Agricultural Transition within the ASAL Rural-Urban Continuum in Kenya: a case study of Kajiado County

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Abstract

Diversification into intensive livestock and crop production systems is replacing pastoral way of life in peri-urban Kajiado County due to declining land holding sizes. This study assessed the transition in two ways: (1) the causes of declining land size, areas of agricultural transition and the main influences (2) the benefits and challenges due to the transition. Data was obtained from cross section surveys, focus group discussions and key informant interviews. The study found out that size of the land owned and origin of household whether indigenous or immigrant influenced livestock and crop production system practised. Intensification in livestock production systems that aim to achieve higher returns from declining land sizes like various types of improved breeds and methods of husbandry have been adopted, whereby 90 per cent of the indigenous and all immigrants have improved livestock breeds. Livestock alien to the area like, fish, pigs and poultry and other emerging ones like ostriches have been adopted. Currently 69.1 per cent of indigenous pastoralists practice crop production to ensure food security while the immigrants practise commercial horticulture under irrigation in greenhouses and along rivers. Competition for resources has culminated into conflicts, degradation and low resilience from natural shocks. The continuous adoption and diversification of agricultural systems including the adoption of alternative income-generating activities needs to be guided through capacity building to enhance and ensure ecosystem sustainability given the fragile nature of the arid and semi-arid area that serves as a wildlife corridor.

Key words: Peri-urban pastoralism, intensification technologies, Indigenous and immigrant households

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Introduction

Peri-urban areas are the transitional zones between rural and urban landscapes that experience constant population change and disturbance of traditional social, environmental and economic characteristics. Stockwell *et al.*, (2013) reckon as a result, sustainable community development initiatives are complicated in these fragmented and often contested landscapes. Kajiado County is predominantly arid and semi-arid (Jaetzold *et al.*, 2011). It is endowed with good natural resources like wildlife (borders Nairobi national park and Amboseli game reserve), rivers, pastures, stones and limestone for quarrying, good soils and sceneries. Pastoralism of the semi-nomadic, transhumant variety has been the land use of choice for hundreds of years in the region. However, Kenya has experienced rapid changes in land policies that have transformed former pastoral communal lands into group ranches, individual ranches and private holdings. This is the prevailing situation in Kajiado North. These changes in land tenure systems have led to an emergence of several land-use systems which include rain-fed and irrigated crop agriculture, permanent settlement, quarrying and tented camping sites within private ranches (ECA, 2012; Nyamasyo & Kihima, 2014). According to Berakhi, *et al,* (2015) in East Africa, the spatial pattern of land use change for the past 30 years has been characterized by increasingly intensively managed landscape. This land loss to agriculture, parks, as well as immigration and land subdivision, are some of the factors causing land fragmentation and loss of pastoral mobility (ECA, 2009). Peri-urban Kajiado North area is experiencing increased fragmentation (Rutten, 2008; Nkedianye *et al.*, 2009) as result of an influx of immigrants and property developers due to the proximity to Nairobi City. This has resulted in increased fencing in the area which in turn adversely affects livestock and wildlife mobility, to access range resources hence compounding the risks of drought in arid areas (ECA, 2009).

Changes in agricultural technology towards helping farmers cope with changes in the environment like climate change and variability, declining land holding sizes and fertility have been adopted in many arid areas in Sub-Saharan Africa (UNDP, 2012). At the same time the Boserupian theory of intensification (Boserup, 1965) due to population growth seems to apply in Kajiado North due the sprawled nature of the study area.

This study was undertaken with the following objectives, (1) to describe the livestock and crop production systems adopted due to declining land sizes (2) to describe the challenges experienced with production systems adopted and food security.

Study setting

The study was carried out in Kajiado North Sub-County of Kajiado County of Kenya. The study area covers 1631.18 KM^2 and lies between 36^0 37'E to $37^0$8'E, and $1^0$23'S to $1^0$49'S.The area receives a bimodal regime of rainfall, short rains in October-December and long rains in March-May. The annual average rainfall is between 300 and 1300mm, but it is mostly unevenly distributed and unreliable. Temperature varies between 13 ^{0}C and 25 ^{0}C throughout the year. The Sub-County is largely semi-arid thus suited for ranching activities and early maturing crop varieties. The soils are too stony to retain moisture and the rainfall amounts only support crop production if distributed well (Jaetzold *et al.*, 2011). The Maasai form the predominant indigenous pastoral households undergoing transition while the Kikuyus, Kambas, Kisiis are the immigrants who have introduced intensification agricultural production systems to the area.

Materials and Methods

Quantitative data collection

A cross-sectional study design was used to measure the variables at a single time. A pre-tested questionnaire comprising of open ended and closed questions was administered to households. The household was the sampling unit. A sample size of 420 respondents was randomly drawn from the study area for household interviews. Households selected included both immigrant and indigenous populations.

Qualitative data collection

Qualitative data was collected by way of Focus Group Discussion (FGD) and Key Informant Interviews (KII) conducted through use of question guides developed and refined during pre-testing. Sampling of informants was done purposively to include community members who had the desired characteristics.

Data Analyses

Comparative descriptive statistical analyses were done with respect to origin and physical location of respondents. Using content and thematic analysis (Vaismoradi *et al*, 2013), the qualitative data were coded and logically organized into a matrix of related issues following the steps outlined by, (Lacey, 2007; Saldana, (2009), The emerging themes described trends in agricultural production systems, challenges and coping strategies adopted to ensure food security in the community for the period 1980-2010.

Results and Discussion

In the analysis, physical location was categorized to; urban which refers to sub-locations within 1-4 km radius from a town or commercial setups, rural at least 5 km from urban set-ups and urban/rural sub-locations that stretch from the urban to the rural. Figure 1 gives the breakdown as to how the questionnaire was administered with respect to physical location.

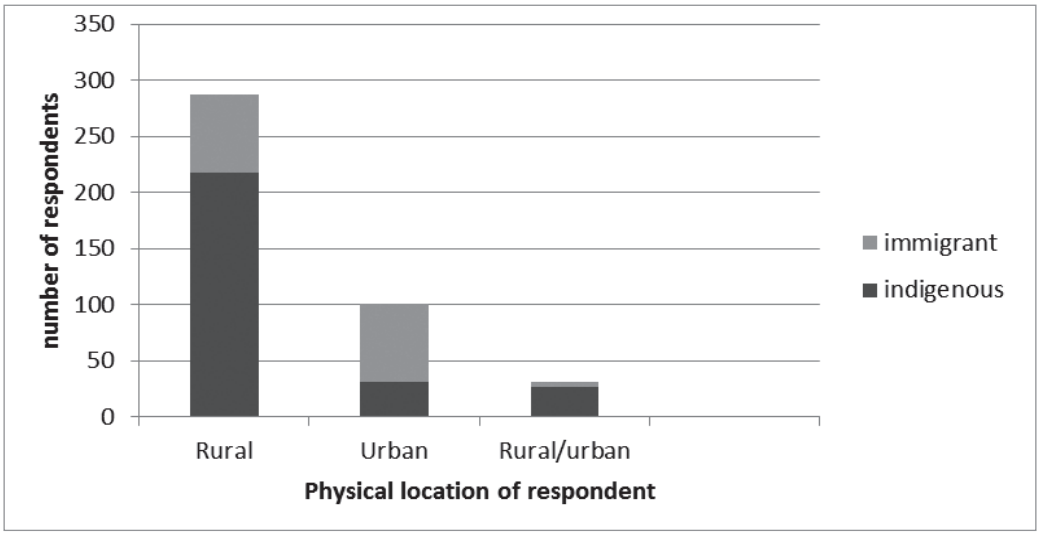

Figure 1: Distribution of sampled households by physical local and origin in the survey

The urban areas had few households doing farming as compared to the rural areas.

Causes of Declining Land Size

The survey revealed that fragmentation was the leading cause of declining land size followed by degradation. The survey results of the average land size owned by each ethnic group with respect to each physical location is given in Table 1.

Table 1. Ethnic Group and Acres owned in each Location Type

Physical location	Ethnic group/average acres owned									
	Indigenous		Immigrants							
	Maasai		Kikuyu		Kisii		Kamba		Others	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Urban	188	58.99	5.5	1.65	0.4	0.06	0.25	0	4.3	1.35
Urban/rural	145	45.97	41.6	13.6	0.1	0	-		-	-
Rural	185	57.67	12	3.83	0.9	0.22	0.35	0	17.1	5.594

The indigenous own on the average 145-188 acres of land with spread range from 5 to 400 acres while the immigrants own from less than one acre to about eighty acres. Considering the pastoral nature of the area these sizes are not adequate to support family livelihood from pastoralism alone hence the need to diversify to other income generating activities. The results are consistent with those of Nkedianye *et al*., (2009) on fragmentation of Kajiado whereby the current holding sizes are not adequate for pastoralism way of life.

KII from Kitengela and Ongata Rongai Division revealed that some indigenous people sell their land and use the proceeds to buy larger pieces far from the urban areas where they hire workers to herd livestock. Alternatively, they use the proceeds to construct a commercial building which ensures that the household has guaranteed income for their needs. The practice started from around the year 2000 and proportional piling placed adoption at 5 per cent. With the appreciation of land value more indigenous people are getting influenced by their peers to follow suit.

Hiring of grazing land outside the division is a common practise adopted by some households to mitigate lack of pastures. Proportional piling during interviews from all four divisions revealed that, 20-30 per cent of the indigenous farmers hire farms where they graze during periods of adversity, meanwhile 50-70 per cent of immigrants who do commercial dairy production hire land for fodder production either in or outside Kajiado North district. These results show that mitigation measures must be put in place to sustain livestock production as land sizes for grazing decline. Livestock spreading was adopted by the indigenous in Kajiado North to mitigate adverse weather conditions; this involves the division of the herd into smaller numbers and driving each of them to a relative or friend where they are looked after together with the host's herd. In so doing, they expect to reduce the risk by keeping their wealth in different baskets while increasing chances of survival of at least some of them if the rains fail. The areas that were common for spreading were Northern Tanzania, Mashuru, Namanga and Magadi.

The size of land owned and origin of respondent influences livestock production system adopted. The survey revealed that nomadic system is practised by 65.9 per cent for cows, goats 63.8 per cent and sheep 67.3 per cent. With regard to land size owned, nomadism was practised by about 95 per cent of those with large sizes (>140 acres) of land with no fences mainly located in the rural areas, while those with less than 20 acres have fenced the land and use mixed methods. In the rural/urban to urban areas livestock production is practised in a transitory manner, 7 per

cent do pure nomadism for cows and 8 per cent for sheep while others have their land divided into paddocks for efficient utilization of pastures with little or no trespass. Tethering of livestock is practiced by few farmers 3.5 per cent, while zero grazing of cows is practiced by 6.5 per cent of the immigrants in urban areas. The results demonstrate that as land size decreases, there is a transition from extensive to intensive livestock production systems. The range of livestock production systems are in line with those described by (IUCN, 2010; Otieno, 2013) which takes into consideration the land holding sizes and prevailing climatic conditions.

Fragmentation has led to increased incidences of interaction leading to resource use conflict among livestock, wildlife and residents as indicated by 35 per cent of the survey respondents. A KII said there was rampant "Human-wildlife conflict in Kitengela area bordering the Nairobi National park and the wildlife corridor, as residents' experience livestock loss to the big cats. FGDs revealed varied types of conflicts in all divisions in the study area; Conflict from trespassing neighbours' animals (goats, cows, sheep and chicken) is widespread. The population of goats has declined over the years due their ability to trespass and in fact KII revealed that they were considered as enemies of development. According to KII from Sholinke, livestock predation and crop destruction has increased over the years whereby monkeys and baboons from the national park have turned into pests that attack chicken, taking chicks and eggs hence affecting production. Putting scare crows, embracing firm fencing and security enhancement have been adopted in mitigation. The results demonstrate that declining land sizes and encroachment to wildlife corridor have lead to stiff competition for resources resulting into conflict. As per our findings this human wildlife conflict losses erode the farmers' diversification economic benefits as confirmed in similar studies in Kenya (Waweru & Oleleboo, 2013; Hariohay & Roskaft, 2015).

Inability to cope with natural shocks was ranked second by the household heads who identified drought, disease and drought mitigation expenses as the main challenges that sometimes lead to livestock loss. This is compounded by the declining land holding sizes that produce inadequate pastures and encroachment on dry season grazing areas. The results are consistent with previous findings by, Nkedianye *et al.*, (2011) that associated the loss to competition for land resources between livestock, wildlife and human development activities. Interviews revealed that incidence of diseases had increased even though use of veterinary medicine was at 64 per cent. This was attributed to congestion and decreased mobility which is in line with findings of Ogutu *et al,* (2014). Our findings revealed that there

were mobility constraints due to fences and this is consistent with those of Orindi *et al.*, (2009) and Nkedianye *et al.*, (2011) who attributed fences to high population density. Our findings revealed that as the Maasai become more sedentary doing agro-pastoralism with fences, they tend to develop and maintain few, close ties in sharing resources especially water and pastures. The communal way of sharing resources is declining over the years as confirmed from earlier studies (Nkedianye *et al.*, 2009) this is compounded by trespass and human wildlife conflicts.

The current status of land was considered degraded by 34 per cent of the respondents which they attributed to increased human activities like cultivation, waste disposal, erosion due to livestock traction to common watering points and introduction of invasive species, un-rehabilitated stone and gypsum quarrying mines. The results are also consistent with previous findings by, Maitima *et al.*, (2010) and AU-IBAR (2012), where environmental degradation is a major issue in intensifying systems especially ASAL lands with low productivity potential, poor soils and poor physical characteristics which are aggravated by increasing human and livestock populations as is the case in Kajiado North.

Field observations identified pasture degradation due to overgrazing and encroachment by invasive species (*Opuntia* and *Ipomoea*) leading to existence of poor quality pastures in the rural locations of Kajiado North. These results are consistent with those of Kidake, *et al.*, (2015) about *Ipomoea* species invasion in Southern Kajiado. In three rural sub-locations, households had abandoned their homesteads due to the invasion by the thorny and prickly *Opuntia* species. The two weeds affect pasture quality and quantity since they are not palatable. Pavanello & Levine (2011) argue that pastures quality goes beyond the species composition and the presence of palatable or poisonous plants and amounts to pasture degradation as observed in the field.

Uncontrolled extraction of natural resources namely; water abstraction, forest products, quarrying and mining have degraded the environment. KI Interviews revealed that infrastructure provision like electricity and lack of strict adherence to borehole drilling guidelines had resulted in drilling within close proximity. This lead to drying of many shallow wells. These findings are in line with those of Rutten & Mwangi (2012). Both genders are affected by the lack of adequate water for domestic use and agricultural production activities. Uncontrolled stone quarrying activities in Noompopong area of Oloosirkon location and excavation of limestone by the cement manufacturing factories at Ilipolasat area had resulted

in a lot of land degradation. Meanwhile no crop or livestock production activities can take place in these areas as a lot of inert waste is left behind which can remain bare sometimes for up to ten years hence contributing to a decrease in browsing and grazing areas.

Transitions in Livestock Production

Several farmers had done herd improvement changes over the years and results are presented in Figure 2.

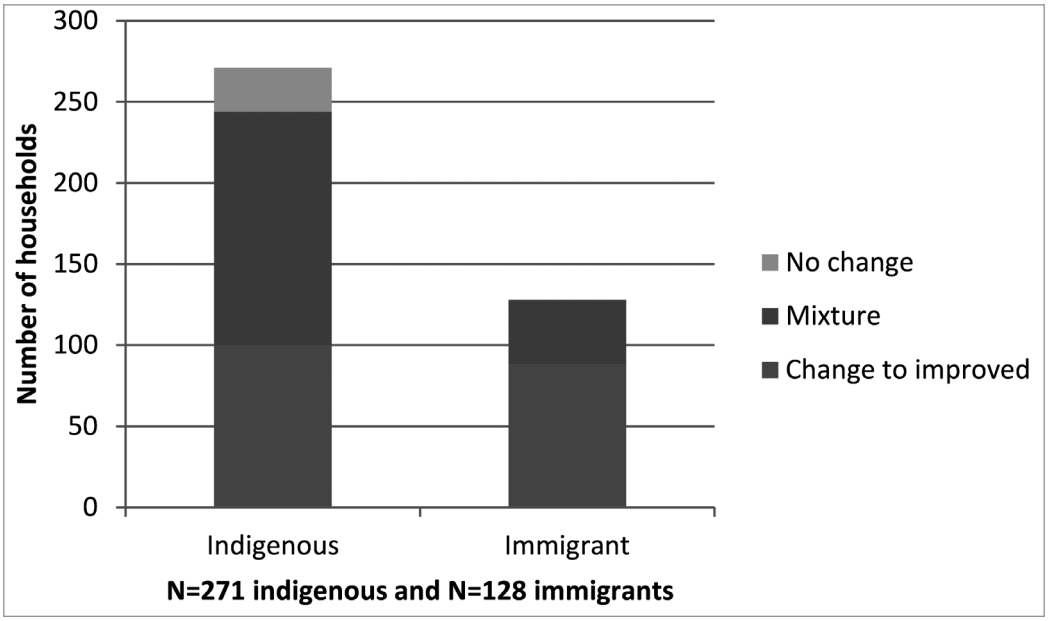

Figure 2: Livestock improvement changes with respect to origin

Transitions were in herd improvement and production systems to improve productivity from the declining land holding sizes; in addition there was an emergence of non-conventional livestock. The survey results indicate that most immigrants keep improved cattle (69%) while 31 per cent keep a mixture of breeds. Cross breeding is an adaptation to harsh climatic changes, at the same time achieve higher yields per unit area. FGD interviews revealed that majority of the indigenous farmers used to keep 100 per cent indigenous animals in the 1980s but currently 36 per cent keep improved breeds, 53 per cent keep mixed breeds and only 10 per cent keep pure indigenous livestock. This shows the transition to livestock that have higher returns to support household livelihoods as land size declines. In addition to dairy, poultry and pigs were kept on commercial basis by 5 per cent of urban immigrant farmers. FGD and KII interviews revealed that

improved livestock breeds with high returns per unit area are now kept by both the indigenous and immigrants. Sahiwal and Simmental dual purpose cows were introduced in 1986 for breeding in collaboration with Kenya Agricultural and Livestock Research Organization (KARLO) Naivasha to provide better yields of both meat and milk as opposed to boran. "Sahiwal skin colour is referred to as "rangi ya pesa" (meaning the colour of money when it comes to household herds). This implies that whoever has the Sahiwal herd has breeds of high value compared to others. These results are consistent with research attributes identified by Ilatsia *et al,* (2011) in Kenya and Zafar *et al.*, (2008) in Pakistan the origin of Sahiwal breed of cattle. Before 1986, most farmers had the red Maasai sheep after which the residents adopted dorpers. A breeding centre for dorpers was established at Maasai technical Institute in 1985 which made accessibility easy. Naivasha shoats breeding centre was an alternative source for quality dorpers for farmers. Interviews revealed that the dorper sheep is well adapted to climate, requires less herding labour, provides milk when cows migrate and gains weight fast thus yields better market returns. These results are consistent with those of Audho *et al.*, (2015) and Nyangito *et al.*, (2009).

Despite these changes climate variability leads to inadequate pastures due to drought. Livestock migration, controlled breeding in addition to buying hay and water are the coping strategies adopted. Herders control breeding of shoats through use of plastic barrier ('*echoniolmeregeshi*') fixed on males to hinder mounting to avoid bearing of young ones during the dry periods. These results are consistent with those of IOM on migration of livestock due to drought (Liljestrand, 2012; IOM, 2010). During the drought when cows have migrated they use acacia seeds to feed goats. This enhances household food security. In Oloyaingilani Female FGD the respondents revealed that they shake the yellow acacia trees to drop the seed pods which are rich in nutrients to be used as feed. The goats get water once or twice in a week. This is adequate for them to be able to get enough milk for the family. The family sometimes feeds once a day during times of scarcity. These results are consistent with recommendations on the nutritive capacities of acacia by Dubey (2007). In general, the findings reveal a transition from extensive way of animal production to intensive ways of production that ensure high returns from declining land holding sizes through adoption of better yielding breeds and diversification.

Adoption of Commercial Exotic Breeds by Immigrants

The survey revealed that immigrants in the urban sub-locations were doing well with intensive livestock keep systems whereby they have ventured into exotic dairy cows, broilers, layers, pigs and fishing farming in earthen ponds. In the rural/urban to urban areas livestock production is practised in a transitory manner, few about 7 per cent do pure transhumant nomadism for cows and 8 per cent for sheep while others have their land divided into paddocks for efficient utilisation of pastures with little or no trespass. Tethering of livestock is practiced by few farmers (3.5 per cent), while cows' zero grazing is practised by immigrants in urban areas at 6.5 per cent. Accumulative total of 19.2 per cent immigrants practise zero grazing system for all livestock as opposed to indigenous who do only 4% per cent total. These results are similar to those of Munyasi *et al.*, 2012 on non-traditional land use practices in Oloitokitok sub-county of Kajiado. Field observation and key informant interviews revealed that; most immigrants practice livestock production systems suitable under factors in consideration; (a) *security*; when they keep indigenous cows, they get stolen hence they keep dairy under zero grazing to cushion themselves, (b) *target market*; the immigrants carry out production with a particular market target especially dairy cows, broilers, layers, pigs and fish, therefore to get good returns they practice intensification. These results are consistent with those of IUCN, 2010 on intensification of peri-urban areas in Africa. The exotic breeds adopted make it easy for the households to house them in relevant structures, hence easy to achieve the desired security, at the same time the urban dwellers create a market niche for their products as opposed to the indigenous population.

Emerging Livestock

Kitengela division has a farm/picnic resort that rears ostriches, a venture that the indigenous never thought was possible, meanwhile fish ponds are sited near water sources like boreholes and rivers. Currently there is one certified breeder in Kisaju area of Isinya who supplies fingerlings to farmers. The farmers consist of both indigenous and immigrants who benefited from the economic stimulus project of the Ministry of Fisheries from 2009. Contrary to what had been reported earlier on improved agricultural activities by Homewood *et al.*, (2012) fish and wildlife rearing especially quails and ostriches are new income generating ventures. The demand for these products by the urban dwellers leads to increased adoption by both the immigrants and indigenous as alternative

sources of income generating activities. The ventures also require less space as compared to pastoralism hence making them more suitable in the case of prevailing declining land holding sizes.

Transition to Crop Production

Most crop producers are immigrants as 92.4 per cent participate while only 69.1 per cent of the indigenous do crop production. Majority of indigenous crop producers reside in the rural sub-locations while the immigrants are mainly located in the rural and urban areas. The rural- urban locations had the least number of crop producers. Proportional piling results during FGDs revealed that most of the immigrants 90 per cent originate from high potential areas and are used to crop production; with the introduction of simple green houses in 2009 and availability of borehole water, they ventured into commercial horticulture production with the aim of targeting Nairobi and nearby urban centres for the market. This is what is greatly contributing to the observed transition to crop production. In addition, the immigrants who own small acreage 1-10 do mixed commercial farming whereby they keep dairy animals, pigs, fish ponds, rabbits, poultry in addition to green houses and open field irrigation. Even though the yields from crop production are not assured due to the marginal nature of the area, the residues from crop failure are used to supplement livestock feeding among the mixed farmers.

Qualitative interviews revealed that agro-pastoralism is on the increase whereby more indigenous people do crop production because it supplements livestock feeding under livestock intensification production system through crop residues and products of crop failures. Others felt that "crop production by indigenous was adopted due to influence from immigrants who made them realise that with little effort one can achieve good yield from previous livestock pens". The indigenous site the cultivated plot below the cow sheds in a gently sloping area. During the rainy season erosion of manure fertilizes the field with little effort resulting in high yields. Our findings are in agreement with those of Nyangito, Musimba, & Nyariki, (2009) and Reid, *et al.,* (2008), that demonstrated pastoral households use crop agriculture to support pastoralism, by reducing the need for the family to sell livestock to buy grains during dry periods.

Crop Production Intensification Technologies

Intensification technologies observed were; greenhouses, irrigation, use of improved seeds, fertilizer and crop protection chemicals. The survey revealed

that use of improved seeds had been adopted by 76 per cent of the producers, 41 per cent use fertilizer, 28 per cent use crop protection chemicals and 21 per cent had a sustainable source of irrigation water. These results are consistent with studies by Nicol, *et al.,* 2015, whereby they found out that rain fed and irrigated crop production had increased in the East African pastoral areas. Irrigation in greenhouses was practised by 33 per cent of the producers while 23 per cent did open field irrigation. All producers engaged in rain fed crop production to some extent. Participants in KII identified emerging new technologies like greenhouses and drip irrigation to have introduced farming ventures that were not seen in the area before 1990. Basic greenhouse structures emerged as a new technology for adoption from 2009 for horticultural production, a technology disseminated by the Extension Officers whose adoption was enhanced by water availability from boreholes and shallow wells.

In a bid to ensure food security and nutrition some Non-Governmental Organizations (NGO) like, Farajaratia team-up with the government to augment household food supplies through supply and establishment of kitchen garden irrigation kits. Further, Lynn (2009) argues that despite the risk of crop failure in this semi-arid ecosystem, cultivation is an important component of contemporary pastoral livelihoods, boosting food production, maintaining livestock herds, and buffering household vulne*rabi*lity which was confirmed by qualitative interviews. Changes in social, economic and cultural norms due to interaction between the indigenous and immigrants are causing a shift in food production and consumption habits in Kajiado North. A similar scenario has been witnessed in Tanzania pastoral areas, (Lynn, 2009; McCabe *et al.*, 2010; Sangeda & Malole, 2014) where pastoralists adopted crop production due to changing cultural and social norms to be food secure. Crop failures due to climate variability and inadequate crop production skills were impacting negatively on food security. Research by, Nkedianye *et al.*, (2009) showed that diversification into cropping appeared to be quite a shaky option, with many households not getting a harvest even in a year considered to be a 'good rainfall year.' In semi-arid Ethiopia, Desta & Coppock (2004) report, decline in household per capita cattle holdings and population pressure led to diversification to crop production to achieve food security even though there were high chances of crop failure which relates to the situation in Kajiado North as per our findings. One positive finding from interviews is that crop failure products complement livestock fodder.

The survey established that the simple green house technology was adopted mainly by immigrants for horticultural crop production but many failed due to several reasons as shown in figure 3.

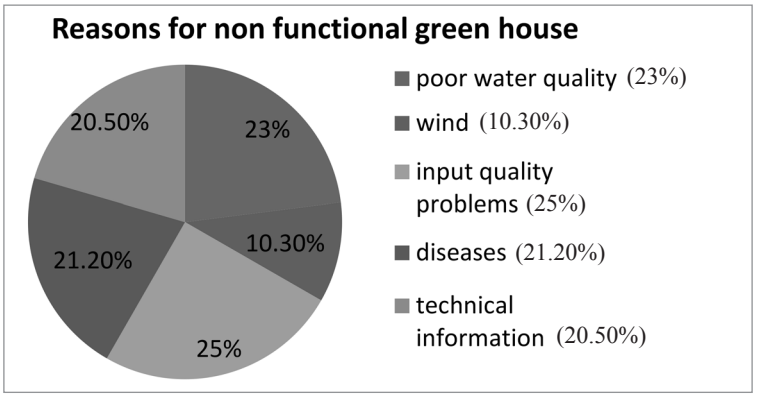

Figure 3. Reasons for failed Greenhouse Project

The area being a rangeland has no wind breaks; hence 10.3 per cent of the greenhouses were blown off by strong winds. Planting of trees and putting up soil conservation structures at relevant areas had been adopted in mitigation after capacity building by the Extension Officers. Boreholes were the main source of water used in drip irrigation by small scale farmers even though it was saline in many cases and leading to decreased yield in subsequent seasons. Aggressive marketing agents who promise a lot but are unavailable as revealed by FGDs in Ongata Rongai and Kitengela; "Some companies dealing with supply and construction of greenhouse promise training and extension services, but these are not normally forth coming leading to crop failure". Use of old and unsanitary greenhouse papers from flower farms which are not effective and sometimes come with diseases was a common cause of crop failure due to lack of adequate information. Planting of wrong crops in greenhouses e.g. onions and spinach which take up to three-six months with low returns in comparison to inputs/what alternative crops can give from green houses. Poor planning in planting of horticultural crops; harvesting season falls during the glut period in the Country hence farmers do not gain much. These show that good agricultural practices are not followed with regard to greenhouse farming manual guidelines according to De Gannes *et al.* (2014).

Large scale Commercial Greenhouse

The terrain of Kajiado is quite flat, hence a number of commercial greenhouse firms have been established due to the fact that the distance to the Jomo Kenyatta International Airport is only 70 Km away. In total there were six firms covering

approximately 1000 acres, one farm the largest covering 650 acres was doing flowers and herbs for export. Such big greenhouses contribute to decline in pastoral land in addition to limiting accessibility to range resources due to fences. Nevertheless, they create job opportunities for the immigrants and increase the economic activities in the area through increased demand for food that many farmers have transitioned to produce.

Policy Implications and Conclusion

Despite the important role pastoralism plays in supporting livelihoods in range environment of Kajiado, its capacity to adapt to change is facing many challenges due to declining land sizes in addition to those posed by land use/cover change. Decline in land for pastoral livestock production due to fragmentation, population increase and degradation has led to diversification into intensive livestock and crop production in addition to alternative income generating activities. The result is competition for resources and decreased resilience from weather shocks in the fragile semi-arid Kajiado North, as factors like animal diseases, water scarcity, livestock/wildlife conflicts and trespass increase. The indigenous Maasais have adopted crop production to be food secure. However, there is need to build their capacity on areas of planning and crop husbandry to avoid crop failures.

The current state of resource competition is likely to continue and there are gaps in land use planning and capacity of livelihood production activities in agriculture and other sectors. Therefore, there is need for all stakeholders to target increasing capacities in areas of resources utilization that ensures ecosystem sustainability with regard to ASAL areas. Although the results of this study are specific to Kajiado County in Kenya, the approach and findings could be applicable to other peri-urban arid and semi-arid areas in the region.

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