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Assessment of the Effect of Pastoral Mobility On Food Security in Semi-Arid Areas Of Simanjiro and Handeni Districts, Tanzania

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Abstract

This paper assessed the effect of pastoral mobility on food security to the Maasai in Simanjiro and Handeni districts. The data were collected through literature survey, structured questionnaire, in-depth interviews, focus group discussions and participatory GIS. A total of 367 pastoralist respondents who were part of pastoral mobility and eight extension officers were interviewed, one from each sampled village. The IBM Statistical Package for Social Sciences (SPSS) version 20 was used to analyse data. The results showed that most of the respondents, about 61%, indicated that there is no food available for the pastoralists during mobility, which causes them to suffer from food insecurity. Exploratory factor analysis (EFA) identified challenges that pastoralists faced during mobility and at the *boma*, to include livestock death, wild animals' attacks, and low price of livestock products produced, drought and shortage of forage; poverty, seasonality, shortage of food, poor diet, and poor food storage. The paper concludes that pastoral mobility has an effect on food security since walking long distance searching pasture and water causes livestock to be unhealthy, which lead to poor production of milk and meat. From these results, there is a need to promote development of climate change resilient livestock species in pastoral areas.

Keywords: *pastoral mobility, food security, semi-arid areas, boma, mobility routes*

1. Introduction

Pastoralists reside in over 21 countries across the African continent (Schilling et al., 2012). Livestock holdings represent wealth in pastoral areas where animals are used both as a form of savings, and as assets to be exchanged for cash or grain as needed (COMESA, 2009). Pastoralism is important since it supports huge populations and make significant contributions to the subsistence economy in some of the poorest regions in the world (Dong et al., 2016).

Pastoral livelihoods are constituted of delicate balance between pasture availability and livestock production, and are believed to be resilient to periodic shocks of drought and rainfall variability (Thornton & Herrero, 2015).

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However, recent climate variability through increased extreme events, such as drought and floods, undermine pasture and water availability (ibid.). Pastoralists' livestock production depends on mobility to ensure timely and reliable access to pasture (Otieno, 2016).

Pastoral mobility is part of coping strategies to prolonged drought, which affects pasture and water. Mobility is one of the traditional coping strategies based on movements within and across geographically distributed grazing units (Berhanu & Beyene, 2015). Pastoralists' way of living is reliant on keeping of livestock, and often sustained through regional and national migration (Kratli et al., 2012). Mobility is important for pastoralists living in dry land areas, as they move in search of water and pasture. In this way, mobility is essential to reach the most optimal production in times of unstable climate and drought (Flintan et al., 2013).

Mobility creates serious problems to the livestock on the way towards destination areas. For instance, movement over long distances weaken their body, which lead to low production of milk (Cochrane et al., 2005). Also, moving livestock away from pastoralists' home areas increase the risk of livestock loss by force, or through the exercise of power by local elites and/or government officials, which can also result to food insecurity as they lose their source of food, i.e., livestock (Turner, 2011).

The ongoing climate change and variability, inadequate land due to protected areas—such as Kitwai game-controlled area in Simanjiro—have affected Maasai pastoralists more negatively, forcing them to migrate from their areas of origin to far destinations looking for pasture and water. This mobility leads to food insecurity as they travel long distance and leave their wives and children at the origin areas whereby food becomes inadequate as they move with their livestock, only leaving behind a few cattle which sometimes cannot produce enough food for the family left behind (Mwakaje, 2013). Pastoralists have often experienced food shortages; and the government has been providing them with food aid every year. However, this food aid reduces the capacity of the community to build resilience to food shortage because they fail to identify the root causes of food shortages and thus the possible solutions (Nderumaki et al., 2016). This paper intended to assess the effect of pastoral mobility on food security of the Maasai of Simanjiro and Handeni districts, Tanzania, so as to inform decision makers and to provide insight regarding the influence of mobility on food security in space and time.

2. Context and Methods

Research was conducted in Simanjiro District and Handeni District which are in Manyara and Tanga regions respectively in Tanzania (Figure 1). These areas were selected because most of the people living in these districts, about 90%,

are pastoralists and agro-pastoralists. Most of the pastoralists in Simanjiro District migrate to Handeni District during drought seasons in search of pasture and water (Nkedianye et al., 2011).

The Manyara Region is located in the northern part of Tanzania. Geographically, Simanjiro District is stretches from vast plains to scattered ridges and hill valleys. It is one of the six districts of the Manyara Region of Tanzania. It is bordered to the north by Arusha Region, to the north east by Kilimanjaro Region, to the south east by Tanga Region, to the south by Kiteto District, to the south west by Dodoma Region, and to the west by Babati Rural District (Homewood et al., 2012, Nelson et al., 2009).

Eight (8) villages from four wards were picked for *boma* survey, whereby the heads of the *boma* were the ones who were selected to answer the questionnaires. A *boma* is a homestead headed by one male, consisting of houses for each of his wives and their children. Maasai are polygamous, and every Maasai woman builds her hut in her husband's *boma*. The researcher opted for *bomas* rather than households because most of the Maasai live in *bomas,* and those people living in one *boma* share the same livestock.

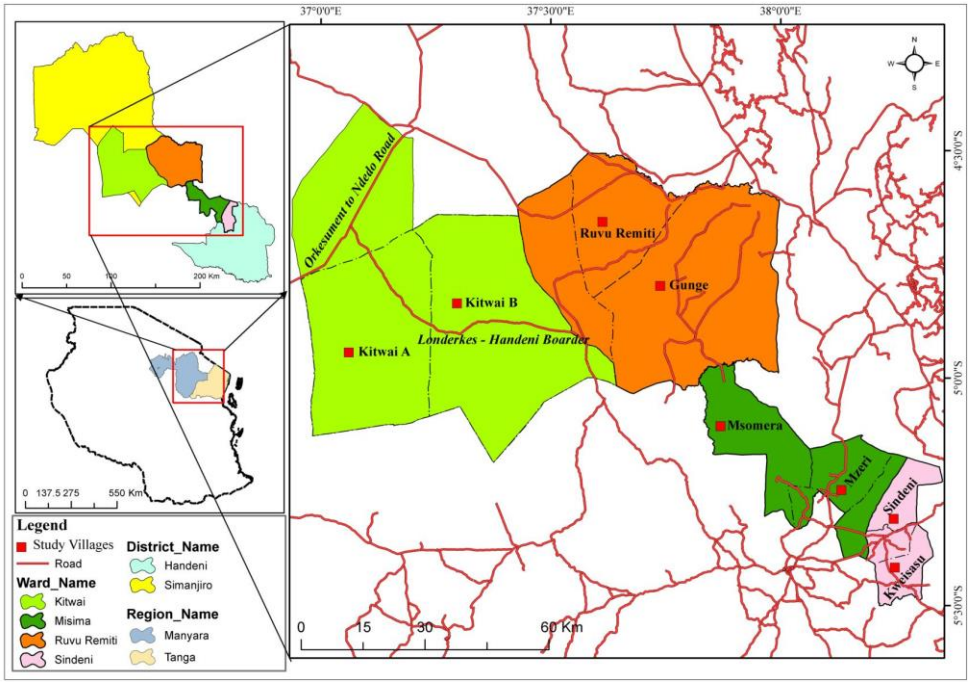


Figure 1: Location of the Study Areas

Source: Cartographic Unit, Geography department, University of Dar es Salaam, 2018

2.1 Bomas Survey

Data was collected from 367 *boma*s between October and December 2018. The 367 questionnaires were used to collect data; both open-ended and close-ended questions were asked. The data collected include demographic characteristics of the respondents, sources of food, constant food supply and availability, constant food accessibility, utilization and stability, seasons for pastoral mobility, milk production during mobility, access of food along the mobility route, days travelled from Simanjiro to Handeni districts, and challenges faced during mobility.

2.2 In-depth Interview

Face to face in-depth interviews were conducted with sixteen key informants using an interview guide to facilitate collection of qualitative data on food security status to pastoral communities, coping strategies and the challenges of pastoral mobility to food security. The key informants comprised people who had knowledge on the theme studied: this included 8 village leaders and 8 agricultural extension officers.

2.3 Focus Group Discussion

Eight focus group discussions were held based on the guided topics. There were six discussants in each group. The method was adopted to collect information concerning the description of the migration routes, factors to food insecurity and the diseases that affect cattle during mobility.

2.4 Participatory GIS (PGIS)

Eight satellite images were taken to the villages, each village with its own satellite image where by the villagers, especially those who migrate with livestock, indicated the mobility routes, i.e., the former ones and the new ones; and also, the stations where they rest and the points where they run out of food.

2.5 Climate Data

Climate data were collected from the Tanzania Meteorological Agency. Data on rainfall and temperature from the study areas (Simanjiro and Handeni Districts) covering a period of 30 years were acquired to locate the droughts in the study areas.

3. Results and Discussion

3.1 Pastoral Mobility Routes

Pastoral mobility routes are the routes whereby pastoralists, with their livestock, pass when moving from their area to another destination. Most of the pastoral mobility routes start from the area where they live. Figure 2 shows the direction of the pastoral mobility routes, which are from Simanjiro to Handeni districts; and then back to Simanjiro district through the same routes. These

pastoral routes pass on areas where livestock can get pasture and sometimes water. Most of the pastoralists from Ruvu Remiti move through Lerumo village, passing Kitwai B, until they enter Handeni districts in the village known as Saunyi. Pastoralists from Gunge village are divided into two groups: one pass through Ngiro Mountain, and the other pass through Larupa area; but they all meet near the boundary between Simanjiro and Handeni districts, and all enter Msomera village in Handeni district. Pastoralists from Kitwai A village have different mobility routes: some pass Lolongumaishi Mountain, Onyokye, Ngurret and then enter Handeni district. Others pass Lolongumaishi Mountain, and then pass East of Ngurret to Saunyi village in Handeni district. Other pastoralists from Kitwai A migrate through Supaker, passes Kitwai B to Saunyi village. Therefore, most of the pastoralists from Simanjiro district enter Handeni district through Msomera village to Mzeri village, while others enter through Saunyi village to Sindeni and Kweisasu villages.

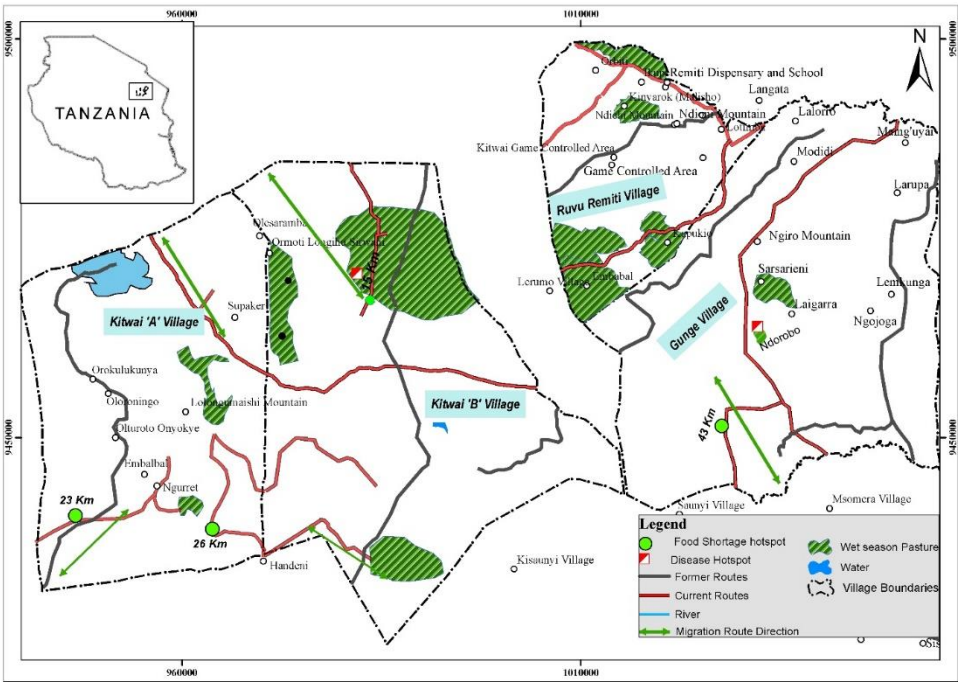


Figure 2: Pastoral Mobility Routes in Simanjiro district

Source: Cartographic Unit, Geography department, University of Dar es Salaam, 2018

Figure 3 shows that during the rainy season, pastoralists migrate from Handeni district to Simanjiro district. The Maasai pastoralists from Kweisasu village are divided into two groups: some move through Sindeni village then pass Mzeri village to Msomera village to Simanjiro district through Gunge

village. Other Maasai pastoralists from Kweisasu village pass Mzeri village and then enter Simanjiro district through Gunge village. Those pastoralists who go to Msomera village also pass dry season pasture area and enter Simanjiro district through Gunge village, while others from pass Saunyi village and then enter Simanjiro district through Kitwai B village.

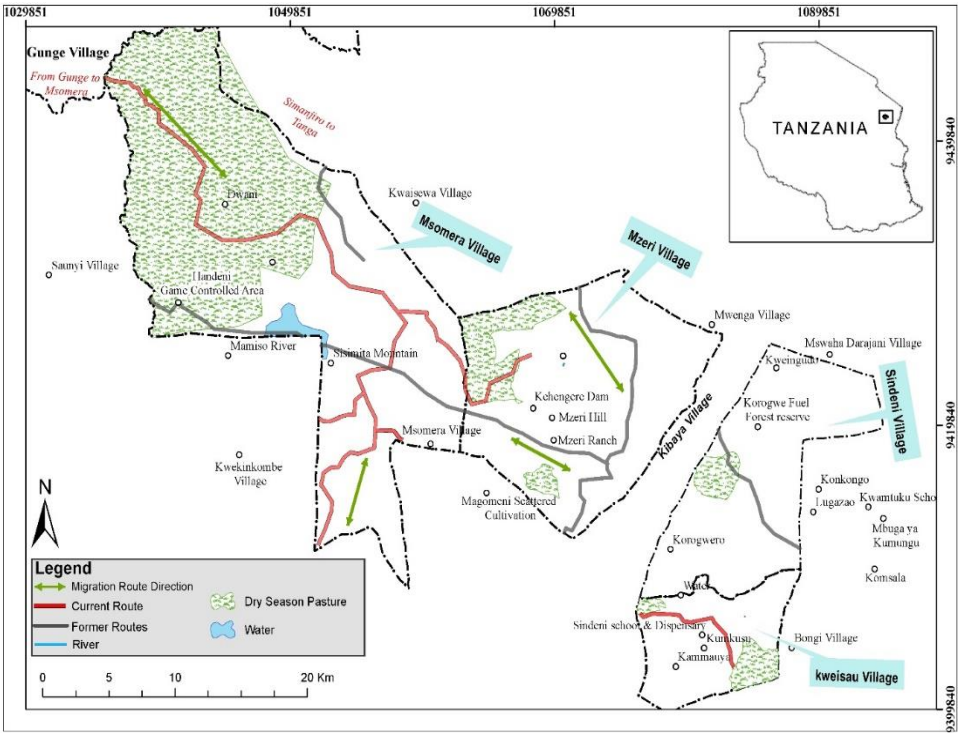


Figure 3: Pastoral Mobility Routes in Handeni district

Source: Cartographic Unit, Geography department, University of Dar es Salaam, 2018

The pastoralists' communities do not involve every individual in mobility but there are people of a certain age and sex who are involved in moving with livestock in search of pasture and water. These are the boys (*morani*) who are aged between 15 and 23 years (see table 1 for respondent ages) are involved in going far for months (*ronjoo*) while those who are younger than the *morani* are involved in taking care of livestock around their surroundings. In some cases, the *boma*s with no *moranis* the elders, aged 25 years and above, are forced to participate in mobility (*ronjoo*).

Table 1 indicates that 81% of the pastoralist respondents reported youths (morani) of the age 15 - 23 as being the most involved in travelling with livestock in search of pasture and water, while few respondents about 19%

reported elders of age 25 and above as being involved in traveling with livestock in search of pasture and water. Elders are involved in a situation where there are no any youths (morani) in particular household hence elders remain with no option but to take livestock themselves in search of pasture and water.

Table 1: Those who are involved in Pastoral Mobility

Involved in Mobility	Responses	
	N	***Percent***
Elders	73	18.6
Youths (Morani)	294	81.4
Total	**367**	**100**

Source: Field work, 2018

3.2 Pastoral Mobility Routes Change

The pastoral mobility routes have been changing with time, the change of the routes depends on several reasons such as shortcut of the route so as to reduce number of travelling days, heavy forests because it is not easy to pass with livestock across heavy forest, wild animals are another reason for route change this mean that in some areas when passing with their livestock the wild animals like lion attack the livestock, in so doing they decided to change the route. Also, pests and diseases have been the cause of pastoral mobility route change. The findings shown in Fig 4 reveal that 58% of Maasai pastoralists changed their routes because they found a short cut route to reach their destinations, about 13% changed their routes due to heavy forests, pests and diseases, while 17% changed routes due to wild animals. These former and current routes are shown in Figures 2 and 3.

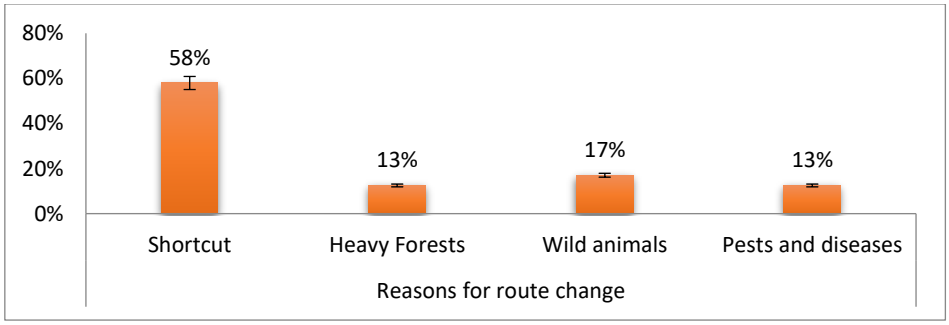


Figure 4: Reasons for route change
Source: Field Survey, 2018

On the other hand, fig. 5 shows that Maasai pastoralists from Simanjiro district do not only migrate to Handeni district but also migrate to Babati, Mwanga, Same, Korogwe and Kilindi districts. Also, after reaching these districts and the

problem of pasture and water still exist due to drought, usually these pastoralists opt to go on migrating to other districts, for instance those who went to Handeni district move on to Bagamoyo and Pangani districts, and those who went to Kilindi district also moved on to Gairo district and others to Mvomero district.

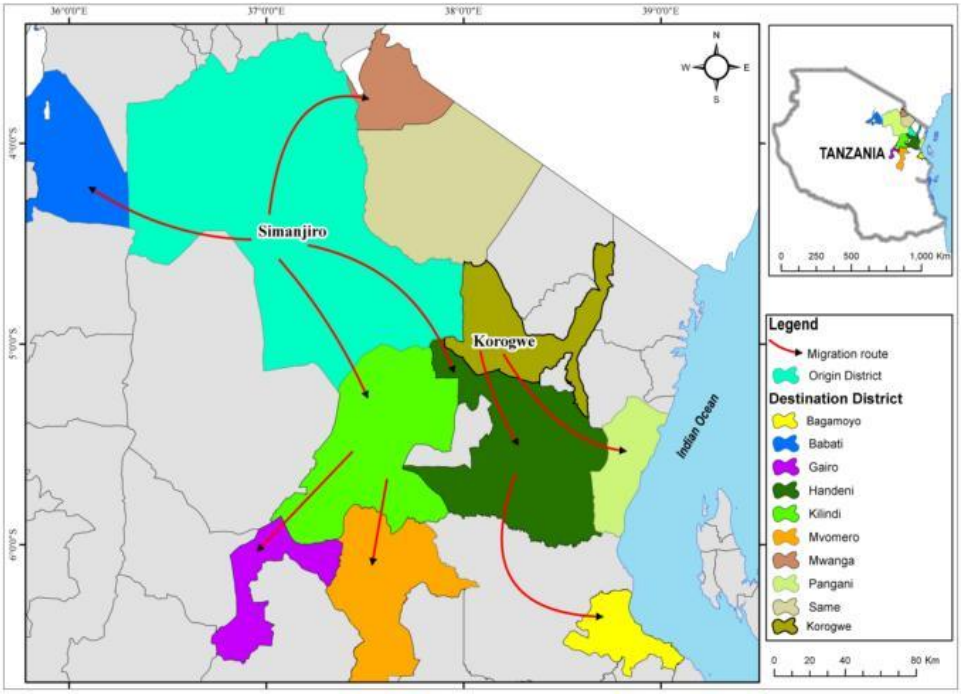


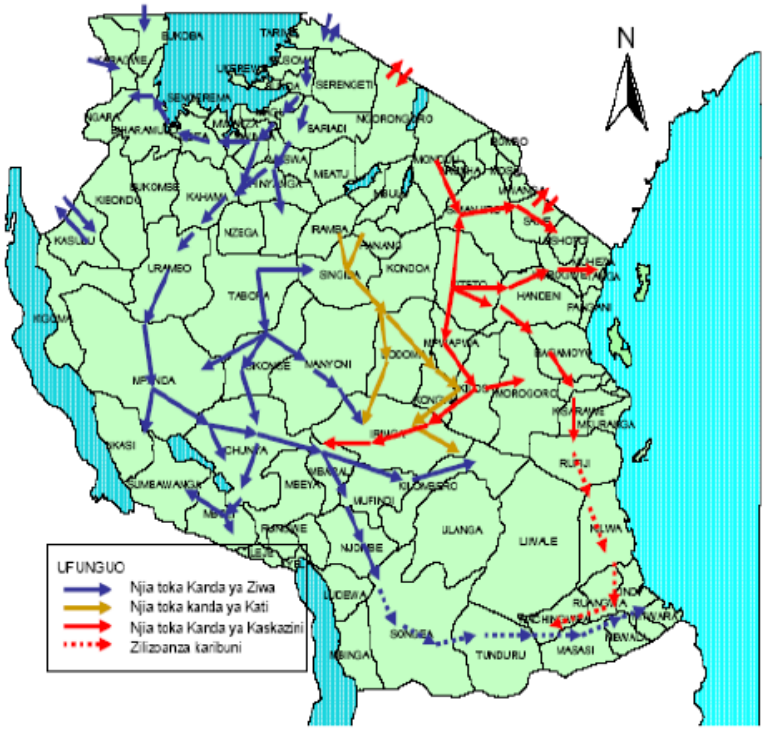
Figure 5: Extension Destination Districts

Source: Cartographic Unit, Geography department, University of Dar es Salaam, 2019

These routes are also mentioned by Shem (2010), who indicates that pastoralists have not maintained their former and current routes for sometimes. He categorized four pastoral mobility routes as follows: first is the route around the lake zone; second is the route around central zone; third is the route around the northern zone; and the last is the new routes that pass through Rufiji, Kilwa, Lindi, Ruangwa, Nachingwea, Tunduru, Songea, Masasi, Newala and Mtwara. Pastoralists from Monduli district migrate to Simanjiro district through the routes from the North to South-east of Tanzania (Figure 6).

On arrival at Simanjiro district, one group of pastoralists goes to Same district and then to Kenya, while another group goes to Lushoto district. The reason for the split is the availability of relatives in those areas where they head to, and

experience of the group on those areas which they are intending to go. There is yet another group that moves from Simanjiro district to Kiteto and Handeni districts. Those using this route find themselves also splitting at Handeni District. One group remains in Handeni until the rainy season, and then goes back at Simanjiro district; while another group moves to Muheza (Shem, 2010) (Figure 6). All the routes are southwards because most of the northern parts of Tanzania are prone to droughts, while the southern parts of the country experience high rainfall that provides pasture and water. The other routes include from lake zone to southern part of the country; another pastoral mobility route is from central zone to southern parts of Tanzania. Each pastoral mobility route is dominated by its own pastoralists' community: for instance, the red pastoral mobility route is dominated by the Maasai community, the blue is dominated by the Sukuma community, while the brown is dominated by both Maasai and Sukuma communities. Therefore, each route is dominated by a certain tribe.



Key

- Red continuous route from Northern Route
- Red and blue dotted route from recent routes
- Brown line route from central zone
- Blue line route from the Lake zone

Figure 6: Pastoral Mobility Routes in Tanzania

Source: Shem, 2010

3.3 Milk Production During Mobility

Pastoral mobility has a great impact on the health of livestock due to long walking distances. The livestock do not get enough pasture and water, and some of the areas are prone to diseases. All these contribute to poor production of milk. Figure 7 presents the findings showing the impacts of migration on milk production as the pastoralists move with their livestock towards destination areas.

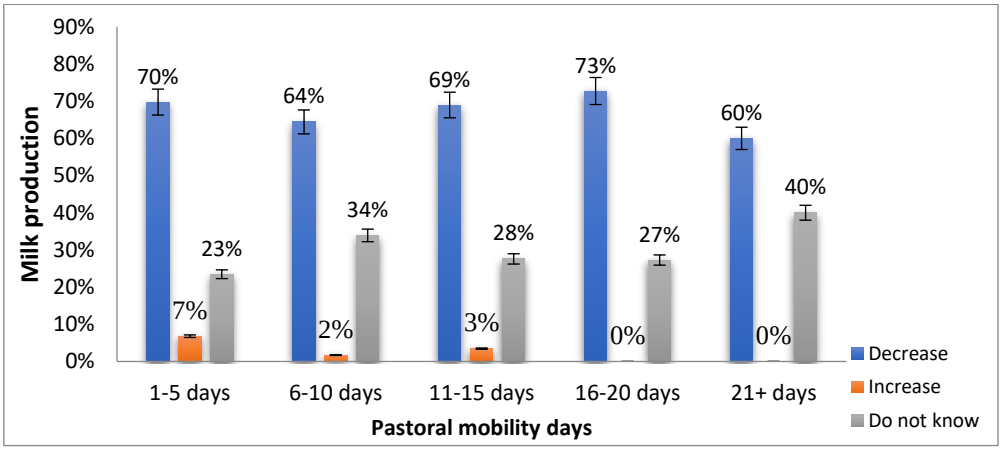


Figure 7: Milk Production during Mobility

Source: Field Survey, 2018

The results indicate that, for pastoralists who travelled 1–5 days, 70% of the respondents reported a decrease in milk production; while only 7% reported an increase. On those who travelled for 6–10 days, 64% reported a decrease in milk production while only 2% reported an increase. For those who travelled a distance that lasted 11–15 days, 69% of the respondents reported a decrease in milk production while only 3% reported an increase. 73% of those who travelled distance lasting for 16–20 days reported a decrease in milk production, while 60% of those who travelled for more than 21 days reported a decrease in milk production. On average, 67% of the pastoralists who travelled between 1 day and more than 21 days to their destination areas reported a significant decrease in milk production, whereas those who reported an increase in milk production were merely 2%. These results imply that long walking distance has negative effects on milk production.

Also, the production of milk decreased as the number of the days of mobility increased. However, when approaching their destination area, milk production started to increase because the livestock start getting pastures and water (Figure 8).

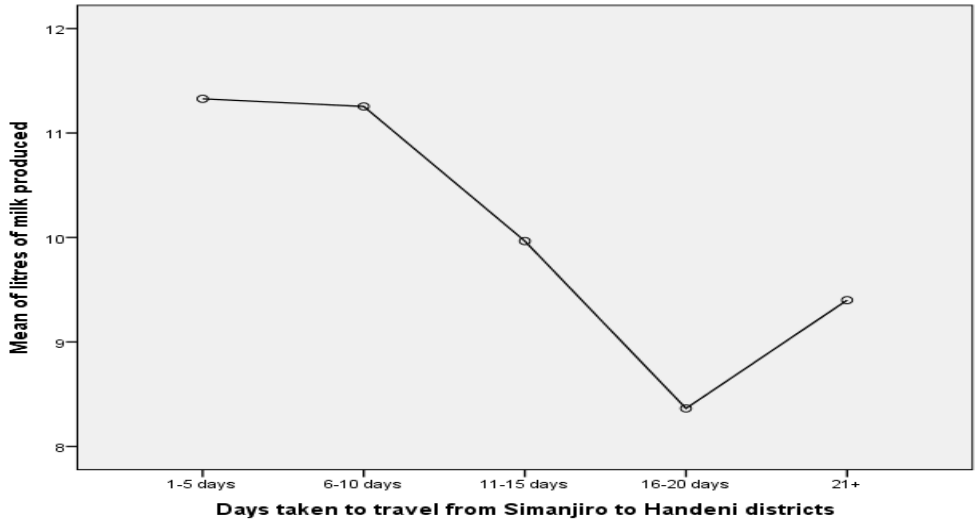


Figure 8: Liters of Milk Produced During Mobility

Source: Field Survey, 2018

This finding was also established by Theodory and Malipula (2014), who revealed that ongoing climate change impacts cause prolonged drought which compel pastoralists to migrate with their livestock in search of pasture and water. They further showed that during mobility milk production declines as a result of some of the livestock—such as cattle, sheep, and goats—become unhealthy. Therefore, long distance walks affect the health of livestock, which leads to less or no production of milk and meat.

Also, during pastoral mobility few livestock, about seven (7) (and especially) cattle, are left at home so as to provide food for those who remain there. However, because of droughts that cause a reduction of pasture, there is high mortality rates even for the livestock remaining behind, and a significant reduction of milk production due to inadequate feeding and increased incidence of diseases (Swai et al., 2012). Therefore, pastoral mobility causes food insecurity as the movement itself leads to livestock becoming unhealthy; and so being unable to produce adequate milk and meat.

Cross tabulation was done so as to investigate the relationship between food security and days used to travel by the pastoralists from Simanjiro to Handeni districts. The results found that there is a statistically significant relationship between food security and days taken to travel (Table 2). Pearson chi-square test at 12 degree of freedom (df) was used to test if the results were statistically significant. The results showed a significant positive relationship at $X^2 = 44.534$; p-value = 0.000.

Table 2: Cross-tabulation Between Food Security and Days Travelled from Simanjiro to Handeni Districts

Food security	Days taken to travel from Simanjiro to Handeni districts				Total
	1 - 5	*6 - 10*	*11+*	*N/A*	
Highly Food Secure	24.1	23.7	20.0	12.2	20.3
Food Secure	26.5	23.7	15.6	9.2	20.1
Moderately Food Insecure	24.7	16.9	13.3	18.4	20.3
Food Insecure	14.2	22.0	17.8	26.5	19.2
Highly Food Insecure	10.5	13.6	33.3	33.7	20.1
Total	100.0	100.0	100.0	100.0	100.0
X^2 = 44.534; *df* = 12; P-Value = 0.000					

Source: Field Survey, 2018

From these findings, it can be argued that as pastoralists move with their livestock for many days, they become food insecure since the increase in walking distance disturbs the health of the livestock, and hence resulting into low production of milk and meat which they depend on as their basic food during mobility. This was also shown by (Reader et al., 2011), who also found that the mobility of the livestock decreases milk production because livestock face different problems during mobility, such as diseases.

Cramer's V correlation was done to find the nature of correlation between food security and days used to travel from Simanjiro to Handeni district. The results found that there is a very strong relationship between those variables since Cramer's V correlation was 0.202, which imply there is a strong relationship between the variables. (Akoglu, 2018) argues that Cramer's V correlation that is >0.25 is interpreted as very a strong relationship, >0.15 is interpreted as a strong relationship, >0.10 is interpreted as a moderate relationship, >0.05 is interpreted as a weak relationship, and >0 is interpreted as no or very weak relationship.

Figure 9 shows the nature of the relationship between food security and days travelled, which shows that the nature of relationship is inversely proportional, which means as the days travelled increase, they become food insecure. Therefore, those who travelled for many days became food insecure: this is because travelling many days affects the health of the livestock, which leads to low production of milk and meat.

The exploratory factor analysis was used to identify four hidden factors that were defined with the associated variables within each factor. Factor 1 was defined as 'pastoralist challenges associated with production and sales of livestock products'; factor 2 as 'drought challenge and associated risks'; factor 3 as 'financial challenge and associated risks'; and factor 4 as 'challenge of poor means of food storage' (Table 3).

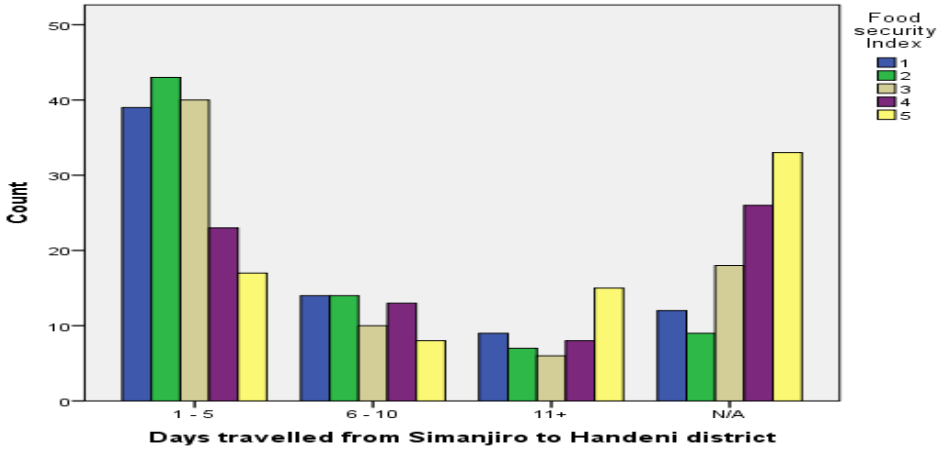


Figure 9: Days Used to Travel from Simanjiro District to Handeni district

Source: Field Survey, 2018

Table 3: Rotated Factor Loadings

Variable	Factor1	Factor2	Factor3	Factor4	Uniqueness
Drought challenge		0.5289			0.5197
Shortage of forage		0.6762			0.4448
Pest and diseases	0.6431				0.6919
Poverty			0.6302		0.5451
Seasonality			0.4853		0.5967
Climate Change			0.5312		0.5764
Food shortage			0.6548		0.4848
Poor diet			0.6279		0.5684
Livestock death	0.6631				0.5173
Wildlife attacks	0.6607				0.6351
Poor storage				0.5096	0.6148
High price food			0.6484		0.5641
Food shortage mob			0.6312		0.6126
Low price products	0.5361				0.5506
Weight loss	0.5351				0.6355

Source: Field Survey, 2019

Kimaro et al., (2018), also found that Maasai livestock challenges during mobility, which include diseases such as African animal trypanosomiasis (AAT) that cause most of livestock about 77.7% lose weight, and if the disease is not treated, can lead to livestock death. These challenges were also mentioned during focus group discussion in Msomera village (Handeni district) thus:

> *We normally face different challenges during mobility which affect our food security. These challenges include livestock death, wild animals' attacks, low price of products produced, drought, shortage of forage, poverty, food shortage, poor diet and poor storage (*Focus Group Discussion, 05.12.2018).

A Pearson product correlation coefficient was computed to assess the relationship between food security and challenges of pastoral mobility. The results found that there was a positive correlation between the two variables; which are food security, and challenges of pastoral mobility (Table 4).

Table 4: Correlations Coefficient Between Challenges Of Pastoral Mobility and Food Security

		Environment Challenges	Animal Challenges	Human Challenges	Food Security Index
Environment Challenges	Pearson Correlation	1	.567**	.557**	.033
	Sig. (2-tailed)		.000	.000	.527
	N	367	367	367	367
Animal Challenges	Pearson Correlation	.567**	1	.415**	.040
	Sig. (2-tailed)	.000		.000	.444
	N	367	367	367	367
Human Challenges	Pearson Correlation	.557**	.415**	1	.029
	Sig. (2-tailed)	.000	.000		.584
	N	367	367	367	367
Food security Index	Pearson Correlation	.033	.040	.029	1
	Sig. (2-tailed)	.527	.444	.584	
	N	367	367	367	367

Notes: **. Correlation is significant at the 0.01 level (2-tailed).

Source: Field Work, 2018

Therefore, the results imply that environmental challenges, animal challenges and human challenges: all have the same effect on food security. This means that during pastoral mobility, the pastoralists' food security can be affected by either environmental challenges, animal challenges, or human challenges. Environmental challenges include water shortage, drought, seasonality and climate change; animal challenges include shortage of forage, pests and diseases, livestock deaths, attack by wild animals and long-distance travel; human challenges include poverty, shortage of food, poor means of storage, high food price, conflict with other pastoralists, conflict with farmers, poor access to financial credit, and poor access to food.

4. Conclusion and Recommendations

Pastoralists' movements were from their areas of residence to destination area where they could find pasture and water. However, it should be noted that, sometime, they did change their mobility routes due to reasons such as heavy forests, wild animals, pests and diseases. During mobility, pastoralists face different problems, which included food unavailability since most of the areas where they travelled along made it difficult for them to access food after the depletion of the ones they carried. Consequently, they are compelled to feed on wild fruits and roots since during such periods their cattle fail to produce adequate milk due to the long distance travelled. Also, pastoralists were challenged by livestock deaths, wild animals' attacks, prolonged droughts: all of which led to the low production of milk and meat; causing pastoralists to suffer from food insecurity. The paper recommends that there is a need to promote the production of livestock species that are resilient to climate changes in pastoral areas so that they can survive during drought seasons and avoid pastoral migration.

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