

Effects of Seasonality on Household Food Security and Food Consumption Patterns of Pastoralist's Children in Kajiado County, Kenya

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Abstract

The livelihood of communities in arid and semi-arid lands of Kenya is mainly pastoralism. Climatic seasonality is one of the determinants of food security. Food consumption patterns have been shown to fluctuate depending on the food security situation in a household. Households in ASALs are more likely to be affected by the fluctuations of the seasons which in turn affect food availability. This study aimed to investigate the effect of seasonality on food security and food consumption patterns among children (6 - 59 months) from pastoralists' households. The study adopted a longitudinal, observational study design, following on households for one year. The study was carried out in 2013 on 150 randomly selected households in Kajiado County. Data were collected using questionnaires and focus group discussion guides. Data were collected on a monthly basis for one year. Data on the climatic profile was obtained from the metrological department. Analysis of variance was used to assess for any differences in food security and food consumption patterns across the seasons. The dietary diversity score was significantly higher ($p < 0.05$) during the long rains season (5.13 ± 0.06) as compared to short rains (4.13 ± 0.04) and the dry season (3.45 ± 0.03). During the dry period, the households lacked the capacity to access adequate food due to low production, high food prices and low income from livestock and livestock products. Food scarcity was noted in the markets especially during the dry period due to low supplies. During dry seasons, there was a low frequency of food consumption, less number of meals consumed and reduced nutrient intake among children. Seasonality had a significant effect on food security with the situation becoming worse during the dry season. The change in dietary diversity, the number of meals consumed per day, the frequency of food consumption across seasons was an indicator of how different seasons affected household food security and food consumption patterns. This study recommends promotion of food preservation during the plenty seasons, production of drought-resistant crops, initiation of irrigation projects and use of social safety nets during extreme conditions. Policy intervention should focus on income generating activities to increase income for food purchasing.

Keywords: Food Security; Food Consumption Patterns; Seasonality, Arid Areas, Pastoralists

Abbreviations

ASALs: Arid and Semi-Arid Lands; DDS: Dietary Diversity Score; KDHS: Kenya Demographic Household Survey

Introduction

The arid and semi-arid lands (ASALs) in Kenya make up more than 80% of the country's surface area [1]. Kenya's ASALs support more than 30% (approximately 12 million) people, 50% cattle, 70% sheep and goats and the entire camel population [2]. According to a report by the Kenya demographic household survey [KDHS] [3], the arid and semi-arid lands (ASALs) cover over 40% of global land biomass and over 89% of the Kenyan land mass.

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It is estimated that the livestock sector provides almost 90% of employment and more than 95% of family incomes in Kenya's ASALs [4]. About 16% of the population in Kajiado County relies on pastoralism [5]. The Maasai community is one of the largest pastoralists group in Kenya. They depend on cattle, sheep, goats, donkeys and camels. They rely on access to water and pasture for the survival of their livestock. Climatic seasonality is primarily defined as the rainfall distribution throughout the year. Kenya has a bimodal climate with two rainy seasons in a year [1].

For a household to be food secure there should be availability of adequate food in terms of quantity and quality throughout the year [6]. Food availability is one of the pillars of food security [7]. Food security is diminished when food systems are stressed [8]. The components of food systems include food access, availability, allocation and preference. Food availability is both a component of food production and food procurement. The food produced either from livestock or crop farming can be sold to ensure income to procure more food. During the high productivity period, more food is produced or purchased thus ensuring a highly-diversified diet. During the lean season, there are fewer food reserves and limited cash resources. Therefore, food shortage coincides with diminishing purchasing power of the households as a result of adverse trade between livestock and staple cereals [6].

Any calendar year is divided into seasons depending on climatic conditions. A season is a division of the year, marked by changes in weather and ecology. The focus is usually the amount and duration of rain period. Each season has marked characteristics that are a determinant of the amount of food produced, availability of pasture and water for livestock or favorable conditions for crop production. With improved pasture, the animal nutrition is improved and this translates to higher milk production for household use and good market prices for livestock. During high production period, the surplus can be sold to enable household to procure other types food, thus ensuring dietary diversity. Seasons of droughts caused by the deficiency in rainfall leads to decline in water levels affecting agricultural activities and livestock production. This, in turn, affects income, choice of food and food consumption patterns.

The availability of food at the household level determines the number of meals consumed per day and its quantity and quality. This eventually translates to nutrients intake. During lean seasons, households change the normal food consumption patterns and adopt coping mechanisms for survival. This influences the nutritional status of the affected populations.

Traditionally, the Maasai community did not practice agriculture on a regular basis. Low levels of livestock exchange for agricultural products characterized their economic system [9]. These patterns have changed as livestock holdings have decreased. Climate change has led to the decline in livestock production. Livestock populations have fluctuated with downward trends due to re-current drought and desertification resulting from climate change, variability and overstocking [10]. The declining pasture quantity and increasing the distance to grazing areas and water sources affect livestock body condition and hence reduce household food security as most animals succumb to death. During drought or dry season, the animals migrate leaving a few small stocks to provide milk for the family. This affects the availability of meat and milk in the household for consumption among children as the little they get is shared in the household. The malnutrition rates among children in the ASALs have remained high over years [3].

Kajiado County has an estimated population of 405,685 and an area of 21,902.9 km², translating to an average density of 19 persons per km² [11]. Kajiado is predominantly inhabited by the Maasai people who depend mostly on livestock as their major source of livelihood though a small percentage engages in small scale farming. Kajiado experiences bimodal rainfall patterns. In Kajiado, the mean annual rainfall ranges from 300 to 800 mm, with "short rains" from October to December and "long rains" from March to May [11].

The Maasai traditional diet consists of milk, meat and blood from their livestock herds [9]. However, there is an increase in the consumption of non-pastoral foods such as maize meal, tea and sugar [12]. Cash is required to buy these goods and to purchase inputs for livestock and for agricultural production. The increased dependence of pastoralists on cash income has resulted in the incorporation of cultivation into their economic strategies wherever rainfall and ecological factors permit. The Maasai have responded in one way to these pressures by taking up agriculture [5].

Objectives

This study aimed to investigate the effect of seasonality on food security and food consumption patterns among pastoralists’ children. This study aimed to contribute useful information on the effects of seasonality on household food security with a view of supporting households to be more resilient to seasonal changes.

Materials and Methods

The study adopted a longitudinal, observational study design to follow on the households for one year. The study was carried out on 150 randomly selected households in Kajiado County in the year 2013. The households with children aged 6 - 47 months, were included, as those above 49 months would have attained more than 59 months by the end of the longitudinal study. Food security was assessed on a monthly basis using a 14-question food insecurity questionnaire. More information was collected using focus group discussions. Data on income, assets ownership status, occupation, the source of food, dietary habits and patterns was collected on a monthly basis for one year. Analysis of variance was used to assess for any difference in food security as measured using household food diversity score and food consumption patterns across the seasons.

Results

Characteristics of households

Results showed that 64.0% of the household heads had at least completed primary education. About 50% of female caregivers had an incomplete primary education which was common in the community (Table 1). Education plays an important role in child care. This study showed that 50% of the female caregivers had not completed primary education.

		N (150)	%
Education of the father	None	4	2.7
	Primary incomplete	32	21.3
	Primary complete	82	54.7
	Secondary	25	16.7
	Tertiary	7	4.7
Education of caregiver	None	3	2.0
	Primary incomplete	75	50
	Primary complete	43	28.7
	Secondary	23	15.3
	Tertiary	6	4.0

Table 1: Education level of household heads and caregiver of the children.

Occupation of fathers and caregiver of the children

The main occupation of caregivers was herding with 52.7%. About 9.3% of caregivers were in business while formal employment had only 12% (Table 2). Other occupations noted were casual labor and farming which were done by a minority.

		n (150)	%
Occupation of the fathers	Herding	79	52.7
	Business	14	9.3
	Formal employment	18	12.0
	Casual laborer	18	12.0
	Farming	21	14.0
Occupation of the caregiver	Herding	58	38.7
	Business/petty trade	29	19.3
	Formal employment	7	4.7
	Casual laborer	20	13.3
	Housewives	16	10.7
	Farming	20	13.3

Table 2: Occupation of fathers and caregiver of the children.

Household size

The majority of the households had five members (32.7%). The mean household size was 5.3 ± 0.7 SD (Table 3).

	n (150)	%
>8	16	10.7
7	13	8.7
6	26	17.3
5	49	32.7
4	30	20.0
3	16	10.7

Table 3: Household size in Kajiado County.

Household income and sources

Household income is a contributing factor to household food insecurity. The majority of the households earned between 4001- 6000 KES (37.3%) (Table 4). The average income per household was 5391.3 ± 1520 SD. From the results, it was evident that sale of livestock and livestock products accounted for the highest sources of income with 58.6%. Others were business/petty trade (24%) casual work (10.7%) sale of milk (19.3%) and employment (6.7%).

		n (150)	%
Household income	< 2000	13	8.7
	2001 - 4000	29	19.3
	4001 - 6000	56	37.3*
	6001 - 8000	39	26.0
	8001 - 10000	10	6.7
	>10001	3	2.0

Source of income	Sale of livestock	56	37.3*
	Sale of milk and milk products	32	21.3
	Business	36	24.0
	Casual laborer	16	10.7
	Employment	10	6.7

Table 4: Household monthly income in Kajiado County.

*Majority had an income range of 4001-6000 mainly from the sale of livestock.

Seasonal calendar for Kajiado

During the 12-month study period, the wet season occurred from the end of March through June and end of October through December. The sequence from land preparation to harvesting largely depended on the climate (Table 5).

Short dry spell			Long rains			Long dry spell			Short rain		
Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Short rains harvest		Land Preparation	Planting/weeding		Crops mature	Long rains harvest		Land Preparation	Planting/Weeding		Crops mature

Table 5: Seasonal calendar.

Livestock Ownership

Sheep and goats were predominantly kept by almost all households at 98.7% and 99.3%, respectively during the dry season and 100%, respectively during the rainy season. More than one-third of the households (43.3%) and (39.3%) owned between 21 to 50 sheep and goats, respectively during the rainy season. The livestock numbers are almost halved during the dry season. Though cattle were kept in more than 80% of the households, the numbers were much less compared to the small stock (Table 6).

Number	Cows	Camel	Sheep	Goat	Poultry	Donkeys
none	10(6.7)	146(97.3)	0(0)	0(0)	10(6.7)	36(24)
< 5	16(10.7)	4(2.7)	4(2.7)	7(4.7)	19(12.7)	89(59.3)
5 to 10	36(24)	0(0)	26(17.3)	16(10.7)	23(15.3)	25(16.7)
11 to 20	52(34.7)	0(0)	39(26)	26(17.3)	56(37.3)	0(0)
21-50	26(17.3)	0(0)	65(43.3)	59(39.3)	26(17.3)	0(0)
51-100	10(6.7)	0(0)	16(10.7)	42(28)	16(10.7)	0(0)
Total	150(100)	150(100)	150(100)	150(100)	150(100)	150(100)

Table 6: Household Livestock ownership during the wet period in Kajiado County.

The numbers of sheep and goats owned was significantly less ($p < 0.05$) during the dry period as compared to the rainy season (Table 7).

Number	Cattle	Camel	Sheep	Goat	Chicken	Donkeys
none	16(10.7)	148(98.7)	2(1.3)	1(0.7)	15(10)	42(28)
< 5	32(21.3)	2(1.3)	10(6.7)	13(8.7)	28(18.7)	91(60.7)
5 to 10	59(39.3)	0(0)	45(30)	29(19.3)	47(31.3)	17(11.3)
11 to 20	24(16.0)	0(0)	57(38)	45(30)	34(22.7)	0(0)
21-50	14(9.3)	0(0)	31(20.7)	40(26.7)	21(14)	0(0)
51-100	5(3.3)	0(0)	5(3.3)	22(14.7)	5(3.3)	0(0)
Total	150(100)	150(100)	150(100)	150(100)	150(100)	150(100)

Table 7: Household Livestock ownership during dry period in Kajiado County.

Trends of livestock prices through the year

Livestock prices for small stock fluctuated across seasons of the year as shown in Figure 1. The price of an animal sold during the rainy season was almost twice the cost of the same animal during the dry season.

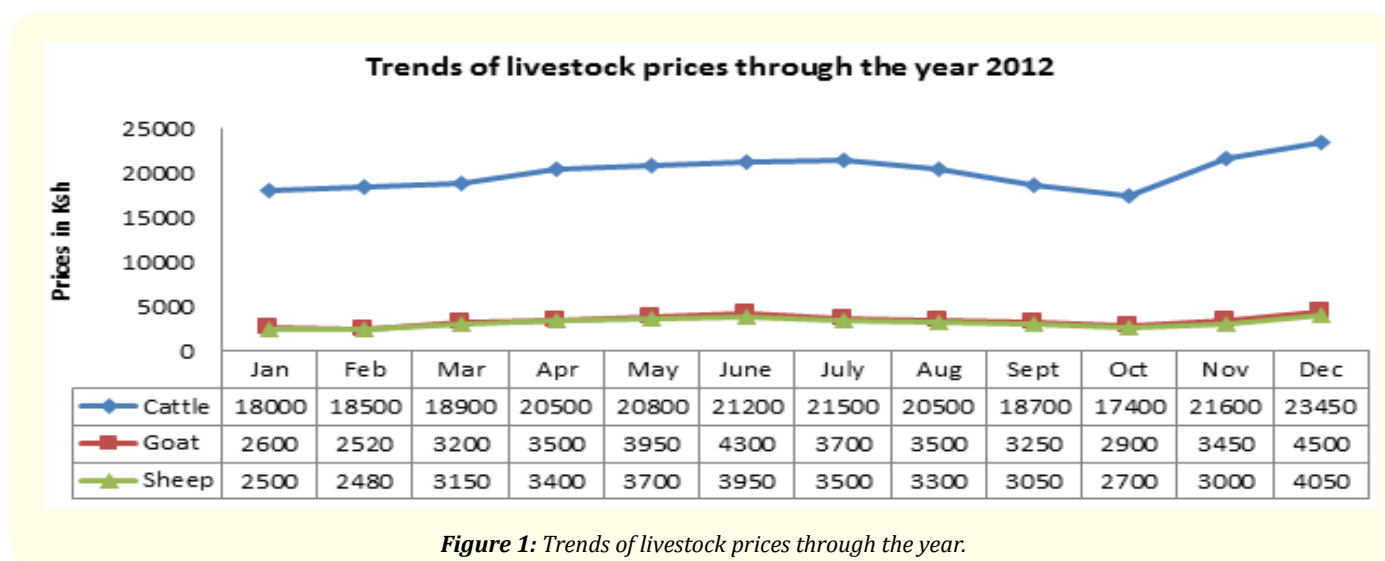


Figure 1: Trends of livestock prices through the year.

Change in income across seasons

The source of income slightly fluctuated with seasons. Wet seasons had more income from the sale of livestock and increased livestock products as compared to dry lean seasons. Lean seasons were presented with a limited the sale of small stocks and petty trade like sale of charcoal as common sources of income. The study revealed that during the rainy season livestock prices were higher compared to the dry season (Table 8). The majority of the households had their highest income during the long rains as opposed to the dry spell. Most of their income generating activities was found to be from livestock due to their pastoralism livelihood.

Income	Dry			Short rains			Dry spell			Long rains		
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
	3400	3200	3000	5170	6000	6200	5500	5500	4500	5500	6500	7000

Table 8: Amount of income in various seasons.

Source of food across seasons

The source of food slightly fluctuated with seasons, where during the wet season; food was from production as compared to dry seasons where it was purchased (Table 9). Peak seasons were realized towards the end of the rain season and the beginning of the dry season. The lean season began in the dry spell and stretched through the first few weeks after the rains set before pasture reached maturity and was adequate for the animals. The majority of the households bought their food during the lean seasons but also a significant number (highest at 13%) of them got it from donations.

source of food	%	Dry		Short rains			Dry spell				Long rains		
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
Buy		35	61	52	49	39	55	54	60	65	47	30	30
Produce		52	26	40	150	55	41	30	28	25	40	60	60
Donation		5	13	8	9	6	4	13	10	10	8	16	4

Table 9: Sources of food.

Food prices

Food prices for the vegetables and meat were found to fluctuate with the season. During the wet seasons, the prices were lower (Table 10). During the dry season, the prices were high for these commodities. Milk prices were high during the dry season due to the high demand and low supplies.

Food	units	dry		Short rains			Dry spell				Long rains		
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
Milk	L	35	40	40	35	35	35	40	40	40	40	35	35
Meat	Kg	400	350	350	400	400	400	350	350	350	350	400	400
Maize flour	kg	52	52	52	52	52	52	52	52	52	52	52	52
Rice	Kg	60	60	60	60	60	60	60	60	60	60	60	60
Potatoes	Kg	30	40	40	40	30	30	30	40	40	40	40	40
Kales	Kg	30	30	30	20	20	30	30	30	30	30	20	20
Cabbage	Kg	40	40	30	20	20	20	25	30	35	40	30	20
Oranges	Kg	150	130	130	130	130	130	130	120	100	100	20	20
Mangoes	Kg	100	100	100	100	100	100	100	100	100	100	100	100
Paw paw	Kg	75	75	80	85	85	80	90	80	75	70	75	75
Avocadoes	Kg	80	90	90	90	90	90	90	90	90	90	70	70

Table 10: Food prices of commonly consumed foods.

Dietary diversity score

The majority of the households had a more diversified diet during the long rains and least diversified during the long spell period (Table 11). This is due to high production during the wet season that led to more food production.

No of food groups	Jan-Feb (Dry) %		March-May (Short rains) %		Jun-Sep (Dry) %		Oct- Dec (Long rain) %	
2	54	36.0	42	28	47	31.3	39	26
3	36	24	43	28.7	39	26.0	40	26.7
4	25	16.7	26	17.3	22	14.7	33	22
5	16	10.7	17	11.3	18	12.0	17	11.3
6	10	6.7	13	8.7	17	11.3	13	8.7
7	9	6	9	6	7	4.7	8	5.3
Total	150	100.0	150	100	150	100.0	150	100

Table 11: Average number of food groups in households across seasons.

The mean DDS was significantly higher ($p < 0.05$) during the long rains season (5.13 ± 0.06) as compared to short rains (4.13 ± 0.04) and the dry season (3.45 ± 0.03). This ranged from 2.83 to 6.5 (Table 12).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
DDS	3	2.83	3.5	5.1	6.4	5.2	4.4	3.5	3.6	4.1	5.3	6.5

Table 12: Mean dietary diversity score.

Food consumption patterns

The study showed that children (56%) consumed > 4 meals during the wet periods. The number of meals during the dry spell was mainly \leq than 3 (Table 13). Reduction of meals was one of the coping strategies during the dry period. Goat's milk was highly consumed by children compared to milk from other livestock.

No of meals	Jan-Feb (Dry)		March-May (Short rains)		Jun-Sep (Dry)		Oct- Dec (Long rain)	
2	53	35.3	39	26	56	37.3	36	24
3	63	150	67	44.7	55	36.7	70	46.7
4	22	14.7	30	20	22	14.7	36	24
5	12	8	14	9.3	17	11.3	8	5.3
Total	150	100	150	100	150	100	150	100

Table 13: Proportion of children consuming various meals.

The seasonal calendar in Table 14 shows the foods consumed during the different seasons of the year. Camels and goats milk were consumed during the long dry season. As observed, Milk was consumed in all seasons throughout the year.

Short dry spell	Long rains	Long dry spell	Short rain
Jan - March	April - June	July - Sept	Oct - Dec
cow’s milk	Cow’s milk	Goats Milk	Cow’s milk
Goats Milk	Goats Milk	Camel’s milk	Goats Milk
Camel’s milk	Animal blood	Animal blood	Animal blood
Animal blood	Meat	Eggs	Meat
Eggs	Rice	Ugali	Rice
Rice	eggs	Corn soya blend porridge	eggs
Ugali	Ugali	Porridge-maize flour	Ugali
Corn soya blend porridge	Porridge-maize flour	beans	Porridge-maize flour
Porridge-maize flour	Animal fat	Vegetables	Animal fat
beans	beans	Wild foods	beans
Vegetables	Assorted Vegetables	Tea with milk	Assorted Vegetables
Wild foods			
Tea with milk			

Table 14: Seasonal calendar of foods consumed by children 6-59 months.

Discussion

The household heads with the education above secondary were either in business or in formal employment. The occupation status is a determinant of level of income and food accessibility in a household. From focus group discussions, the herdsman were found to sell the livestock to buy food for the children. This household size was higher than the Kenyan national figure of 4.6 [3]. The household size has been shown to affect the dietary practices of a child [13]. Low incomes amidst high food costs are barriers to the adoption of quality diets. Income has also been shown to be used to buy other foods thus improving the food basket [14].

Pastoralism was affected by drought leading to death of animals thus negatively affecting the income of households in Kajiado County. Climate related factors strongly affected livestock production negatively. These further affected the socio-economic factors which include food prices and income opportunities. As a result, households adapted to alternative sources of income such as petty trade, casual work and farming for those near water sources. During the short and long dry spell, there was water and pasture decline thus resulting to milk yield drops, livestock prices declined while only small stocks had market demand. During the long rains and short rains, there was increased milk yield due to high calving and lambing rates as well as adequate pasture and water. There was also increased slaughtering of animals and increased livestock prices.

Source of income slightly fluctuated with seasons. Wet seasons had more income from the sale of livestock and increased livestock products as compared to dry lean seasons. Lean seasons were presented with a limited sale of small stocks and petty trade like the sale of charcoal as common sources of income. The study revealed that during the rainy season livestock prices were higher compared to the dry season. The gradual increase in livestock prices during the rainy season was attributed to favorable weather condition. Livestock prices for small stock fluctuated across seasons of the year as shown in Figure 1. During the dry season, the livestock prices were low due to the high supply and low demand. The price of an animal sold during the rainy season was almost twice the cost of the same animal during the dry season. These findings were in agreement with a study in Ethiopia [15]. Sale of cattle was noted to be rare in the study area due to diminishing numbers over time. The average number of small stock sold in every household during the dry spells and rainy season was two and three, respectively.

The numbers of sheep and goats owned were significantly less ($p < 0.05$) during the dry period as compared to the rainy season. This was mainly due to destocking to realize income for food procurement and also to prevent high animal mortality. Destocking was higher in sheep than goats due to their poor resistance to drought. Thus, during the rainy season, there was enough food for household consumption and the surplus was sold. Moreover, during the rainy season, the pastoralists were also restocking to recover the livestock disposed during the dry season.

During the dry spell, the population was receiving relief food. To compensate for reduced milk production in the dry months, small stocks were slaughtered. Milk is commonly used among the pastoralist as a complete food for adults and also a complementary food for infants. Fruits prices were not affected by the local seasons since they are not locally produced. The increase in food prices could lead to a decrease in access to quantity and quality of food for households. This is further revealed by the low dietary diversity during the dry seasons. Other studies have also shown that high food prices could affect access to quality foods [14]. Procuring other foods not farmed is also possible as the animal prices (the main source of income) were also favorable.

Goat's milk was highly consumed by children compared to milk from other livestock. This could be because the goats have the ability to produce milk throughout the year. Their milk is also highly regarded in the Maasai community for its perceived health benefits. Milk consumption was high during the rainy season as compared to the dry season. As milk availability decreased consumption of blood mixed with the little milk available, and farm products such as maize meal, rice, sugars and vegetables acquired from the sale of stock are adapted.

Competing Interests

The authors declare they have no competing interests.

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Authors' Contributions

The authors made an equal contribution to research and development of this manuscript.

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