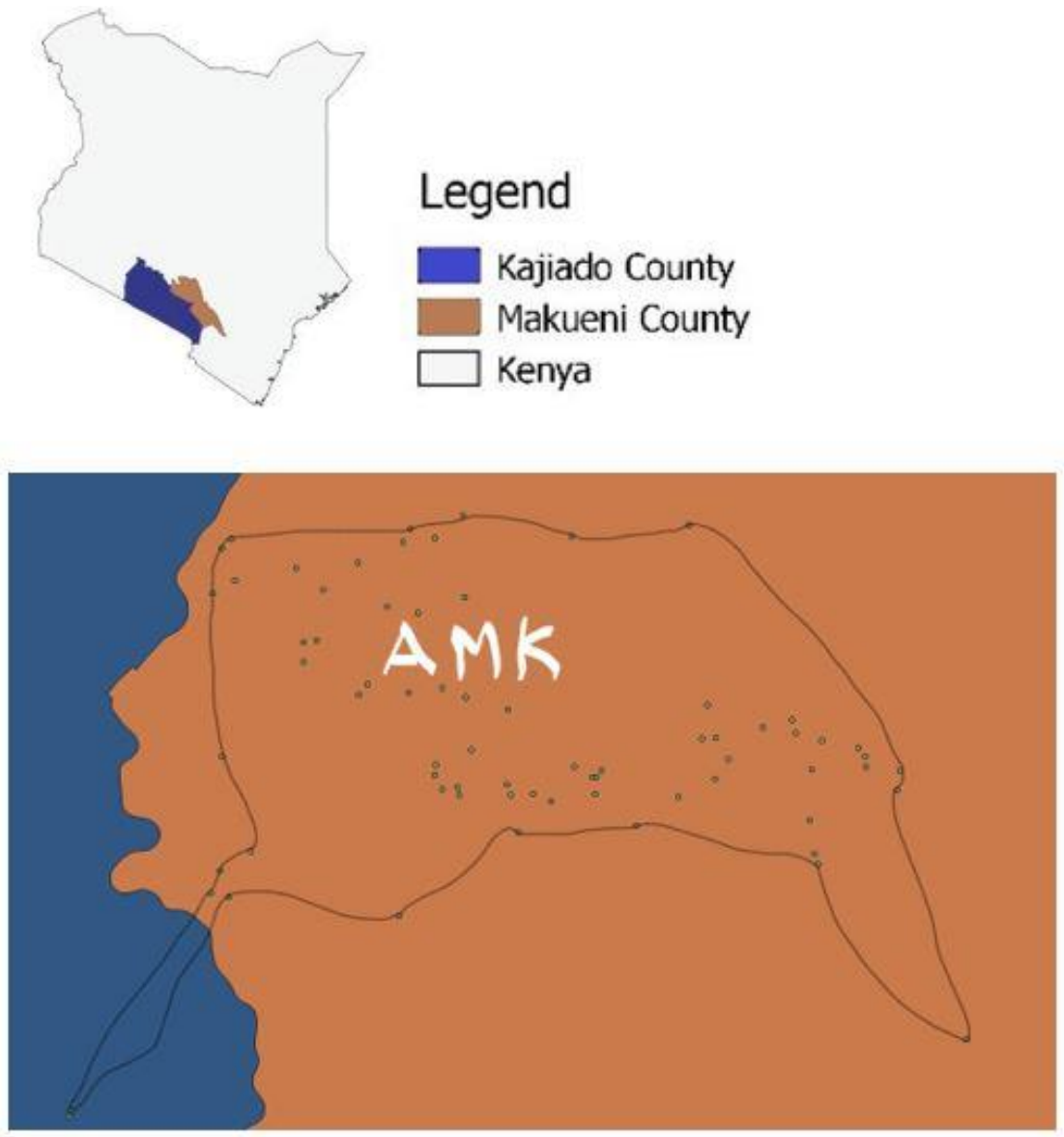


Figure 1: Map showing location of Makueni & Kajiado Counties in Kenya; Source – Created using QGIS software (version 7.4.1)

3.2.2 Data Collection

Semi-structured interviews were conducted to fill in the questionnaires between June and November 2017. The target population was the current residents of Aimi ma Kilungu who have occupied their share of the land. Respondents were selected randomly from those who had already settled in the AMK. The questionnaire data was collected using EpiCollect Plus (EpiCollect + Beta. n.d.). This is an application that allows input of survey questions on its database on the internet. The application is then loaded onto a tablet or mobile phone and questions once answered are stored and loaded onto the EpiCollect database for later retrieval. The application also allows one to take Global Positioning System (GPS), audios, videos and photographs.

The questionnaires sought to elicit information on the type of livelihood channels pursued the reasons behind a livelihood activity and the level of current productivity compared to that before subdivision. Data on the type and quantity of assets owned, the livelihood activities undertaken and agricultural productivity of the plots after and before the ranch subdivision was collected.

In addition, 3 key informant interviews (KI) were held. The participants in the KIs were identified and interviewed. These included residents who had been in the area since the inception of the ranch, young inheritors, local government, former ranch workers and people who had bought land in Aimi ma Kilungu.

3.2.3 Data Sources

Ranch records were used to get data on the earlier performance of AMK when it was intact. This included data of livestock population before subdivision, livestock records before subdivision and livelihood data before subdivision. Secondary data was obtained from reviews of both published and unpublished literature from diverse local, national and international sources related to ranch

subdivision and crop and livestock dependent livelihoods. The results from the reviews have been used to supplement primary data, which was collected via questionnaires, key informant interviews, participant observations, and to support various aspects related to the study.

3.2.4 Sampling and Sample size

The map showing placement of all households was provided by the former ranch manager of AMK who was the field assistant for the study.

The study applied the method provided in the book ‘Craft of Research’ that involves rigorous scientific formulae, which provides for 95% confidence level as below, to compute a sample size of 72 households from the recorded 1530 households (Booth, Colomb and Williams, 2008).

$$n = \frac{(z^2 \times p \times q \times N)}{e^2(N - 1) + (z^2 \times p \times q)}$$

Equation 1: Sample Size Calculation

Where:

n = Sample size (being determined),

N = Population size (which is known, 1530),

p = Sample proportion (assumed to be 0.05, if not given),

q = 1 – p,

e = 0.05 (since the acceptable error (level of significance) should be 5%) and z = Standard deviation at a given Confidence Interval (z = 1.96 at 95% CI).

The sample households were selected randomly through balloting. All the households were written down on pieces of paper, folded and put in basket and picked. The researcher chose to do work with 79 households all randomly selected

3.2.5 Data Analysis

The questionnaires data was downloaded from the EpiCollect Database on Microsoft Excel 2016. The data was then analyzed through generation of tables showing proportions, average productivity and cross-tabulations of key factors. Where possible, value of productivity and activity was generated. Relationships and associations were determined using frequency measure tables, visual graphs/tables and ANOVA using Statistical program for Social Scientists (SPSS 20.0). Data from KIs turned out to be irrelevant to the study and therefore, was not analyzed.

3.3 RESULTS AND DISCUSSION

3.3.1 Introduction

The characteristics of the residents living in AMK, the locations they live in, their assets and livelihood activities are shown on **Table 2**. The highest proportion of respondents were living near water sources (85%) followed closely by those living near the tarmac (Nairobi-Mombasa highway) (70%) with the hilly and rocky areas had the lowest occupation at 29% and 14% respectively. The proportions add to more than 100% because one respondent can occupy an area with more than one variable e.g. one that is both near water and tarmac.

There was a large variability of land productivity in AMK based on the performance of the various livelihood avenues for the residents. The land parcels were allocated to the residents through ballots. Thus residents had no choice on locations of their lands in AMK; near water, tarmac (Nairobi-Mombasa highway), hilly area and rocky areas.

Table 2: Summary of attributes/characteristics of the survey respondents

		Proportion of respondents , %			
		Near water	Near Tarmac	Hilly area	Rocky area
Proportion of residents		85	70	29	14
Gender	Female	39	37	13	8
	Male	46	33	16	6
Assets	Membership to CBOs*	76	61	27	13
Livelihood Activities	Grows Crops	84	68	29	14
	Livestock Keeping	85	70	28	14
	Business Operator	19	15	8	5
	Wage / Salaried employee	18	15	6	4

*The categories are not mutually exclusive: one may live on hill that is close to water and tarmac road

*CBOs = Community Based Organizations

Crop farming and livestock keeping were the most common livelihood activities for people living close to water sources (85% and 84%) and near the tarmac (70% and 68%) respectively. Business and employment were the least common livelihood activities in all the locations but even more so in the hilly and rocky areas.

The people of AMK are sedentary agro-pastoralists mainly keeping livestock as security because of the unpredictable nature of the climate in Makueni County that makes crop failure a common occurrence. In addition, the residents also engage in alternative livelihood activities to supplement their incomes mainly through business and employment (Nyamasyo and Gichangi, 2006).

3.3.2 Land

Land ownership in AMK was either inherited or original land ownership. There seems to be no correlation between land ownership, its use and allocation, **Table 3**. It shows the preference of some respondents to allocate more land to one use over another. Overall, there was a preference to allocate more land to the homestead with respondents from all locations allocating more than an average of 5 acres. The homestead also provided a haven for the livestock. Land allocation for crops was the second favored with most locations allocating an average of 4 acres for crops. The highest acreage allocation for crops was an average of 4.8 acres for original landowners living near the tarmac. Allocation of land to livestock was the lowest (nominally) with all the respondents engaged in this study allocating less than 1 acre. Data collected indicated that the only land set aside for livestock was an area within the homestead to build the sheds for the animals to sleep. Practices such as rotational grazing and fodder production were uncommon: fodder was planted on a few terraces only. On average, respondents living near water and the tarmac allocated highest amount of land

Table 3: Land allocation to the various enterprises in AMK

		Acres (Mean)		
Land Ownership	Location*	Livestock	Crops	Homestead
Original	Near water	0.08	4.2	5.7
	Tarmac	0.09	4.8	5.1
	Hilly	0.05	3	6.9
	Rocky	0.03	4.1	5.9
Inherited	Near water	0.1	4.4	5.5
	Tarmac	0.1	4.2	5.7
	Hilly	0.07	4.4	5.5
	Rocky	0.06	4.3	5.6

*The categories are not mutually exclusive: one may live on hill that is close to water and tarmac road

to livestock at 0.10 and their least at 0.08. The hilly and rocky areas settlers allocated livestock least land between 0.03 and 0.07 acres.

3.3.3 Incomes

The residents had various sources of income as shown in **Table 4** and **5**. The most lucrative sources of income for the residents of AMK were business, livestock and crops respectively. Education was shown to have an impact on the level of income. Those that had no education showed lower levels of income than those with education. The youth were making more money than the middle aged and older people in all other locations.

People living near water had higher incomes than all the others living elsewhere. Persons living near the tarmac roads and involved business achieved higher incomes. In this, women performed better than men. Thus combined access to tarmac road and water contributed best to income derived livelihoods. Access to water and reliable tarmac roads achieves lower production and access resulting in higher returns. Similar studies have documented this in the past, for example, Kassali, Ayanwale and Williams (2009) who associated distance to water with productivity; Alpízar (2007) who linked low household and crop productivity to long distances to water, poor roads and lack of electricity.

Boreholes and dams (**Figure 2**) were the key sources of water for domestic and livestock use in AMK. However, only 3.8% residents had the water source located on their plots, and of them only 1.3% had a borehole that provided sufficient water for domestic use and sale. All others depended on communal dams and boreholes.

Table 4: Incomes

Location*	Age Rank	Education	Female					Male				
			Crops	Livestock	Business	Wage / Salaried	Other Sources	Crops	Livestock	Business	Wage / Salaried	Other Sources
Near Water	Youth	Primary	47,000	49,780	31,200	37,920		14,800	28,600	46,800	122,400	14,400
		Secondary	31,375	11,400	54,000	3,000		36,000	10,300		30,000	24,000
		Tertiary	69,000		204,000							
		Total	147,375	61,180	289,200	40,920	0	50,800	38,900	46,800	152,400	38,400
	Middle Aged	Primary	61,450	11,700	18,750		3,000	12,083	41,167		29,000	4,000
		Secondary	39,200	32,720	27,600	71,040		31,500	49,790	79,500		6,000
		Tertiary		70,000	170,400							
		Total	100650	114420	216750	71040	3000	43583	90957	79500	29000	10000
	Old Aged	Primary	12,000					11,400	49,333			16,000
		Secondary	13,250	50,550			9,000	67,030	50,110	38,400	16,800	15,600
		Tertiary	6,000	32,000			18,000	-1,000	35,900			32,000
		Total	31250	82550	0	0	27000	77430	135343	38400	16800	63600
Tarmac	Youth	Primary	47000	49,780	31,200	37,920		18,500	35,750	13,500	153,000	18,000
		Secondary	31375	11,400	54,000	3,000		36,000	10,300		30,000	24,000
		Total	78375	61180	85200	40920	0	54500	46050	13500	183000	42000
	Middle Aged	Primary	49,825	15,013	20,250		3,000	25,125	15,500		13,500	9,000
		Secondary	39,167	34,767	23,000	59,200		34,333	63,667	106,000		8,000
		Tertiary		70,000	170,400							
		Total	88,992	119,780	213,650	59,200	3,000	59,458	79,167	106,000	13,500	17,000
	Old Aged	Primary	48,167	6,000			12,000	16,600	32,000			24,000
		Secondary	17,667	59,667				39,186	40,143	3,429	8,571	5,143
		Tertiary	2,600	8,000			84,000		9,600			36,000
		Total	68,434	73,667	0	0	96,000	55,786	81,743	3,429	8,571	65,143

*The categories are not mutually exclusive: one may live on a hill that is close to water and tarmac road; **Key:** Youth = 18 – 35 years; Middle aged = 36 – 55; Old aged = >55

Table 5: Incomes (cont.)

Location*	Age Rank	Education	Incomes (Mean)										
			Female					Male					
			Crops	Livestock	Business	Wage / Salaried Employee	Other Sources	Crops	Livestock	Business	Wage / Salaried Employee	Other Sources	
Hilly Area	Youth	Primary						38,000	134,000	54,000	240,000	72,000	
		Secondary						42,000	15,100			48,000	
		Total	0	0	0	0	0	80000	149100	54000	240000	120000	
	Middle Aged	Primary	79,400	13,200	30,000			12,000	31,000		9,000		
		Secondary	44,667	30,500	46,000			30,667	39,053	100,000			
		Total	124,067	43,700	76,000	0	0	42,667	70,053	100,000	9,000	0	
	Old Aged	Primary						1,000	84,000				
		Secondary	10,500	77,500				126,667	17,667	120000			
		Tertiary							9,600			36,000	
		Total	10,500	77,500	0	0	0	127,667	111,267	120,000	0	36,000	
	Rocky Area	Youth	Primary										
			Secondary						42,000	3,000			96,000
Total			0	0	0	0	0	42000	3000	0	0	96000	
Middle Aged		Primary	109,500	26,400				6,000	55,000		18,000		
		Secondary	44,667	30,500	46,000			30,000		300,000			
		Total	154,167	56,900	46,000	0	0	36,000	55,000	300,000	18,000	0	
Old Aged		Secondary						25,000	26,500				
		Total	0	0	0	0	0	25000	26500	0	0	0	

*The categories are not mutually exclusive: one may live on a hill that is close to water and tarmac road

Key: Youth = 18 – 35 years; Middle aged = 36 – 55; Old aged = >55



Figure 2: Dam in AMK with Animals Watering

Furthermore, some of the residents reported that they had Kilimanjaro Water (the pipes of this water processing company pass through AMK) installed in their homesteads as a measure to curb water insecurity but the water from this company was hardly ever available throughout the year frustrating their efforts. Nevertheless, the residents often stated that increased proximity and availability of water throughout the year would result in higher incomes from all sectors, and more so from crop and livestock. It has however been argued that initiating development in ASALs by increasing water points may not necessarily achieve the desired results of increased production/income. The reason being that scarcity of water especially during the dry season is what limits livestock populations and pasture access therefore balancing the carrying capacity and available forage (Thurow and Herlocker, 1993). Therefore, ranch subdivision had an effect of increasing crop and livestock productivity of the land if water is freely available.

3.3.4 Productivity in AMK

Livestock productivity

Number-wise, there were more poultry and goats per homestead than cattle. However, based on Tropical Livestock Units (TLUs) there were more cattle than all other animal species in the households (Jahnke and Jahnke, 1982). Cattle also yielded the highest production, in terms of income returns, for all locations as shown on Table 6. Those living in hilly areas had the highest average returns from cattle at KES 30,626 per year, compared to households near water, at an average of KES 25,903. Probably because there were very few donkeys, there were few reports of financial returns from the. However, they were valued by owning households for ferrying water and building materials, though they did not attach cash values to these services. Sheep and goats and sheep incomes were similar although households had more goats than sheep. Chickens, having low individual value, registered low income to the households.

Table 6: Mean Livestock numbers and income per household (KES)

Location*	Livestock Type	Population / Household (numbers)	Tropical Livestock Units (TLU)	Key Products Generating Income	Gross Annual Income (KES) / Household
Near water	Cattle	8	5.6	Live animal, Milk	25,903
	Goats	10	1	Live Animal	2,654
	Sheep	8	0.8	Live Animal	932
	Chickens	14	0.14	Live Animal	361
Tarmac	Cattle	8	5.6	Live Animal, Milk	23,662
	Goats	10	1	Live Animal	1,522
	Chickens	17	0.17	Live Animal	416
	Sheep	8	0.8	Live Animal	105
Hilly Area	Cattle	8	5.6	Live Animal, Milk	30,626
	Goats	12	1.2	Live Animal	2,217
	Sheep	8	0.8	Live Animal	1,159
	Chickens	18	0.18	Live Animal	157
Rocky area	Cattle	9	6.3	Live Animal, Milk	20,382
	Goats	14	1.4	Live Animal	3,182
	Sheep	9	0.9	Live Animal	955
	Chickens	25	0.25	Live Animal	164

*The categories are not mutually exclusive: one may live on a hill that is close to water and tarmac road

Tropical Livestock Units conversion factors are: cattle = 0.7, sheep = 0.1, goats = 0.1, chicken = 0.01 (Jahnke and Jahnke, 1982).

The results showed no direct association between livestock numbers and financial returns or between location and financial returns.

Crop productivity

Maize and beans were allocated more land and therefore were more important crops to the residents than other crops including vegetables, fodder or fruits. This is shown in **Table 7**. Higher average incomes per home were registered from beans, which ironically were allocated less land than maize. The highest average bean crop income was reported in the rocky areas at KES. 35,364. Next was the report of KES 27,200 bean income from the hilly areas. However, it is important to note that beans fetch a higher unit price than maize at KES 60 per kg compared to the KES 30 per kg of maize. Vegetables also made a significant contribution to incomes for those living in hilly areas and near water unlike fodder and other crops that failed to make a significant contribution to household incomes in most areas.

Comparison of Production in AMK

The comparison for productivity in AMK before subdivision and the current situation confirmed that the residents' have higher incomes now than they did before the subdivision. **Table 8** shows that the residents are getting higher incomes than they were before the subdivision in all sectors. Crops were bringing higher returns than all other sectors before subdivision.

In **Table 3** and **8**, there is decreasing preferential use of land for homestead, crops and livestock in that order. More land was allocated to crops than to other forms of land uses. This is attributable to the higher incomes that crops brought compared to livestock **Table 6** and **7**. Crop and livestock production have been shown to be the main sources for people living in ASALs.

Table 7: Mean Crop production (KES) and acreage per household in AMK

Location*	Crop Type	Acreage	Gross annual Income (KES)
Near water	Beans	1.7	17,434
	Maize	2.3	13,034
	Vegetables	0.23	3,104
	Fodder	0.07	537
	Other Crops	0.05	269
Tarmac	Beans	1.7	17,761
	Maize	2.4	15,829
	Vegetables	0.26	145
	Fodder	0.05	-
	Other Crops	0.05	345
Hilly Area	Beans	1.8	27,200
	Maize	2.1	10,783
	Vegetables	0.19	8,696
	Fodder	0.01	-
	Other Crops	0.05	783
Rocky area	Beans	1.4	35,364
	Maize	2.4	6,727
	Other Crops	0.04	1,636
	Vegetables	0.4	-
	Fodder	0	-

*The categories are not mutually exclusive: one may live on a hill that is close to water and tarmac road

This is because of the source of nutrition and the fact that livestock has high-end byproducts such as meat and milk which fetch high prices (Veit, 2011). Furthermore, the residents of AMK show diversity in the types of livestock they kept. This ensured a complementary use of forage and gambled on the strengths of each species eg. Goats survive drought better than cattle and sheep. This also gave a cushion in times of crop failure and sedentary agro-pastoralists could rely on livestock at those times (Nyariki, 2004; Kariuki, Tandigar and Farah, 1996). This is another positive effect of ranch subdivision whereby initially all the land was dedicated to extensive livestock but after subdivision it was subdivided to various uses among; crops, livestock and homestead.

The comparative study for production before and after subdivision is shown on **Table 8**. It shows that all sectors were having higher returns after than before subdivision. Beans, maize and vegetables were doing better than the other crops. The livestock numbers were higher after subdivision more so the poultry, goat and cattle in descending order. In terms of sectors crops, livestock and business were performing much better than other sectors after subdivision.

This therefore means that there was reduced land degradation after subdivision. Other studies have found that there was variable performance of the various sectors after subdivision (Kiarie, 2014). Other studies suggest that adequate time was not allowed after subdivision and that the higher productivity can be attributed to fertile soils that have not undergone overuse as the major reason (Kimani and Pickard, 1998).

In addition, some studies also suggest that understanding the effect of subdivision on long-term land degradation is hard (Behnke, 1993). However, according to Woodhouse (1997) ranch subdivision results in increased land productivity for livestock and crops.

Table 8: Yearly Productivity from Various Sources before and After Subdivision at AMK

Resource	Use	Units per Annum (Mean)	
		Before	After
Land (Acres)	Homestead	0.70	5.58
	Crops	0.86	4.33
	Livestock	0.06	0.09
Crop Production (KES)	Beans	3,655	24,392
	Maize	181	21,358
	Vegetables	9	3,949
	Other Crops	-33	241
	Fodder	0	228
Livestock Production (Number)	Poultry	5	15
	Goat	2	10
	Cattle	2	8
	Sheep	1	6
	Donkeys	1	-
Incomes, KES	Crops	3,807	34,369
	Livestock	12,591	33,684
	Business	608	25,549
	Employment	2,759	21,175
	Other Sources	506	10,116

The implication of this is that the residents will continue to cultivate crops and rear livestock in AMK. There will also be more businesses set up in the area and new employment opportunities.

3.4 CONCLUSION

Ranch subdivision resulted in benefits for many more people than previously when the ranch was intact. Types of livelihood activities were diversified while the number of livestock kept and volumes of crop produced increased. The results, therefore, suggest that subdivision is more beneficial to individual shareholders in terms of incomes and standards of living.

3.5 RECOMMENDATIONS

These recommendations were identified as actions that would enhance the productivity of the land.

They include;

- a) To better manage access to communal water resources at AMK for increased productivity of crops and livestock through participatory allocation.
- b) To advocate for better market prices for the products especially crop products within AMK.

CHAPTER FOUR: RANCH SUBDIVISION: NEW KNOWLEDGE, PRACTICES AND PRACTICES; AIMI MA KILUNGU – MAKUENI COUNTY, KENYA

ABSTRACT

Ranch subdivision transforms the landscape in terms of human and other biodiversity, and land use systems. Studies have generally concentrated on its effects on land productivity and biodiversity. However, gaps exist on information available on social wellbeing of communities after ranch subdivision, perhaps due to its broad, diverse and complex nature. The case of Aimi ma Kilungu (AMK) ranch subdivision is used here to delve onto the potential transformation of attitudes and practices on land tenure and land use systems in addition to social restructuring necessary for survival in the new environment. The data was collected using semi-structured interviews to respond to questionnaire questions. There were 79 respondents randomly selected from those who had settled in AMK after subdivision. The driving forces for ranch subdivision were; the opportunity to change one's fate and economic empowerment which are presented as the expectations and apprehensions in the research. Factors such as ownership of land and the desire for freedom also played a major role. There were challenges met on settling at AMK, but settlers developed coping strategies and transformation themselves and the land to enhance their living standards. Conclusively ranch subdivision was demonstrated to be preferable to group ranching as far as quality of life for the owners was concerned. In addition, it motivated land use changes and influenced social mindset evolution.

Key Words

Ranch subdivision; social wellbeing; land tenure; land use systems; challenges; transformations

4.1 INTRODUCTION

The extent and diversity of land use change drivers in arid and semi-arid lands is complex. However, it is seen to be subject to socio-economic dynamics, livelihood changes under varying socio-cultural environments, government policy and individual aspirations of land title holders. These changes are also influenced by the national context of increasing population growth, diminishing resources in previous high potential areas and consequent migration of people into previously marginal land. The migrants introduce new land uses in addition to carrying-over subsistence systems from their previous areas of residence. Population growth, poor livestock returns, political expediency, livelihood and demographic pressures lead to subdivision of available land into individual titles (Nyamasyo, Namusonge, Odongo, Mugo, Mugure, Maina, Phelix and Ngaruiya, 2006).

At one time, livestock and wildlife dominated the Athi-Kapiti plains (Gichohi, 2003). The increase in livestock numbers were in tandem with human population increase since the end of the last century (Talbot and Talbot, 1963; Kristjanson, 2002). Livestock grazing was the main factor determining the vegetation composition and dynamics of the ecosystem. The high livestock stocking rates, overgrazing and change in land tenure systems led to range degradation that produced human/livestock/wildlife catastrophes that were especially devastating during drought events. Case in point are the starvation and mortalities experienced in 1974, 1984, 1995 – 1996 and 2005 – 2006 (Nyamasyo et al, 2006).

Group members or shareholders exerted pressure that resulted in subdivision because they had hopes and expectations of better lives that were not fulfilled under communal arrangement. They also had some fears of the status quo then. This study examined the expectations and apprehensions that individuals held that led to subdivision of many group ranches. Using the case of Aimi ma

Kilungu group ranch, the extent of realization of the expectations and apprehensions, it helped document the challenges and coping strategies after the ranch subdivision.

4.2 MATERIALS AND METHODS

4.2.1 Study Area

The study was conducted in Aimi ma Kilungu which is located in Makueni and part of Kajiado Counties, *Figure 1*, 93km south-east of Nairobi County, along Mombasa road, covering an area of 8,195 ha (20,077.75 acres, using 1 ha = 2.45 acres). It borders Malili ranch to the north, the Kima-Kiu to the south-eastern side, the Stanley & Sons ranch to the South-west and the Ulu settlement on the South-western side. The GPS coordinates to the area are 1.784°S, 37.215°E to the north and 1.842°S, 37.257°E to the south-eastern side (Nyamasyo and Gichangi, 2006).

The area has bimodal rainfall ranging from 400mm to 850mm with short rains coming on November to December succeeded by a long dry season in January to March. Aimi ma Kilungu receives an average of 600mm of rainfall with the mean annual temperatures ranging from 25°C - 40°C (Nyamasyo and Gichangi, 2006). The area has black cotton soils. Gypsum is common in the area.

Aimi ma Kilungu has 1530 shareholders and supports a population of close to 10,000 people. The residents are mainly small-scale farmers practicing mixed farming. The types of livestock kept in Aimi ma Kilungu include zebu and boran cows, goats and local chicken. Ranch subdivision was finalized by 2006 with equitable sharing of the plots amongst the shareholders. Notably, the surrounding ranches such as Malili, Kimakui and Stanley & Sons are still intact. The main ethnic group is the Akamba with other groups present because of sales of whole or sections of the plots in the area.

4.2.2 Data Collection

Semi-structured interviews were conducted to fill in the questionnaires between June and November 2017. The target population was the current residents of Aimi ma Kilungu who have occupied their share of the land. Respondents were selected randomly from those who had already settled in the AMK. The questionnaire data was collected using EpiCollect Plus (EpiCollect + Beta. n.d.). This is an application that allows input of survey questions on its database on the internet. The application is then loaded onto a tablet or mobile phone and questions once answered are stored and loaded onto the EpiCollect database for later retrieval. The application also allows one to take Global Positioning System (GPS), audios, videos and photographs.

The questionnaires sought to elicit information on the type of livelihood channels pursued the reasons behind a livelihood activity and the level of current productivity compared to that before subdivision. Data on the type and quantity of assets owned, the livelihood activities undertaken and agricultural productivity of the plots after and before the ranch subdivision was collected. In addition, 3 key informant interviews (KI) were held. The participants in the KIs were identified and interviewed. These included residents who had been in the area since the inception of the ranch, young inheritors, local government, former ranch workers and people who had bought land in Aimi ma Kilungu.

4.2.3 Data Sources

Ranch records were used to get data on the earlier performance of AMK when it was intact. This included data of livestock population before subdivision, livestock records before subdivision and livelihood data before subdivision. Secondary data was obtained from reviews of both published and unpublished literature from diverse local, national and international sources related to ranch subdivision and crop and livestock dependent livelihoods. The results from the reviews have been

used to supplement primary data, which was collected via questionnaires, key informant interviews, participant observations, and to support various aspects related to the study.

4.2.4 Sampling and Sample size

The map showing placement of all households was provided by the former ranch manager of AMK who was the field assistant for the study. The study applied the method provided in the book ‘Craft of Research’ that involves rigorous scientific formulae, which provides for 95% confidence level as below, to compute a sample size of 72 households from the recorded 1530 households (Booth, Colomb and Williams, 2008).

$$n = \frac{(z^2 \times p \times q \times N)}{e^2(N - 1) + (z^2 \times p \times q)}$$

Equation 2: Sample Size Calculation

Where:

n = Sample size (being determined),

N = Population size (which is known, 1530),

p = Sample proportion (assumed to be 0.05, if not given),

q = 1 – p,

e = 0.05 (since the acceptable error (level of significance) should be 5%) and z = Standard deviation at a given Confidence Interval (z = 1.96 at 95% CI).

The sample households were selected randomly through balloting. All the households were written down on pieces of paper, folded and put in basket and picked. The researcher chose to do work with 79 households all randomly selected

4.2.5 Data Analysis

The questionnaires data was downloaded from the EpiCollect Database on Microsoft Excel 2016. The data was then analyzed through generation of tables showing proportions, average productivity and cross-tabulations of key factors. Where possible, value of productivity and activity was generated. Relationships and associations were determined using frequency measure tables, visual graphs/tables and ANOVA using Statistical program for Social Scientists (SPSS 20.0). Data from KIs turned out to be irrelevant to the study and therefore, was not analyzed.

4.3 RESULTS AND DISCUSSION

4.3.1 Expectations and Apprehensions

Change is risky. However, one must hope for the best and prepare for the worst. People anticipating for the best have *expectations* while those preparing for the worst have *apprehensions*. In the period leading to the subdivision of the AMK there was a lot of pressure from the shareholders to subdivide. The residents had some expectations and apprehensions in the period preceding the subdivision of Aimi ma Kilungu (AMK) ranch. Upon subdivision there were several positive and negative outcomes seen. There were also immediate challenges that were experienced. The researcher also endeavored to find out the coping strategies that the residents adopted in order to deal with these challenges. In addition, the individual, family and community adjustments made due to the challenges or benefits arising from subdivision were also recorded.

The expectations and apprehensions that the residents of AMK had before the ranch was subdivided in 2006 are shown on **Table 9**. About 45% of the residents ‘strongly agreed’ that they hoped they would control their own destiny once the ranch subdivided. This was because in their previous residences most claimed that they were not able to control their destinies due to various

prevailing situations. These included but were not limited to; living in the same compounds with their in laws, conflicts with neighbors over boundaries or animals trespassing and living on other people's land. This was followed closely by the hope for economic empowerment at 43.9%. The respondents expressed that their desire to have the ranch subdivided was so they could move to AMK to get the opportunity to uplift their economic situations. There were other expectations held by a smaller proportion such as to do crop farming at 3.2% and keep livestock at 1.9%. This was mainly because they either did not own land or had very small pieces in their previous settlements. Other expectations were; to build a home (1%), get bigger land than what they currently owned (1%), opportunity to get assets (0.6%), get away from social pressures (0.6%), desire for freedom (0.3%), to do business (0.3%) and improved access to amenities (0.3%).

The control of destiny and economic empowerment were among the highest-ranking drivers of land use change. It is evident that the respondents were willing to move from their previous residences and migrate to the new settlement of newly subdivided ranch of AMK. This is supported by literature on migration in other areas of the country and the world. According to Elbadawy (2011), the youth in Egypt especially those from resource poor areas were willing to migrate to other areas and outside with the expectation of better opportunities to get economic empowerment (Collins, 2017). Whether these drivers for migration (including desire to own land, desire to keep livestock or plant crops) that eventually led to the ultimate subdivision of the ranch were influenced by social or individual factors is far from being ascertained.

Table 9: List of the Ranking Expectations and Apprehensions Among Respondents Before Subdivision

Expectations	%	Apprehensions	%
Control of their fate	44.9	Rise in conflicts due to land	28.4
Economic empowerment	43.9	Increased misuse of natural resources e.g. Cutting down of trees	25.4
Do crop farming	3.2	Would not get land	24.7
Improve economic situation	1.9	Reduced community association/collective action	20.4
Keep livestock	1.9	Wildlife attacks on people, livestock and crops	0.5
Build a home	1	Social challenges e.g. no friends in AMK	0.2
Get bigger land	1	Sale of ranch land without shareholders knowledge	0.1
Get assets e.g. livestock	0.6	Insecurity e.g. theft in homes	0.1
Reduced social pressure e.g. Fights with neighbors	0.6	Family e.g. conflicts over land	0.1
Freedom	0.3	Low capital/Lack of money	0.1
Do business	0.3		
Improved access to amenities	0.3		

Some literature has argued that the desire to migrate is usually a 'social force' rather than an individual desire (Carling, and Collins, 2017; Carling, 2014). Notably, research shows that the perceptions of the community are usually critical in long-term ecological integrity maintenance. This is because the community could easily cascade into widespread destruction as the shareholders feel that their resource is benefitting non-members, illegal grazers, wildlife, tree poachers and pastoral herders (Nyamasyo et al, 2006).

Among the highest ranking fears were the fear of rise in conflicts (28.4%), followed by the fear that there would be increase in the misuse of natural resources (25.4%). A significant proportion was also afraid they would not get land (24.7%) while another proportion feared that there would be a reduction in the collective action of the shareholders (20.4%) once the ranch was subdivided. Smaller proportions of the AMK residents also disclosed other fears such as fear of wildlife attacks (0.5%), social challenges (0.2%), that there would be sale of the ranch without knowledge of the shareholders (0.1%), insecurity in AMK (0.1%), family/personal problems (0.1%) and low capital (0.1%).

The fears held by the respondents were rational. This is because the decision to migrate from an area of familiarity to one that is unknown is usually risky because of unforeseen challenges and the disappointment of unfulfilled hopes and dreams (Elbadawy, 2011). The respondents feared that there would be conflicts arising after ranch subdivision. The type of conflicts feared were those surrounding the decision to subdivide, ownership and the use of land. This is because historically land holds a very vital position in African communities. It is viewed as an asset, a factor of production as well as a form of cultural identity. Therefore, it is a very precious commodity and very often the cause of disputes (Lund, Odgaard and Sjaastad, 2006).

4.3.2 Realization of Expectations and Apprehensions

Upon settlement in AMK some of the expectations and apprehensions were realized while others were not. The breakdown of the realization of expectations and apprehensions is shown on **Table 10**. This section describes the realization of the expectations and apprehensions. It is evident that the major expectations the respondents harbored for AMK were satisfactorily realized with 77.2% reporting they were able to control their destiny and 82.3% having realized economic empowerment. Other expectations which have been listed in **Table 10** were realized with a proportion of 17.7%. With regards to apprehensions the fear that there would be misuse of natural resources was realized at 67.1%. This came in the form of widespread cutting down of trees and burning of charcoal as soon as the ranch was subdivided. The apprehensions, reduced community association and rise in conflict were both realized at 8.9% for those who harbored these apprehensions. The fear of not getting land after subdivision was harbored by all respondents but was not realized for any of the respondents in the study. Other apprehensions which have been listed in **Table 10** were realized at 5.1%.

4.3.3 Outcomes of Subdivision of AMK

After the eventual subdivision of AMK in 2006 and the settlement of the respondents into the area there were some outcomes that were witnessed. **Table 11** shows both positive and negative outcomes of ranch subdivision. The positive outcomes were as follows; 36.5% of the respondents reported an increase in the livestock numbers while 36% indicated increased incomes. An increased number of livestock was seen as a positive outcome because those that reported this viewed increased livestock as an increase in assets. The increased incomes came as a result of having the opportunity to have more space to make income from their livelihood activities.

Table 10: Realization of Expectations & Apprehensions of Respondents of AMK after Ranch Subdivision

Aspiration	Realization (%)		
	No	Yes	Not Applicable
Expectations			
Control Destiny	0.0	77.2	22.8
Economic Empowerment	7.6	82.3	10.1
Other Expectations	19.0	17.7	63.3
Apprehensions	No	Yes	Not Applicable
Reduced Community Association/Collective action	81.0	8.9	10.1
Misuse of Natural Resources	8.9	67.1	24.1
Rise in Conflict e.g. fights over land	67.1	8.9	24.1
Would not get land	100	-	-
Other Fears	68.4	5.1	26.6

‘No’ denotes that the individual harbored the hope or fear but it was not realized. ‘Yes’ denotes the individual harbored the hope or fear and it was realized. ‘Not applicable’ denotes that the individual did not harbor the hope or fear and therefore it was not applicable to them.

Table 11: Outcomes of Ranch Subdivision

Outcomes			
Positive	%	Negative	%
Increased livestock numbers	36.5	Environmental destruction e.g. cutting trees and burning charcoal	56.2
Increased incomes	36	Family breakdown (due to land disputes)	31.2
Reduced environmental destruction	26.1	Decreased incomes	6.3
Bigger land	0.5	Poor amenities e.g. Schools, hospitals, shopping centers	6.3
Peace	0.5		
Freedom	0.5		
Decreased conflicts	0.5		

In addition, it also came as a result of reduced cost of living e.g. they were no longer buying food. About 26% of the respondents stated that they had witnessed reduced environmental destruction (*Figure 3*), 0.5% now had bigger land, 0.5% peace, 0.5% freedom, and 0.5% decreased conflicts. It was reported that environmental destruction occurred immediately after ranch subdivision due to extensive illegal logging of trees in AMK. Unknown people carried out the destruction during the intervening period of subdivision and the resettlement. The AMK residents implicated the nearby Ulu residents. Those that indicated that they had bigger land in AMK previously had very small pieces of land. Peace and freedom were quoted by those that previously lived with in-laws, had conflicts with neighbors and by those who did not live on their own lands in their previous residences. This was also the case for those respondents that reported decreased conflicts as these situations often precipitated conflicts.

The negative outcomes witnessed were environmental destruction (56.2%), family breakdown due to land disputes (31.2%), decreased incomes (6.3%) and poor amenities e.g. schools and hospitals. The environmental destruction witnessed after ranch subdivision was immense. The trees were cut down to burn charcoal.

Family breakdown was seen in some families as some of the siblings fought over the AMK parcels of land. This was especially so, in those families where the original owners e.g. the parents had passed on and left the land to their children. Decreased incomes were witnessed in those households whose occupants had to desert employment or business ventures in their previous residences in order to migrate and settle in AMK. It was reported that poor amenities were an outcome. Even at the time of writing this paper, AMK is yet to get social amenities such as hospitals and schools.



Figure 3: Tree Cutting in AMK

4.3.4 Immediate and Long Term Challenges of Subdivision

The challenges that were experienced immediately after subdivision and in the long term are listed in **Table 12**. They are ranked in order of challenge with highest impact to that with least impact.

Water shortage ranked as the biggest challenge immediately after ranch subdivision and in the long term because there was vandalization of the piped water system that existed before the ranch was subdivided. This system had been designed with water being pumped from various boreholes and distributed to water tanks throughout the ranch. However, the new AMK residents and other unknown perpetrators vandalized the water pipes and tanks therefore escalating the water challenge in an area that has always been climatically water scarce. Wildlife attacking people, livestock and crops was ranked second as a challenge immediately after subdivision. This arose from the fact that during its ranching times, AMK was a wildlife habitat, in addition to being a migratory route. On subdivision, the wildlife was displaced from their habitat.

Furthermore, fencing of individual parcels disrupted their migratory routes while the influx of livestock depleted the available grazing forage and water (Nyamasyo and Gichangi, 2006). There was also insecurity immediately after ranch subdivision and in the long term. This included livestock rustling, burglary, and even incidences of violent robberies. Immediately after ranch subdivision, there were no amenities such as schools, hospitals, shopping centers, and roads. This was expected as the area was a newly settled land and these amenities take time to establish while such amenities as schools, churches and hospitals grow on demand. In the long term while there were efforts to set up such institutions as churches, hospitals and shopping centers, there still are many quality challenges as new institutions are mostly ill-equipped. Such communal institutions as schools and hospitals do not even hold title deeds to the lands they sit on.

Table 12: List of the ranking immediate and long-term challenges of subdivision

Challenges	
Immediate Challenges	Long-Term Challenges
Water shortage	Water shortage
Wildlife attacks on people, livestock and crops	Poor amenities e.g. incomplete schools
Insecurity e.g. cattle rustling, breaking into homes	Drought
Lack of amenities e.g. hospitals, schools & shopping centers	Wildlife attacks on livestock and crops
Food shortage & Drought	Lack of money
Lack of money	Lack of animal feeds e.g. grazing forage and concentrates
Family problems e.g. conflicts over land	Social challenges e.g. Loneliness
Lack of animal feeds e.g. grazing forage and concentrates	Livestock diseases e.g. east coast fever & anaplasmosis
Lack of building materials	Grazing disputes
Social challenges e.g. Loneliness	Insecurity e.g. cattle rustling, breaking into homes
Lack of employment opportunities	Lack of title deeds
Destruction of public amenities e.g. water pipes & tanks	Lack of energy sources e.g. firewood
Livestock diseases e.g. east coast fever & anaplasmosis	
Lack of energy sources e.g. firewood	

The respondents experienced food shortage and drought when they settled in AMK. This was because the land was virgin, having no previous cultivation. In addition, AMK is an area that is plagued by drought and some of the planting seasons did not yield quick harvests aggravating the food shortage. Thus food had to be bought from the budding shopping centers which were at a distance. In the long term the area is still plagued by drought and the respondents only sell crop produce if the succeeding planting season yields harvest. This is done to avoid food shortage.

Lack of money was a challenge in periods both early after subdivision and long after. While money is generally a scarce resource particularly in the rural areas, inability to earn any because of scarcity of opportunity and the expensive migratory process only caused the new settlers more grief. In some cases, the respondent had to leave their previous income earning activity therefore, settling in AMK meant loss of income. This pecuniary challenge led to family problems immediately after subdivision and consequently some household strife over the ownership of the land in AMK.

Lack of adequate grazing was also an immediate challenge because of low quality vegetation and the rapid increase in stocking rates occasioned by people neighboring AMK who took advantage to have their livestock invade open grazing areas during the transition period, especially the Maasai with their vast herds. The animal concentrates were also prohibitively expensive. The livestock feeds challenge has continued to date.

The other problems encountered included availability of building materials preceding commercial development; new livestock diseases e.g. anaplasmosis; low employment opportunities; lack of fuel wood in the poorly wooded grassland; loneliness felt from missing past friends and family, and low human populations. To date loneliness continues to be a challenge for some. Livestock

diseases on the other hand resulted in economic losses through death, loss of production and increased costs of production.

In the long term, there was also the challenge of grazing disputes, in addition to the Maasai herders invading the area during drought seasons, and lack of title deeds. These disputes arose as a result of competition for the little available forage vis-a-vis the high number of livestock per household in AMK. There is also the issue of title deeds which has become a challenge as the respondents are yet to receive their deeds.

4.3.5 Coping Strategies for Challenges

The strategies that the residents adopted to cope with the challenges are recorded and shown in **Table 13**. In the short-term water shortage was dealt with by buying water. They bought water from those who had private boreholes and water vendors in towns such as Salama and Sultan Hamud (along Nairobi - Mombasa road). In the long term, the residents experiencing water shortage preferred to harvest water during the rains, to create their own boreholes or buy water. Sinking boreholes depended on the financial ability of the individual.

To cope with feed shortage immediately after subdivision residents sold livestock to generate funds to buy feed for the remainder. In the long term the respondents have been coping in various ways namely; storage of forage, grazing in other plots that are not occupied, adopting modern farming e.g. zero grazing and rotational grazing. Fodder storage and zero grazing witnessed during the research is demonstrated on *Figure 4 & 5*.

Lack of money was a challenge experienced immediately after subdivision and long after settlement. Immediately after subdivision, some of the respondents took loans while in the long term sale of manure has been employed by some to cope with lack of money.

Table 13: Coping Strategies For Challenges Experienced Immediately After Subdivision and in the Long Term After Settlement of AMK

Coping Strategies *N = 79			
Challenge	Short Term	Long term	
Water scarcity	Buying water from nearby towns e.g. Salama or from people with private boreholes	Water capture and storage in water tanks	
		Creating boreholes/dams	
		Buying water	
Lack of animal feeds and forage	Selling livestock to reduce the stocking density	Storing forage in sheds for use in the dry season	
		Buying forage from nearby towns e.g. Salama and Sultan Hamud	Grazing in other plots that are not occupied
			Modern farming e.g. zero grazing
Lack of money	Taking loans	Rotational grazing in paddocks within their land	
		Selling manure	
		Joining and forming community self-help groups	
Social Challenges	Did nothing		
Wildlife attacks on people, livestock and crops	Chasing the wildlife by use of crude weapons and noise		
	Calling the Kenya Wildlife Service (KWS)		
	Killing the wildlife		
Insecurity e.g. theft of stock and breaking into homes	Engaging the law (calling the police)		
	Killing the thieves		
Lack of Amenities or Utilities e.g. churches, hospitals, schools, roads	Travelling long distances to get amenities		
	Started schools and churches		
Food Shortage	Receiving relief food from the government		
	Buying food		
Lack of building materials	Makeshift houses		
	Bought building materials		
Lack of employment opportunities	Found employment		

Other Problems	Awaiting the hard times to pass	
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*N is the total number of respondents in the study. They are 79 in total.

Social challenges e.g. lack of friends and social contact was reported as a challenge currently experienced by some of the respondents in AMK. In order to cope the residents indicated that forming and joining local groups e.g. self-help and social groups (*chamaas*) was helpful in making new friends and contacts.

The following are the coping strategies of the short-term challenges experienced immediately after subdivision. Relief food was provided for those who could not afford food. To overcome poor access to building materials, some made make-shift houses while a few others brought building materials with them. To deal with the wildlife challenge the respondents chased away the wildlife or called the Kenya Wildlife Service (KWS). Occasionally, some killed the wildlife. Rustlers and burglars were either referred to the police or were handled by mob beating/killing. Adults and children walked long distances to access shopping centers, hospitals and schools. Those with experience found employment. The rest simply waited through the hard times.

The short and long term challenges experienced and the coping strategies employed by the community presented respectively on **Tables 12** and **13**. Challenges such as lack of water, wildlife destruction seen both in the short and long term were expected given that AMK is an ASAL and water scarcity and drought are major characteristics of these areas. The research found that the major sources of water were community boreholes and dams. The boreholes had been there for long periods of time required rehabilitation and livestock management. The same applies to the dams which could support the domestic and livestock needs. However, areas adjoining the dams must be protected from overgrazing and cultivation to prevent siltation.

In regards to wildlife, AMK was a wildlife habitat before the subdivision and the subdivision disrupted their homes as well as migration routes especially due to fencing of individual parcels.



Figure 4: Fodder Storage in AMK



Figure 5: Zero Grazing in AMK

Some scholars have suggested that tolerating wildlife within livestock production system is one way of increasing ASAL productivity and biodiversity of local communities (Reid, Gachimbi, Worden, Wangui, Mathai, Mugatha and Ogol, 2004). However, this would only be applicable to AMK if land tenure and profitability were guaranteed.

Furthermore, the ranch is surrounded by subdivided plots of former ranches and its viability as an isolated conservation is doubtful. Lack of amenities seen as a short and long-term challenge is usually an expected challenge in newly settled land. For permanent settlement to take place the construction of social amenities such as schools, dispensaries, roads and shopping centers must take place (Nyamasyo et al, 2006). This must all be taken into account including allocating roads during the survey process. While this was done it is yet to be fully implemented in AMK.

The coping strategies employed in **Table 13** have been employed in other situations with success. Wanyonyi (1998) in the paper ‘rainwater harvesting possibilities and challenges in Kenya’ explores the various ways in which rainwater can be captured and stored for future use. There however, remains a huge gap in water preservation and conservation in ASALs such as AMK. Fodder shortage which remains a challenge in AMK, was solved through; fodder conservation, rotational grazing, and adoption of zero grazing production system. Notably, fodder shortage is also a challenge associated with water stress. Research done suggests the solution lies in shifting to different livestock breeds in conjunction with grazing reorganization and pasture preservation for use in times of extreme hardship (Ketiem, Diarra, Soura and Konou, 2015). BurnSilver and Mwangi (2007) found that despite the Maasai advocating for subdivision of their group ranches (change in land use) in order to intensify and diversify production, they also made efforts to re-aggregate their access to resource through pasture swapping and sharing (Jaetzold, Schmidt,

Hornetz and Shisanya, 2006). This has not been seen in ranches that have subdivided so far in Ukambani e.g. Malili which is close to AMK.

The following is a summary of the changes that have since taken place in AMK since the subdivision up until now. A summary of the differences between AMK in 2016/2017 and 2006 (when subdivision took place) are listed on **Table 14**. Of particular importance was the comparison of the poverty levels in the different times. Poverty has decreased significantly since 2006. This is not automatic since the challenges of settlement in the new area are tremendous as exemplified in **Table 14**. However, similar studies have also supported this finding where the impact of migration and resettlement has a consistently negative correlation with the incidence of poverty. This is despite the challenges associated with process of resettlement (Van Meeteren, Engbersen and Van San, 2009).

4.3.6 Transformations and Adopted Practices after Ranch Subdivision in AMK

A transformation refers to a marked change in form or behavior of an individual or society (Cambridge English Dictionary, n.d.). There were some transformations that the society of AMK underwent either as a direct result of the ranch subdividing or as coping mechanism to the challenges that developed due to the subdivision of the ranch. **Table 15** highlights some of the notable transformations that were seen in AMK. It gives the proportion and the percentage of people that were transformed. There are transformations that were associated with water and those affiliated to livestock. As mentioned earlier in the paper AMK is a relatively dry area. In addition to this the networked water system that had initially existed before subdivision was destroyed (**Figure 6 & 7**), interrupting water supply and availability. This was further aggravated by the drought which at times plagues the area.

Table 14: Mean Comparison of Different Sectors in AMK between 2006 (immediately after subdivision) and 2016/2017 (currently)

Year	Insecurity	Water Insecurity	Forage Availability	Land Related Family Conflicts	Poverty Levels
2006	4.3	2.5	3.5	4.5	6
2016 / 2017	2.4	4.4	1.8	2.8	2.5

This table was derived from responses by the residents of AMK on their opinions on whether each section listed was doing better or worse in 2016 / 2017.



Figure 6: Destroyed Water Tank in AMK

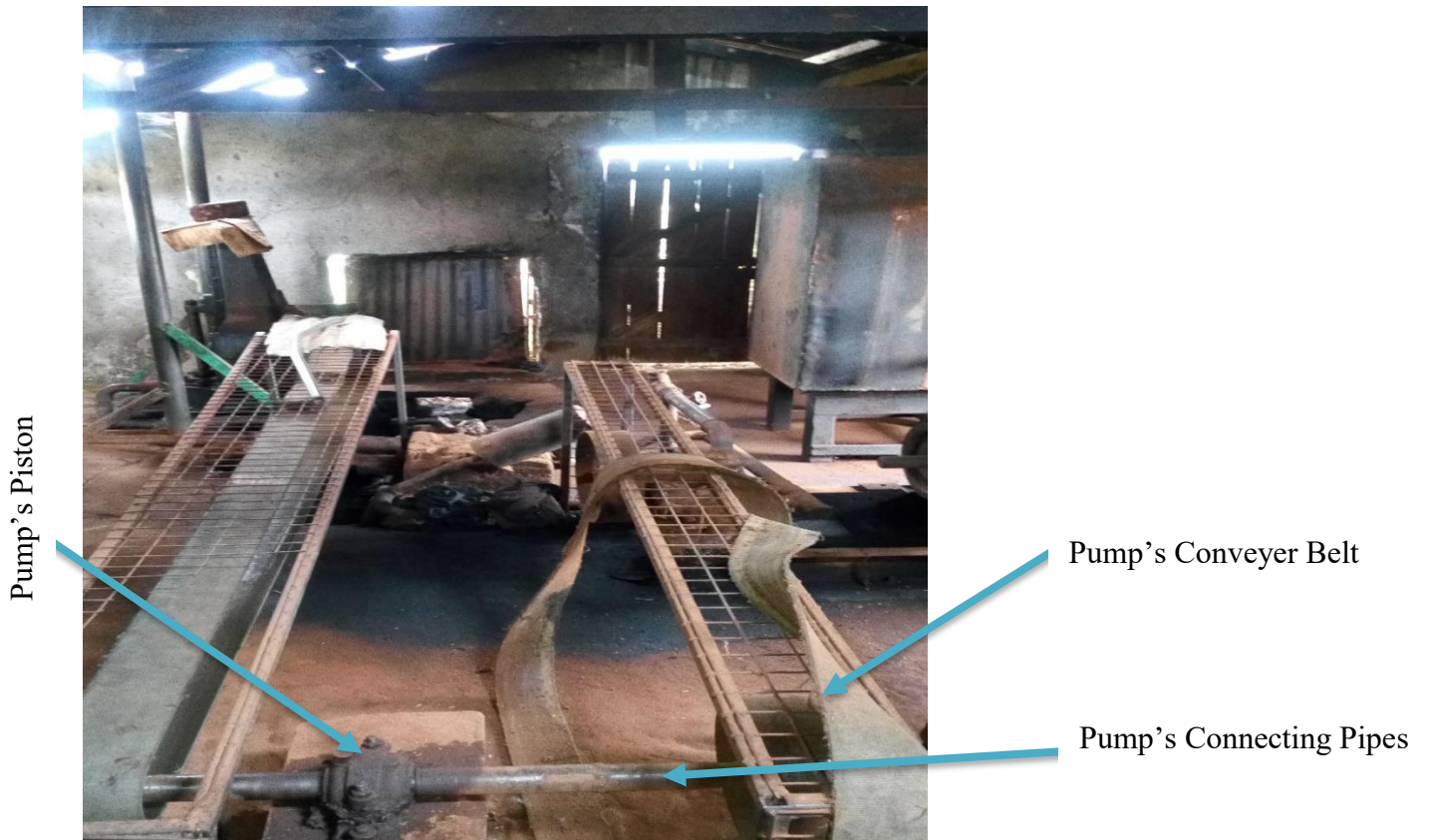


Figure 7: Water Pump Infrastructure at AMK (these would pump water to water tanks shown on Figure 6 were installed by the original British owners)

Table 15: Transformations & practices adopted after Ranch Subdivision in AMK

Transformations		
Water	Proportion (N)	Percentage
Water harvesting (Capturing and storing rain water in water tanks)	30	38
Sinking Boreholes	7	8.9
Livestock	Proportion	Percentage
Fodder Storage e.g. in sheds	23	29.1
Zero Grazing	3	3.8
Rotational Grazing of livestock	2	2.5
Under stocking livestock	2	2.5
Society	Proportion	Percentage
Forming and joining community groups	67	84.8

*N is the total number of respondents in the study (sample size). They are 79 in total.

In a bid to cope with this challenge some of the respondents adopted sustainable water harvesting techniques. A small minority (8.9%) who had the financial ability sunk boreholes while (38%) invested in tanks and captured rain water.

Another major sector that underwent transformation was livestock with regard to the challenges of feeding, watering, and spread of livestock diseases. A significant proportion (29.1%) adopted fodder production and conservation techniques. Others also bought and conserved fodder from neighbors during periods of plenty. About 3.8% went into cut and carry systems (zero grazing) for their cows while 2.5% subdivided part of their land and practiced rotational grazing. Others (2.5%) reduced the number of livestock in their herds to a number that could be comfortably sustained by their land eliminating the need to buy feed.

The AMK society was transformed by formation of voluntary and open community groups. These groups are diverse and they met the social needs of the new settlers in AMK.

Examples of the groups include; funeral welfare associations, table banking (merry-go-rounds), groups for the aged, women groups that assist in procurement of household and kitchen wares e.g. plates, furniture. 84.8% of the respondents affirmed belonging to such groups.

The transformations seen in **Table 15** were mainly as a result of coping strategies that the respondents employed to deal with the challenges they faced after settling in AMK. However, the residents are not aware or do not attribute these transformations to change in land use more so the social changes. This is a trend that has been confirmed by other studies which suggest that most respondents to studies on impacts of land use often do not attribute those transformations to land use changes. Usually they depend on a person's awareness of the transformation and their personal beliefs on the cause of that transformation. At times the perceived cause of the transformation

differs from the actual observed cause. Therefore, in order to address these transformations one must have an understanding of both perceived and actual cause (Williams and Schirmer, 2012).

4.4 CONCLUSION

The results of this study accept the null hypothesis of the study that ‘ranch subdivision transforms knowledge, innovations and practices. After sub-division, settlers encountered challenges but developed practices and innovations to overcome them including adoption of zero grazing, storing fodder and water harvesting techniques. However, these findings also highlighted theoretical gaps for explaining “transformations dependence on challenge” sometimes dubbed as “necessity is the mother of invention”.

4.5 RECOMMENDATIONS

The researcher identified some areas that call for further study or action as follows;

- a) A robust Environmental and Social Impact Assessment (ESIA) is necessary to inform subdivision of group ranches. However, its recommendations should be followed, else it is a waste of funds, time and fails on the accountability test as it did in AMK.
- b) The potential that exists for water harvesting should be exploited further seeing that it has great dividends.

CHAPTER FIVE: GENERAL RESULTS AND DISCUSSION

The findings of the study show that the location of settlement for the AMK residents had a marked effect on the productivity of households. However, it must be noted that the residents had no control over the location of their individual parcels during ranch subdivision as it was done using balloting. Those living near water and near tarmac (Nairobi – Mombasa highway) recorded higher household productivity than other residents living in hilly or rocky areas, **Table 4** and **5**. It is important to note that a person could be living in more than one area e.g. near water and in hilly area. Studies have corroborated these findings as people found living far from these amenities namely; water sources and roads had low productivity (Kassali et al, 2009; Alpizar, 2007). The study found that only 3.8% of the residents of AMK had their own water supply. During the survey the residents argued that if a higher proportion of residents had their own water supply or greater access to water sources higher productivity would be registered in AMK. Nevertheless, it has been reported that increasing water points/access may not achieve the desired results of increased productivity. This is because the scarce water supply especially during the dry season limited the livestock population and pasture access thus balancing the carrying capacity and available forage (Thurow and Herlocker, 1993).

In regards, to allocation of land for the various land uses there was a decreasing preferential allocation of land to homestead, crops and livestock respectively (**Table 3** and **8**). There was more land allocated to crops than livestock due to the higher returns from crops in comparison to other forms of land use as shown in **Table 6** and **7**. There is evidence that complementary use of land among the various livelihood activities safeguards the household. This gives a cushion in times of hardship e.g. drought when there is crop failure and thus households can rely on livestock (Nyariki, 2004; Kariuki et al, 1996). The study also shows that the overall production in the different sectors

was significantly higher after subdivision than before subdivision. This is displayed in **Table 8**. Similar research has recorded that there is usually variable performance of the different sectors after ranch subdivision (Kiarie, 2014) while Kimani and Pickard (1998) suggest that enough time is not allowed after subdivision to study the impact of subdivision. Therefore, they often attribute the higher productivity to fertile soils that have not been subjected to overuse. However other studies defy this and conclude that ranch subdivision causes increased land productivity more so for crops and livestock (Woodhouse, 1997).

The study also explored the effects of ranch subdivision on several social aspects of the resettled residents of AMK. These include the prevailing attitudes on land tenure and land use systems as well as the social mind set transformations seen after ranch subdivision. The desire to change one's fate and economic empowerment were the greatest drivers of land use change (from group owned extensive ranching to individual owned intensive farming), **Table 9**. During the survey the residents of AMK indicated that they foresaw better opportunities in AMK as compared to the areas they were living in. some also stated that they had no land of their own in their previous settlements. This is supported by similar studies in migration where the move is often prompted by prospect of better opportunities and economic empowerment (Elbadawy, 2011). In the period preceding subdivision they had several expectations and apprehensions regarding resettling in AMK. The greatest fear was that of conflict arising after subdivision especially surrounding the decision to subdivide AMK, land ownership and use. This is because land holds a very pivotal position in the African society as an asset, a form of cultural identity and as a factor of production and therefore predisposed to be a source of conflict (Lund *et al*, 2006). Once they resettled into AMK the residents experienced several challenges both short term and long term. These are exemplified in **Table 12** and **13** where challenges such as water scarcity, destruction of food,

livestock, human life and property by wildlife were experienced both in the long term and short term. These challenges were anticipated given that AMK is an ASAL and therefore drought is commonplace making the former a common phenomenon. The community was using boreholes and dams for their needs but because of poor maintenance they require rehabilitation. As for the latter challenge, before the ranch was subdivided livestock coexisted with wildlife. In addition, AMK formed an essential part of the migration routes for the wildlife in the Athi-Kapiti ecosystem. Therefore, subdivision displaced the resident wildlife while destroying the migratory routes of others at the same time. However, the residents have not shown interest in coexisting with the wildlife despite some studies suggesting that tolerance of wildlife within livestock production system is a way of increasing ASAL productivity and community biodiversity (Reid *et al.*, 2004). The preservation of wildlife would also serve as a source of income for the community through tourism. It has been found that through use of community based approaches such as cost benefit sharing, wildlife conservation can be achieved with benefits to both the community and wildlife (Hulme and Murphree, 2001). Another challenge was lack of amenities such as schools, hospitals and electricity that is still being experienced in AMK. However, this is expected to change over time as more people settle and develop the area. This would ensure permanent settlement takes place (Nyamasyo et al, 2006).

To cope with the challenges, the residents employed the strategies in **Table 13**. For instance, there were those who coped with water shortage by storing water in tanks 38%. This is supported by studies on how to capture and store water for future use (Wanyonyi, 1998). Fodder shortage was solved through fodder conservation (29.1%), zero grazing (3.8%), rotational grazing of animals (2.5%) and by reducing the number of livestock (2.5%). Fodder shortage is invariably linked to water scarcity but its preservation for use during drought has been shown to be effective in

alleviating the challenge (Ketiemi et al, 2015). In some communities such as the Maasai of Kajiado often re-aggregated access to grazing areas through pasture swapping and sharing after ranch subdivision (BurnSilver and Mwangi, 2007). However, this is a not a culture that has been witnessed in AMK or other earlier subdivided ranches in Makueni e.g. Malili. These coping strategies represent the transformations that were seen in the residents of AMK.

An overall comparison of several aspects in AMK at subdivision, 2006 and as at the time of the study, 2016/2017 is given on **Table 14**. Poverty is seen to have reduced significantly despite the challenges of resettlement. This is corroborated by other studies that maintain that resettlement has a negative correlation with the incidence of poverty (Van Meeteren et al, 2009).

CONCLUSION

The study concludes that ranch subdivision improves overall land, crop and livestock productivity. It also improves the overall individual welfare through the fulfillment of individual desires and expectations such as desire to own, change their fate, freedom as well as the hope for land ownership and economic empowerment.

RECOMMENDATIONS

These recommendations are actions that could enhance the productivity of the land or as areas calling for further study. They include;

- a) There is need to create a market for the products especially milk within AMK.
- b) The ESIA that informed the subdivision should be implement.
- c) The potential that exists for water harvesting should be exploited further seeing that it has great dividends.

REFERENCES

- African Union. (2014). Agenda 2063. Retrieved from [https://au.int/agenda 2063](https://au.int/agenda%2063)
- Alpízar, C. A. (2007). Risk coping strategies and rural household production efficiency: quasi-experimental evidence from El Salvador. Doctoral dissertation. The Ohio State University. Retrieved from OhioLINK Electronic Theses & Dissertations Center. (osu1180206697).
- Behnke, R. H.J & Scoones, I. (1993). Rethinking range ecology: implications for rangeland management in Africa. Range ecology at disequilibrium: new models of natural variability and pastoral adaptation in African savannas, 1-30, London: Overseas Development Institute (ODI). Retrieved from http://ls-tlss.ucl.ac.uk/course-materials/ANTH7008_55732.pdf
- Booth, W. C., Colomb, G.G. & Williams, J. M., (2008). The Craft of Research, 3rd edition. The University of Chicago Press, Ltd., London.
- Bruce, J. W., & Migot-Adholia, S. E. (1994). Searching for land tenure security in Africa. Dubuque, Iowa: Kendall/Hunt Publishing Company. Retrieved from <http://hdl.handle.net/10919/65783>
- BurnSilver, S., & Mwangi, E. (2007). Beyond Group Ranch Subdivision: Collective Action for Livestock Mobility, Ecological Viability and Livelihoods. CAPRI Working Paper No. 66. Retrieved from <http://ageconsearch.umn.edu/bitstream/47825/2/capriwp66.pdf>
- Cambridge English Dictionary. (n.d.).Transformation. Retrieved from <https://dictionary.cambridge.org/dictionary/english/transformation>
- Carling, J., & Collins, F. (2017). Aspiration, desire and drivers of migration. *Journal of Ethnic and Migration Studies*, 44(6), 909-926.doi:<https://doi.org/10.1080/1369183X.2017.1384134>
- Carling, J. (2014).The role of aspirations in migration. *Determinants of International Migration. Journal of Ethnic and Migration Studies*, 28(1), 5 - 42. Retrieved from <https://www.imi.ox.ac.uk/files/events/carling-j.pdf>

- Collins, F. L. (2017). Desire as a theory for migration studies: temporality, assemblage and becoming in the narratives of migrants. *Journal of Ethnic and Migration Studies*, 44 (6), 964-980. doi: <https://doi.org/10.1080/1369183X.2017.1384147>
- De Leeuw, P. N., Bekure, S., & Grandin, B. E. (1984). Aspects of livestock productivity in Maasai group ranches in Kenya. *ILCA Bulletin*, 19, 17-20. Retrieved from https://cgspace.cgiar.org/bitstream/handle/10568/4575/Aspects_of_livestock_19.pdf?sequence=1
- Elbadawy, A. (2011). Migration aspirations among young people in Egypt: Who desires to migrate and why. In *Economic Research Forum, Working Paper 619*. Retrieved from <https://erf.org.eg/wp-content/uploads/2014/08/619.pdf>
- Ellis, J. E., Coughenour, M. B., & Swift, D. M. (1993). Climate variability, ecosystem stability, and the implications for range and livestock development. *Range ecology at disequilibrium. New models of natural variability and pastoral adaptation in African savannas*, 31-41.
- EMCA. (1999). *Environmental Management and Coordination Act, Chapter 287. Laws of Kenya*. Retrieved from <http://extwprlegs1.fao.org/docs/pdf/ken41653.pdf>
- EpiCollect + Beta, n.d. *EpiCollect Plus Application Software*. Retrieved from <http://plus.epicollect.net/>
- Food Security Portal. (2012). *Kenya, Agricultural production*. Retrieved from <http://www.foodsecurityportal.org/kenya>.
- Gichohi, H. W. (2003). Direct payments as a mechanism for conserving important wildlife corridor links between Nairobi National Park and its wider ecosystem: The Wildlife Conservation Lease Program. In *Vth World Parks Congress*. Retrieved from <https://sanremcrsp.oired.vt.edu/wp-content/uploads/2013/11/3MoreReading.pdf>
- Grainger, A. (1988). Estimating areas of degraded tropical lands requiring replenishment of forest cover. *International Tree Crops Journal*, 5(1-2), 31-61. doi:<https://doi.org/10.1080/01435698.1988.9752837>

- Harbeson, J. W. (1971). Land Reforms and Politics in Kenya, 1954–70. *The Journal of Modern African Studies*, 9(2), 231-251. doi <https://doi.org/10.1017/S0022278X00024915>
- Hulme, D., & Murphree, M. (2001). African wildlife and livelihoods: the promise and performance of community conservation. James Currey Ltd. Retrieved from <https://www.cabdirect.org/cabdirect/abstract/20013145442>
- Ish-Shalom-Gordon, N. (1995). The Mediterranean grazing ecosystems of the Golan Heights. *Agriculture, ecosystems & environment*, 54(1-2), 67-76. doi [https://doi.org/10.1016/0167-8809\(95\)00589-K](https://doi.org/10.1016/0167-8809(95)00589-K)
- Jaetzold, R., Schmidt H., Hornetz, B. & Shisanya, C. (2006). Farm management handbook of Kenya. Natural conditions and farm management information, 2(2nd ed), Part C, Sub-part C1, East Kenya, Eastern Province.
- Jahnke, H. E., & Jahnke, H. E. (1982). Livestock production systems and livestock development in tropical Africa (Vol. 35). Kiel: Kieler Wissenschaftsverlag Vauk. Retrieved from https://pdf.usaid.gov/pdf_docs/pnaan484.pdf
- Juma, C., & Ojwang, J. B. (1996). In land we trust: Environment, private property and constitutional change. Retrieved from <http://erepository.uonbi.ac.ke/handle/11295/85740>
- Kariuki, G. K., Tandigar, T., & Farah, K. O. (1996). Socio-economic impacts of smallholder irrigation schemes among the Borana nomads of Isiolo district, Kenya. *The African Pastoral Forum Working Paper Series*. Retrieved from University of Nairobi Research Archive <http://erepository.uonbi.ac.ke:8080/xmlui/handle/123456789/51435>
- Kassali, R., Ayanwale, A. B., & Williams, S. B. (2009). Farm location and determinants of Agricultural productivity in the Oke-Ogun Area of Oyo State, Nigeria. *Journal of Sustainable Development in Africa*, 11(2), 1-19. Retrieved [https://s3.amazonaws.com/academia.edu.documents/35713858/FarmLocationDeterminat ion.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1529184107&Signature=aUgUSu7VdXw6vqhQehT9H0jRCpw%3D&response-content-disposition=inline%3B%20filename%3DFARM_LOCATION_AND_DETERMINANTS_OF_AGRICU.pdf](https://s3.amazonaws.com/academia.edu.documents/35713858/FarmLocationDeterminat%20ion.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1529184107&Signature=aUgUSu7VdXw6vqhQehT9H0jRCpw%3D&response-content-disposition=inline%3B%20filename%3DFARM_LOCATION_AND_DETERMINANTS_OF_AGRICU.pdf)

- Kenya Data Portal. (2014). Kenya Agriculture Sheet. Retrieved from <http://kenya.opendataforafrica.org/ejikndd/kenya-agriculture-sheet>
- Kenya National Bureau of Statistics (KNBS) (2016). Economic Survey 2016. Retrieved from http://dyerandblaironline.com/Research_Web/Corporate%20Actions/Macro%20Economic%20Indicators/Economic%20Kenya%20Survey%202017.pdf
- Kenya Vision 2030 (n.d.). Economic and Macro Pillar: Moving the Economy Up the Value Chain. Retrieved from <http://vision2030.go.ke/economic-pillar/#88>
- Ketiem, P., Diarra, A., Soura, A., & Konou, R. (2015). Strategies for adapting to water stress in the arid and semi-arid regions of Africa. IDRC Digital Library. Retrieved from <http://hdl.handle.net/10625/54170>
- Keya, G. A. (1991). Alternative policies and models for arid and semi-arid lands in Kenya. When the grass is gone: Development intervention in African arid lands, 90-114. Retrieved from https://books.google.co.ke/books?hl=en&lr=&id=Eo-SsMpNxxhgC&oi=fnd&pg=PA73&dq=Alternative+policies+and+models+for+arid+and+semi-arid+lands+in+Kenya&ots=TKoTg_18vE&sig=13zdWpfAq3nhVepdhFQydLALZtU&redir_esc=y#v=onepage&q=Alternative%20policies%20and%20models%20for%20arid%20and%20semi-arid%20lands%20in%20Kenya&f=false
- Kiarie, C. K. (2014). Impacts of Subdivision of Ranches on Land Cover and Rangeland Resources in Malili Division, Makueni County, Kenya. Retrieved from Kenyatta University Institutional Repository <http://ir-library.ku.ac.ke/handle/123456789/11032>.
- Kibugi, R. M. (2009). A Failed Land Use Legal and Policy Framework for the African Commons? Reviewing Rangeland Governance in Kenya. *Journal of Land Use & Environmental Law*, 24(2), 309-336. Retrieved from <http://www.jstor.org/stable/42842907>
- Kimani, K., & Pickard, J. (1998). Recent trends and implications of group ranch sub-division and fragmentation in Kajiado District, Kenya. *Geographical Journal*, 202-213. doi: 10.2307/3060370

- Kristjanson, P. (2002). Valuing alternative land-use options in the Kitengela wildlife dispersal area of Kenya (Vol. 10). ILRI (aka ILCA and ILRAD). Retrieved from [https://books.google.co.ke/books?hl=en&lr=&id=0DUTepGuj-kC&oi=fnd&pg=PR3&dq=Valuing+alternative+land-use+options+in+the+Kitengela+wildlife+dispersal+area+of+Kenya+\(Vol.+10\)&ots=Zcc7gR9zhD&sig=JUrpWzltO30IORcCtR5i0XRW7Gc&redir_esc=y#v=onepage&q&f=false](https://books.google.co.ke/books?hl=en&lr=&id=0DUTepGuj-kC&oi=fnd&pg=PR3&dq=Valuing+alternative+land-use+options+in+the+Kitengela+wildlife+dispersal+area+of+Kenya+(Vol.+10)&ots=Zcc7gR9zhD&sig=JUrpWzltO30IORcCtR5i0XRW7Gc&redir_esc=y#v=onepage&q&f=false)
- Lapitskiy, I. (2017). Kenya Data Portal. Kenya National Bureau of Statistics (KNBS). Retrieved from <http://kenya.opendataforafrica.org/infographics/voqacsf/poverty>
- Laws of Kenya. (Eds.). (1970). Land (Group Representatives) Act, Chapter 287. Retrieved from <http://kenyalaw.org/kl/fileadmin/pdfdownloads/RepealedStatutes/LandGroupRepresentativesAct36of1968.pdf>
- Lund, C., Odgaard, R., & Sjaastad, E. (2006). Land Rights and Land Conflicts in Africa: A review of issues and experiences. Danish institute for international studies (DIIS). Retrieved from http://pure.diiis.dk/ws/files/68278/Land_rights_and_land_conflicts_in_Africa_a_review_of_issues_and_experiences.pdf
- Makana, N. E. (2009). Peasant Response to Agricultural Innovations: Land Consolidation, Agrarian Diversification and Technical Change. The Case of Bungoma District in Western Kenya, 1954-1960. *Ufahamu: A Journal of African Studies*, 35(1). Retrieved from <https://escholarship.org/uc/item/4rh67483>
- Marcussen, H. S., Nygaard, I., & Reenberg, A. (2002). Implementing the United Nations convention to combat desertification (CCD). Past experience and future challenges. Proceedings. Copenhagen: SEREIN 2000. (SEREIN - Occasional Paper, 14).

- McAlpine, C. A., Etter, A., Fearnside, P. M., Seabrook, L., & Laurance, W. F. (2009). Increasing world consumption of beef as a driver of regional and global change: A call for policy action based on evidence from Queensland (Australia), Colombia and Brazil. *Global Environmental Change*, 19(1), 21-33. doi <https://doi.org/10.1016/j.gloenvcha.2008.10.008>
- Ministry of Agriculture. (1968). Department of Agriculture Annual Report 1968. Ministry of Agriculture. Retrieved from <http://www.kalro.org:8080/jspui/handle/0/10887>
- Mulinge, W., Gicheru, P., Murithi, F., Maingi, P., Kihui, E., Kirui, O. K., & Mirzabaev, A. (2016). Economics of Land Degradation and Improvement in Kenya. In *Economics of Land Degradation and Improvement—A Global Assessment for Sustainable Development* (pp. 471-498). Springer, Cham. doi https://doi.org/10.1007/978-3-319-19168-3_16
- Mwangi, E. (2007). Beyond group ranch subdivision: collective action for livestock mobility, ecological viability, and livelihoods. Nairobi, Kenya: Kenyatta University. Retrieved from <https://core.ac.uk/download/pdf/6242725.pdf>
- National Environment & Human Settlements Secretariat (NEHSS). (1984). Kilifi District Environmental Assessment Report. Ministry of Environment and Natural Resources, Nairobi. February, 1984. Retrieved from <http://www.worldcat.org/title/kilifi-district-environmental-assessment-report/oclc/31026685>
- National Livestock Policy. (2008). Ministry of Livestock Development. Session Paper No 2 of 2008. Republic of Kenya. Retrieved from <https://www.kenyamarkets.org/wp-content/uploads/2016/06/National-Livestock-Policy-2008.pdf>

- Ng'ethe, J. C. (1993). Group ranch concept and practice in Kenya with special emphasis on Kajiado District. In *Future of Livestock Industries in East and Southern Africa. Proceedings of the Workshop Held at the Kadoma ranch Hotel, Zimbabwe, 20–23 July 1992* (pp. 187-200). Retrieved from https://books.google.co.ke/books?hl=en&lr=&id=1XOaVGy9z8EC&oi=fnd&pg=PA187&dq=Group+ranch+concept+and+practice+in+Kenya+with+special+emphasis+on+Kajiado+District&ots=ExKQmTwAce&sig=CAsc3atrMSZ7qtImSdnTn_euk&redir_esc=y#v=onepage&q=Group%20ranch%20concept%20and%20practice%20in%20Kenya%20with%20special%20emphasis%20on%20Kajiado%20District&f=false
- Ntiati, P. (2002). Group ranches subdivision study in Loitokitok division of Kajiado District, Kenya. Retrieved from https://cgspace.cgiar.org/bitstream/handle/10568/1826/Lucid_wp7.pdf?sequence=1
- Nyamasyo, H. N. G. & Gichangi, D. M. (2006). Initial Environmental Audit of Aimi ma Kilungu. Available at the Aimi ma Kilungu repository.
- Nyamasyo, G. H., Namusonge, M. N., Odongo, D., Mugo, L. W., Mugure, M. M., Maina, W. C., Phelix, R & Ngaruiya, G. W., 2006. Baseline study for Aimi ma Kilungu (AMK) ranch. Available at the Aimi ma Kilungu repository.
- Nyariki, D. (2004). Dryland Husbandry for sustainable development in the southern rangelands of Kenya. Retrieved from <http://repository.mut.ac.ke:8080/xmlui/handle/123456789/191>
- Obwa, O., (1976). District planning as a strategy for rural development in Kenya: Siaya District case study. Retrieved from http://erepository.uonbi.ac.ke/bitstream/handle/11295/29914/Obwa_District%20planning%20as%20a%20strategy%20for%20rural%20development%20in%20Kenya..pdf?sequence=3&isAllowed=y
- Ogolla B D & Mugabe J. (1996). *Land Tenure Systems*, In Land We Trust. Initiative Publishers, Nairobi Kenya.

- Place, F., & Hazell, P. (1993). Productivity effects of indigenous land tenure systems in sub-Saharan Africa. *American journal of agricultural economics*, 75(1), 10-19.
<https://doi.org/10.2307/1242949>
- Reid, R. S., Gachimbi, L. N., Worden, J., Wangui, E. E., Mathai, S., Mugatha, S. M., ... & Ogol, E. (2004). Linkages between changes in land use, biodiversity and land degradation in the Loitokitok area of Kenya. Retrieved from
https://cgspace.cgiar.org/bitstream/handle/10568/1938/Lucid_wp49.pdf?sequence=1
- Rio Declaration. (1992). The Rio Declaration on Environment and Development. The United Nations Conference on Environment and Development, Rio de Janeiro from 3 - 14 June 1992. Retrieved from http://www.unesco.org/education/pdf/RIO_E.PDF
- SOFTKENYA. (2011). Ranches in Kenya – Ranching in Kenya. Retrieved from
<https://softkenya.com/kenya/ranching-in-kenya/>
- Talbot, L. M., & Talbot, M. H. (1963). The wildebeest in western Masailand, East Africa (Vol. 12). National Academies. Retrieved from
https://books.google.co.ke/books?hl=en&lr=&id=gEMrAAAAAYAAJ&oi=fnd&pg=PA5&dq=talbot+1963+masailand&ots=km5nIPzjlQ&sig=MeUFluyJNmexajjuGRDT88N8Bdg&redir_esc=y#v=onepage&q=talbot%201963%20masailand&f=false
- Thornton, P. K., BurnSilver, S. B., Boone, R. B., & Galvin, K. A. (2006). Modelling the impacts of group ranch subdivision on agro-pastoral households in Kajiado, Kenya. *Agricultural Systems*, 87(3), 331-356. doi:<https://doi.org/10.1016/j.agsy.2005.03.001>
- Thurston, A., F. (1987). Smallholder agriculture in colonial Kenya: the official mind and the swynnerton plan. Cambridge African Monographs 8. Retrieved from
<https://www.african.cam.ac.uk/images/files/titles/smallholder>
- Trading Economics. (2018). Kenya GDP 1960 – 2018. Retrieved from
<https://tradingeconomics.com/kenya/gdp>
- Thurrow, T. L., & Herlocker, D. J. (1993). Users Guide for the Range Management Handbook of Kenya. Ministry of Agriculture, Livestock Development and Marketing.

- United Nations Development Programme. (2018). Sustainable Development Goals, Goal 1: No Poverty. Retrieved from <http://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-1-no-poverty.html>
- Van Meeteren, M., Engbersen, G., & Van San, M. (2009). Striving for a better position: aspirations and the role of cultural, economic, and social capital for irregular migrants in Belgium. *International migration review*, 43(4), 881-907. doi <https://doi.org/10.1111/j.1747-7379.2009.00788.x>
- Veit, B. P. (2011). Rise and Fall of Group Ranches in Kenya. *Focus on Land in Africa*. Retrieved from <http://www.focusonland.com/fola/en/countries/brief-rise-and-fall-of-group-ranches-in-kenya/>
- Waiganjo, C., & Ngugi, P. E. (2001). The effects of existing land tenure systems on land use in Kenya today. In *Proceedings International Conference on Spatial Information for Sustainable Development* paper number TS6. 2, ISK/FIG/UN Nairobi Kenya
- Williamson IP, 2000, *Best Practices for Land Administration Systems in Developing Countries*, *Proceedings International C*. Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.622.1339>
- Wanyonyi, J. M. (1998). Rainwater harvesting possibilities and challenges in Kenya. Kenya Rain Water Association. Retrieved from http://www.abcmac.org.br/files/simposio/2simp_julius_rainwaterharvestingpossibilities.pdf
- Williams, K. J., & Schirmer, J. (2012). Understanding the relationship between social change and its impacts: The experience of rural land use change in south-eastern Australia. *Journal of Rural Studies*, 28(4), 538-548. doi <https://doi.org/10.1016/j.jrurstud.2012.05.002>
- Woodhouse, P. (1997). Governance & local environmental management in Africa. *Review of African Political Economy*, 24(74), 537-547. doi: 10.1080/03056249708704280

World Bank Group. (2018). Poverty & Equity Brief: Sub Saharan Africa, Kenya. Retrieved from http://databank.worldbank.org/data/download/poverty/33EF03BB-9722-4AE2-ABC7-AA2972D68AFE/Global_POVEQ_KEN.pdf

APPENDICES

Appendix 1: Household Questionnaire

Introduction

My name is Virginia Ng'endo Kinuthia from the University of Nairobi. I am carrying out a research on '*Evaluation of the impact of subdivision of group ranches on crop and livestock dependent livelihoods at Aimi Ma Kilungu, Makueni County*'. The information that you provide for this study is for academic use only and will be treated with confidentiality. Your participation to this exercise is voluntary. Thanks.

Definitions

- ✚ *Livelihood*: the means of living gained by a household depending on the assets they own or can access mediated by social relations and institutions.
- ✚ *A household* refers to group of people who live together and eat from the same pot.

Background Information

1. Assign a unique number to (1 - 100) each respondent (insert text box)
2. Take a GPS location of household
3. What is your name? (*optional*)

4. What is the number of this agricultural plot? (has to be between 1 - 1530)

5. How many years have you occupied this land? (insert text box)

6. Contact information (Tel / Address) (insert text box)

7. Gender of respondent (insert radio buttons)

Male

Female

8. How old are you? (insert text box)

9. What is your marital status? (drop down or radio buttons)

Single

Married

Divorced / Separated

Widowed

10. What is your level of education? (drop down or radio buttons)

None

Primary

High School

Tertiary

A. Household Information

11. Fill in table to give household structure

Age	0 – 14 years		15 – 45 years		46 – 60 years		60 years	
Total Residents	Female	Male	Female	Male	Female	Male	Female	Male

12. Where is the household located? (insert check boxes)

Near Water

Near Tarmac / Road

Hilly Area

Rocky Area

13. What is your housing situation?

Own House

Renting

Relative's / Friend's House

14. How much rent do you pay per month? (*for renters only*)

15. What material is most of the wall made of?

Mud/Soil

Wooden/Boards/Trunks

Metal Sheets e.g. iron sheets

Concrete/Bricks

Reeds/Straw/Grass

Fibers/ Bamboo

Other

i. Specify other material

16. What material is most of the roof made of?

- Thatch
- Wood / Wooden Boards
- Metal Sheets e.g. iron sheets
- Tiles
- Other

i. Specify other material

B. Household Activities and Incomes

17. What activities do you undertake to earn a living? Rank 3 in order of economic importance 1). Crop farming; 2). Livestock keeping; 3). Business / Consultancy; 4. Employment / Wage Labor (insert text box)

18. Are you involved in any type of business? *If no skip to Q. 21*

- Yes
- No

19. What type of business(es) are you involved in?

- Sale of agricultural produce
- Sale of livestock products
- Sale of merchandise e.g. shop, utilities

- Food service industry e.g. restaurant, pub
- Service industry e.g. barber, salon
- Renting out premises, space or equipment
- Consultancy / Firm
- Transport business e.g. boda boda, matatu etc
- Other

i. Specify other (insert text box)

20. Answer the following with regards to business

Total or Gross Income / Month	Total cost of running business / month	Net income from business(es) / month (total income - cost)

21. Were you undertaking any form of business before you can settle in this plot? ***If no skip to Q. 24***

- Yes
- No

22. What type of business was it?

23. Answer the following with regards to business before ranch subdivision

Total or Gross Income / Month	Total cost of running business / month	Net income from business(es) / month (Gross income – Total cost)

24. Have you planted any crops in your shamba? *If no, skip to Q. 50*

Yes

No

25. Do you plant maize? *If no, skip to Q 29*

Yes

No

26. Answer the following questions with regards to maize farming

Acreage	Kgs harvest / year	Total cost of production / year

27. Do you sell maize? *If no, skip to Q 29*

Yes

No

28. Answer the following questions with regards to sale of maize

Kgs sold / Year	Gross income / Year	Net income / Year (Gross sales – Total cost)

29. Do you plant beans? *If no, skip to Q 33*

Yes

No

30. Answer the following questions with regards to bean farming

Acreage	Kgs harvest / year	Total cost of production / year

31. Do you sell beans? *If no, skip to Q 33*

Yes

No

32. Answer the following questions with regards to sale of beans

Kgs sold / Year	Gross income (Total sold × Unit price/Kg) / Year	Net income / Year (Gross sales – Total cost)

33. Do you plant vegetables? *If no, skip to Q 37*

Yes

No

34. Answer the following questions with regards to vegetable farming

Acreage	Kgs harvest / year	Total cost of production / year

35. Do you sell vegetables? *If no, skip to Q 37*

Yes

No

36. Answer the following questions with regards to sale of vegetables

Kgs sold / Year	Gross income (Total sold × Unit price/Kg) / Year	Net income / Year (Gross sales – Total cost)

37. Do you plant fodder? *If no, skip to Q 41*

Yes

No

38. Answer the following questions with regards to fodder farming

Acreage	Kgs harvest / year	Total cost of production / year

39. Do you sell fodder? *If no, skip to Q 41*

Yes

No

40. Answer the following questions with regards to sale of vegetables

Kgs sold / Year	Gross income (Total sold × Unit price/Kg) / Year	Net income / Year (Gross sales – Total cost)

41. Do you plant any other crops? *If no, skip to Q 46*

Yes

No

42. Which other crops do you plant? (check box)

Millet

Sorghum

Cassava

Sweet potatoes

Arrowroots

Arrowroots

Other legumes e.a. pigeon peas

Fruit trees

Other

i. Specify other (insert text box)

43. *Answer appropriately*, with regards to other crops cultivated

Acreage	Kgs harvest / year	Total cost of production / year

44. Do you sell the produce of other crops? *If no, skip to Q 46*

Yes

No

45. Answer the following questions with regards to sale of the produce of other crops

Kgs sold / Year	Gross income (Total sold × Unit price/Kg) / Year	Net income / Year (Gross sales – Total cost)

46. Whose duty is it to plant, cultivate and harvest crops in this household?

47. **Tick accordingly**, whose duty is it to plant, cultivate and harvest crops in this household?

Father	Mother	Son	Daughter	Grandfather	Grandmother	Hired Labor	Other

i. Specify other

48. Did you undertake crop farming before you moved to this plot? ***If no, skip to Q 50***

Yes

No

49. Can you recall what your average net income from crops was before you occupied this plot?

50. Do you keep any livestock? ***If yes, skip to Q 53***

Yes

No

51. **Tick accordingly**, (for non-livestock keepers) what conflicts have you experienced as a result of your neighbors who keep livestock?

Destruction of crops / property / land	Injury	Poor water quality due to dirtying by livestock	Water shortage due to overuse by livestock owners	Noise pollution by livestock	Destruction of the environment by the livestock	Other	None (if this skip questions)

i. Specify other

52. **Tick accordingly**, how do you resolve these conflicts?

Report to the chief	Report to the former management	Going to court	Informal resolution with the trespasser	Form/join water resource user associations (WRUAs)	Other

53. Specify other , **Kip to Q 96 (for non-livestock owners)**

i.

54. (for livestock owners) how many acres of land have you allocated to livestock? E.g. infrastructure, equipment, grazing area

55. Do you keep cattle? **If no, skip to Q 67**

Yes

No

56. **Tick accordingly**, why do you keep cattle?

Milk	Draught power	Meat	Prestige/Hobby	Dowry	Other

i. Specify other

--

57. Give the structure of the herd as follows

Exotic cattle	Crossbred cattle	Local cattle (Zebu and Boran)

Mature breeding females	Heifers	Heifer calves	Mature breeding bulls	Non-breeding bulls	Bull calves	Cost of Production / Year

58. Do you sell cattle? ***If no, skip to Q 60***

Yes

No

59. **Fill in accordingly**, with regards to sale of cattle

Gross income (Total sold × Unit price/Animal) / Year	Net income / Year (Gross sales – Total cost)

60. Do you milk your cows ***If no, skip to Q 67***

Yes

No

61. **Fill in accordingly**, with regards to the milking the cows

Litres / Month	Cost milk production / Month

62. Do you sell milk? *If no, skip to Q 64*

Yes

No

63. *Fill in accordingly*, with regards to sale of milk

Litres sold / Month	Gross income (Total sold × Unit price/Litre) / Month	Net income / Month (Gross sales – Total cost)

64. *Tick accordingly*, whose duty is it to milk the cows in this household?

Father	Mother	Son	Daughter	Grandfather	Grandmother	Hired Labor	Other

ii. Specify other

65. What other products or services from cattle do you sell? *If none, skip to Q. 67*

Hides	Bull mating services	Processed products e.g. cheese, yoghurt	Selling draught power	Other	None (skip questions)

i. Specify other

66. *Answer accordingly*, with regards to the sale of these products

Gross income (Total sold × Unit price/Product) / Year	Cost of Production / Year	Net income / Year (Gross sales – Total cost)

67. Do you keep goats? *If no, skip to Q 72*

Yes

No

68. *Tick accordingly*, why do you keep goats?

Meat	Sale	Milk	Dowry	Prestige / hobby

69. Give the structure of the goat herd as follows

Exotic goats e.g alpiners, sanens	Crossbred goats	Local goats

Male goats	Female goats	Cost of production / Year

70. Do you sell goats and their products? *If no, skip to Q 72*

Yes

No

71. *Fill in accordingly*, with regards to sale of goats

Gross income (Total sold × Unit price/Animal) / Year	Net income / Year (Gross sales – Total cost)

72. Do you keep sheep? *If no, skip to Q 77*

Yes

No

73. *Tick accordingly*, why do you keep sheep?

Meat	Sale	Wool	Dowry	Prestige / hobby

74. Give the structure of the sheep herd as follows

Exotic sheep	Crossbred sheep	Local sheep

Male sheep	Female sheep	Cost of production / Year

75. Do you sell sheep and their products? *If no, skip to Q 77*

Yes

No

76. *Fill in accordingly*, with regards to sale of sheep

Gross income (Total sold × Unit price/Animal) / Year	Net income / Year (Gross sales – Total cost)

77. Do you keep poultry? *If no, skip to Q 82*

Yes

No

78. *Tick accordingly*, why do you keep poultry?

Meat	Eggs	Sale	Prestige / hobby

79. Give the structure of the poultry flock as follows

Exotic poultry	Local / Kienyeji poultry

Turkeys	Water fowl	Emergent livestock e.g. guinea fowls, pigeons, quails	Cost of production / Month

80. Do you sell poultry and their products? *If no, skip to Q 82*

Yes

No

81. *Fill in accordingly*, with regards to sale of poultry

Gross income (Total sold × Unit price/Animal) / Year	Net income / Year (Gross sales – Total cost)

82. Which other animals of economic value do you rear/keep? *If none, skip to Q 87*

Rabbits	Pigs	Donkeys	Other	None (skip questions)

i. Specify other

--

83. *Tick accordingly*, why do you keep these other animals?

Meat	Sale	Draught Power	Prestige / hobby

84. Give the structure of these animals as follows

Females	Males	Cost of Production / Year

85. Do you sell these other animals and their products? *If none, skip to Q 87*

Yes

No

86. *Fill in accordingly*, with regards to sale of these other animals

Gross income (Total sold × Unit price/Animal) / Year	Net income / Year (Gross sales – Total cost)

87. Do you graze animals in this household? *If none, skip to Q 90*

Yes

No

88. *Tick appropriately*, where do you graze your animals?

At my neighbours' as they have not settled in their land	At conservation areas	Other unsettled plots	Rent a land to graze my animals	Graze in my land	Other

i. Specify other

89. *Tick appropriately*, whose duty is it to graze in this household?

Father	Mother	Son	Daughter	Grandfather	Grandmother	Hired Labor	Other

i. Specify other

90. Do you collect/gather feeds for animals in this household? *If none, skip to Q 92*

Yes

No

91. *Tick appropriately*, whose duty is it to collect / gather feeds for animals in this household?

Father	Mother	Son	Daughter	Grandfather	Grandmother	Hired Labor	Other

ii. Specify other

92. How far do you walk your animals to drink water?

- Ad lib/0 Km/ Water available e.g. borehole water in household
- >1Km
- 1 – 3 Km
- 3 – 5 Km
- 5 – 10 Km

93. Can you recall how far your animals walked to get water before subdivision?

Ad lib/0 Km/ Water available e.g. borehole water in household

- Ad lib/0 Km/ Water available e.g. borehole water in household
- >1Km
- 1 – 3 Km
- 3 – 5 Km
- 5 – 10 Km
- Not Applicable/ Didn't own livestock

94. Have you encountered any conflicts as a result of keeping livestock? *If no, skip to Q 97*

- Yes
- No

95. (if yes) *tick appropriately*, what conflicts have you encountered as a result of your keeping livestock?

Wildlife attacks on livestock	Grazing area conflicts with the neighbours	Water point conflicts over water ownership	Water point / grazing point conflicts due to unplanned mating	Conflict with conservation groups over the use of conservation area as grazing land	Other

i. Specify other

96. How do you resolve these conflicts?

Kill the wild animals	Call KWS / Govt / Police officers	Go to court	Consult former management on boundaries	Pay for mating at water/grazing points	Pay for use of water points	Adhere to demands of conservation groups	Join/create WRUAs for better water management	Informal resolution amongst ourselves	None	Other

i. Specify other

97. Did you keep livestock before ranch subdivision? *If no, skip to Q 99*

- Yes No

98. Can you recall your net income per year from livestock before you occupied this land?

99. Do you undertake any form of employment? *If no, skip to Q 102*

- Yes

- No

100. What type of employment do you undertake?

- Permanent

- Casual employment

- Other

i. Specify other

101. *Answer accordingly*, with regards to employment

gross income per month	net income per month? (after deducting taxes and expenses e.g. meals and transport)

102. Do you have any other sources of income apart from those discussed above? *If no, skip to Q 105*

- Yes

- No

103. *Tick appropriately*, what other sources of income do you have apart from those discussed so far

Remittances	Support from government / organizations	Gifts or support from friends, family and well wishers	Pension	Payment for renting out land	Other sources

i. Specify other sources of income

104. What is the total income from these other sources every month?

105. Did you have any other source of income before you came to occupy Aimi? *If no, skip to Q 108*

Yes

No

106. Which sources were they?

107. Can you recall your net income from other sources before you moved to this plot?

108. Did you want this ranch subdivided? *If no, skip to Q 110*

Yes

No

109. *If yes, tick appropriately below*, indicate why

The dividends from the ranch were too low	I wanted my own piece of land	Corruption of the management	Other reasons

i. Specify other reasons

110. (If no) indicate why

The ranch was performing well	To conserve the environment	I had other sources of income	I have another piece of land	There was no conflict	I was too busy	Other reasons

i. Specify other reasons

111. Did you have any fears before ranch subdivision? *If no, skip to Q 118*

Yes

No

112. ***Tick appropriately***, which fears did you have before you moved/bought this plot?

Strife/conflict over land	Poor productivity of land / poor climate	High level of insecurity	Lack of access to utilities e.g. hospitals, schools	Human wildlife conflict	Other

i. Specify other

113. Were these fears realized? *If no, skip to Q 115*

Yes

No

114. Kindly give evidence (further information) of how this fear was realized?

115. Did you have any other fears before ranch subdivision? *If no, skip to Q 118*

Yes

No

116. Which other fears did you prior to subdivision?

117. Were these fears realized?

Yes

No

118. Did you have any hopes before ranch subdivision? *If no, skip to Q 126*

Yes

No

119. *Tick appropriately*, which hopes did you have before this ranch was subdivided?

Eliminate poverty	Good productivity of area e.g. better climate	Access to utilities e.g. hospitals, roads, schools	Own a piece of land	Other

i. Explain other

120. Were these hopes realized? *If no, skip to Q 122*

Yes

No

121. Kindly give evidence (further information) of how this fear was realized

122. Did you have any other hopes before ranch subdivision? *If no, skip to Q 126*

Yes

No

123. Which other hope did you have prior to subdivision?

124. Were these hopes realized? *If no, skip to Q 126*

Yes

No

125. Kindly give evidence (further information) of how these other hopes were realized

126. On a scale of 1 – 5 (1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree; 5 = can't respond effectively/inherited) indicate how you agree with the statement; I was afraid I would not get land. ***If can't respond effectively, skip to Q 129***

- Strongly Disagree
- Disagree
- Agree
- Strongly Agree
- Can't respond effectively / Inherited

127. Was this fear realized? ***If no, skip to Q 129***

- Yes
- No

128. Kindly give evidence (further information) of how this fear was realized

129. On a scale of 1 – 5 (1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree; 5 = can't respond effectively/inherited) indicate how you agree with the statement; I was afraid there would be a rise in the level of conflict. ***If can't respond effectively, skip to Q 132***

- Strongly Disagree
- Disagree
- Agree
- Strongly Agree
- Can't respond effectively / Inherited

130. Was this fear realized? *If no, skip to Q 132*

Yes

No

131. Kindly give evidence (further information) of how this fear was realized

132. On a scale of 1 – 5 (1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree; 5 = can't respond effectively/inherited) indicate how you agree with the statement; I was afraid there would be increased misuse/overuse of shared natural resources. *If can't respond effectively, skip to Q 135*

Strongly Disagree

Disagree

Agree

Strongly Agree

Can't respond effectively / Inherited

133. Was this fear realized? *If no, skip to Q 135*

Yes

No

134. Kindly give evidence (further information) of how this fear was realized

135. On a scale of 1 – 5 (1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree; 5 = can't respond effectively/inherited) indicate how you agree with the statement;

I was afraid that there would be reduced community association after ranch subdivision.
If can't respond effectively, skip to Q 139

- Strongly Disagree
- Disagree
- Agree
- Strongly Agree
- Can't respond effectively / Inherited

136. Was this fear realized? ***If no, skip to Q 139***

- Yes
- No

137. Kindly give evidence (further information) of how this fear was realized

138. Kindly give evidence (further information) of how these other fears were realized

139. On a scale of 1 – 5 (1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree; 5 = can't respond effectively/inherited) indicate how you agree with the statement; I was hopeful that my opportunities for economic empowerment would increase upon subdivision. ***If can't respond effectively, skip to Q 142***

- Strongly Disagree
- Disagree
- Agree
- Strongly Agree
- Can't respond effectively / Inherited

140. Was this hope realized? *If no, skip to Q 142*

Yes

No

141. Kindly give evidence (further information) of how this hope was realized

142. On a scale of 1 – 5 (1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree; 5 = can't respond effectively/inherited) indicate how you agree with the statement; I was hopeful that I would control/say over my destiny upon subdivision. *If can't respond effectively, skip to Q 145*

Strongly Disagree

Disagree

Agree

Strongly Agree

Can't respond effectively / Inherited

143. Was this hope realized? *If no, skip to Q 145*

Yes

No

144. Kindly give evidence (further information) of how this hope was realized

145. What challenges did you experience immediately after subdivision?

Lack of animal feeds	Water shortage	Low economic power	Lack of food	Wildlife attacks on people / livestock	Stealing	None	Other

i. Specify other challenge

146. Which short term coping strategies did you employ to deal with these challenges?

Buying forage	Moving / selling livestock to graze in other places	Asking the law keepers to intervene e.g. police officers	Taking loans	Receiving relief	Buying water from far	Calling KWS	Killing wildlife	Chasing wildlife	None	Other

i. Explain other strategy

147. *Tick appropriately*, which challenges are you experiencing currently?

Water shortage	Forage shortage	Food shortage	None	Other

i. Specify other

148. **Tick appropriately**, which long term strategies have you devised to deal with these challenges?

Sinking boreholes	Adopting water catching and storage technologies e.g. water tanks	Adopting forage storage technologies e.g. silage	Adopting modern farming e.g. zero grazing, irrigation	Planting perennial crops	Joining unions, Saccos etc	None	Other

i. Specify other outcome

149. *Tick appropriately*, what other outcomes have you experienced as a result of the subdivision?

Increased number of livestock in the household	Increased household incomes	Decreased number of livestock in the household	Decreased household incomes	Family breakdown e.g. divorce/separation, sibling enstrangement	Environmental destruction e.g. cutting down trees to burn charcoal	Reduced environmental destruction	None	Other

i. Specify other outcome

150. Which natural resources do you have access to?

Hilltops/conservation areas	Water points/dams/boreholes	None	Other	

i. Specify other

--

151. What efforts have you made to ensure the sustenance of the natural resources you use/access

Planting trees	Fencing water point / dams	Other	None	

i. Specify other

--

152. Are you part of any association/welfare here? *If yes, skip to Q 154*

Yes

No

153. Why are you not part of any association / welfare? *If none, skip to Q 156*

There are none here

They are not beneficial

I am skeptical/afraid of joining one e.g. due to fraud

I have not found one that fits my needs

Bad experience in the past

Already in other welfares elsewhere

Other

i. Specify other

--

154. **Tick appropriately**, what type of association/welfare is it?

Merry Go Round	Funeral Welfare	Sacco	Self-Help Group	Other

i. Specify other

--

155. What benefits do you receive from the association/welfare (check box)

Financial support	Emotional support	Socializing / sharing ideas	Other material support e.g. clothes, food etc	Self-Help activities and ideas	None	Other

i. Specify other

--

156. Were you part of any association/welfare before this ranch was subdivided? ***If yes, skip to Q 158***

Yes

No

157. Why were you not in any welfare/association?

Lack of money	Was too young	Was not aware of their existence	Skeptical/Suspicious	Bad experience in the past	Other

i. Specify other

158. What type of association was it?

Merry Go Round	Funeral Welfare	Sacco	Self-Help Group	Other

i. Specify other

159. What benefits were you deriving from these associations?

Financial support	Emotional support	Socializing / sharing ideas	Other material support e.g. clothes, food etc	Self-Help activities and ideas	None	Other

i. Specify other

160. What other benefit have you found with moving here?

Freedom/was too squeezed in the previous residence	Better access to utilities e.g. hospitals, schools, roads	Happier	None	Other

i. Explain other

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