

Transformation of Afar pastoralism with climate change and a market economy

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Abstract: The purpose of this study is to assess recent changes in 1) livestock numbers, 2) seasonal movement, 3) dietary intake, and 4) traditional reciprocity and values of Afar pastoralists in the Afar region in north-eastern Ethiopia, as a result of the main effects of climate change and the market economy. Subsequently, the authors propose measures to address the issues associated with these changes. An on-site field survey was conducted in the Serdo and Secoita communities in Dubti District, Zone 1, Afar Region, in north-eastern Ethiopia. Six Afar pastoralist households were interviewed about livestock numbers, sales, and slaughter, dietary intake, the values of livestock and markets, traditional reciprocity, recent climate change, and vegetation conditions. Afar pastoralists' herds have decreased drastically in recent years and seasonal migration has lengthened in a search for water resources. From precipitation data and pastoralists' testimonies, it was considered that it was caused by the increase of low precipitation years and more dispersed precipitation in the last two decades. As climate change occurred in the study area, seasonal migration tended to increase in distance in search for better feed resources and water resources such as rivers and ponds, and the seasonal migration style has changed from all members to some members of households, which has resulted in an increase in the sedentarization of Afar pastoralists. Afar pastoralists' diet has shifted from milk-based to wheat-bread-based, suggesting malnutrition. These changes are due to climate change and the introduction of a market economy with democratization. The current situation of Afar pastoralists is such that although their practice of sharing resources continues, they no longer share livestock, and reciprocity relationships have weakened. Continued climate change will cause the Afar pastoralism system to end within a dozen years. If Afar pastoralism cannot be continued under climate change, Afar pastoralists should become agro-pastoralists by practicing crop cultivation using irrigation or becoming refugees. A strong policy is urgently needed, such as relocation to water-rich areas and/or support for job opportunities, that would allow Afar pastoralists to move from pastoralism to other livelihoods.

Keywords: climate change, feed resources, livestock number, market economy, mutual support

1. Introduction

Climate change due to global warming has caused disasters such as flooding through increased rainfall intensity in humid areas, while precipitation has decreased and dryness has increased in arid areas (Trenberth, 2011; Winsemius *et al.*, 2018). The precipitation of Afar in north-eastern Ethiopia, located in an arid area, has declined in recent years (Seleshi and Zanke, 2004; Mekuyie *et al.*, 2018; Climate Change Knowledge Portal, 2021). Pastoralism is a strategy for local people to survive in the arid regions of Afar. Afar pastoralists have adapted their subsistence to a harsh and arid environment by raising livestock, mainly camels, moving their livestock seasonally to grazing lands that supply feed resources throughout the year, and depending for their many needs on livestock (Schmidt, 2016). Slight changes in the amount and frequency of precipitation can significantly

affect the growth of herbaceous plants. It is assumed that climate change in Afar has a negative impact on the livestock feeding of Afar pastoralists and seriously threatens the survival of the pastoralists themselves.

The Ethiopian political system transitioned from socialism to democracy in 1991 (Hagmann, 2012; Badwaza and Temin, 2018). Democratic policies have had a profound impact on the life of agro-pastoralists, such as the promotion of the market economy (Lefort, 2012; Weis, 2015), the rapid spread of public education (Federal Democratic Republic Government of Ethiopia, 1994). The expansion of protected areas against grazing led by a democratic local government has also led to restrictions on agricultural and pastoral activities (Nedessa *et al.*, 2005; Hirata *et al.*, 2018; Ogawa *et al.*, 2018), a decrease in livestock numbers (Hirata *et al.*, 2018), and a decline in nutritional intake mainly due to the decrease in animal production, such as milk yields (Hirata

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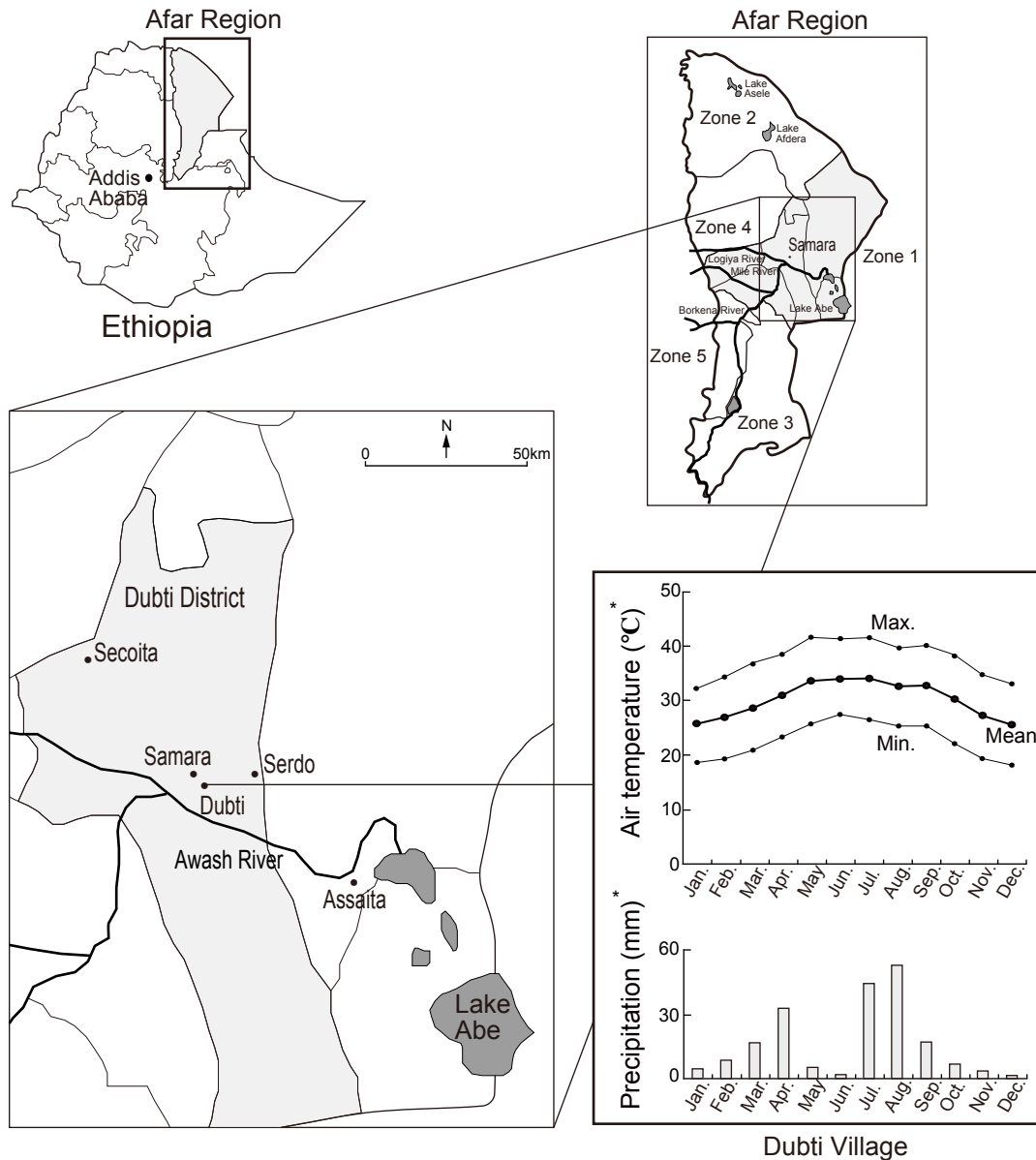


Fig. 1. The location of study areas (Serdo and Secoita Villages), air temperature (°C), and precipitation (mm) at Dubti Town in Dubti District, Zone 1, the Afar Region, Ethiopia.

Source: National Meteorological Agency, 2014.

* Mean in 2000, 2001, 2004, 2006, 2007 and 2008

et al., 2021). However, the impact of a market economy introduced with democratization that affected the concept of values of Afar pastoralists based on livestock has not evaluated enough. These issues are extremely important when seeking to understand the relationship between policy and pastoralists' lifestyle attitudes to clarify how reciprocity and the values of pastoralists have changed with the introduction of the market economy.

The purpose of this study is to assess recent changes in 1) livestock numbers, 2) seasonal movement, 3) dietary intake, and 4) traditional reciprocity and values of Afar pastoralists in the Afar region in north-eastern Ethiopia, as a result of the main effects of climate change and the market economy.

Subsequently, the authors propose measures to address the issues associated with these changes.

2. Location and method

2.1. Location of study area and its natural environment

The field survey was conducted in the Serdo and Secoita communities in Dubti District, Zone 1, in the Afar Region in north-eastern Ethiopia (Figure 1). In Serdo Village, a paved road from Afar to Djibouti was built during the Italian colonial period, and the distribution of substances in the area has developed since that time. There are several shops that sell food and basic goods in the center of Serdo Village. On the other hand, a gravel road was opened around 2010

Table 1. Seasonal classification by the Afar pastoralists.

Month	Local name	Season	Local name
December	<i>Mawluda 2nd</i>		
January	<i>Mawluda 3rd</i>	Cold-dry season	<i>Gilal</i>
February	<i>Mawluda 4th</i>		
March	<i>Rajab</i>		
April	<i>Sombahie</i>	Small rainy season	<i>Segum</i>
May	<i>Somu</i>		
June	<i>Somu futra</i>	Hot-dry season	<i>Hagaya</i>
July	<i>Irffabahie</i>		
August	<i>Irffa</i>	Rainy season	<i>Karma</i>
Early September	<i>Assura</i>		
Middle and later September	<i>Assura</i>		
October	<i>Sefre</i>	Small rainy season	<i>Dada'e</i>
November	<i>Mawluda 1st</i>		

in Secoita Village, but there was little car traffic, and the distribution situation was poor. One shop sells water and seasonings.

The monthly mean air temperature of Dubti Town, the capital of the Afar Region, is nearly constant throughout the year at around 30°C, because it is close to the equator. The mean monthly maximum temperature is approximately 41 °C from May to September, and lower from November to February at approximately 34°C (National Meteorological Agency, 2014; 2019). A relatively cool dry season called *Gilal* extends from December to February, and a hot dry season called *Hagaya* occurs in May and June. Precipitation occurs mainly during the rainy season called *Karma* from July to early September, and the small rainy season in March and April is called *Segum*, while that from mid-September to November is called *Dada'e* (Table 1). There are two to three months each in the dry season, and precipitation occurs during the rest of the year. As described above, the natural environment of the study area in the north-eastern Ethiopian lowlands, which is close to the equator, has a hot temperature throughout the year, and an arid climate comprising rainy and dry seasons that repeat every two to three months.

2.2. Survey households and survey methods

Three households in the Serdo community and three households in the Secoita community were randomly surveyed in January and February 2019. The authors interviewed the heads of Household 1 (male, 35 years old), Household 2 (male, 39 years old), and Household 3 (male, 70 years old) in Serdo Village, and the heads of Household 4 (male, 28 years old), Household 5 (male, 26 years old),

and Household 6 (male, 73 years old) in Secoita Village. The interviews were conducted on livestock numbers, livestock sales, slaughter of livestock, dietary intake, their sense of values of livestock and markets, traditional reciprocity shared among them, recent climate change, and vegetation conditions. The authors stayed in Households 1 and 4 to observe livestock management and living conditions. Household 1 consisted of 6 members: husband, wife, and four children, and Household 4 comprised 5 members: husband, wife, and three children.

Figure 2 shows the changes in annual precipitation in the Dubti District from 1986 to 2018. Meteorological data were measured at the Dubti Station from 1986 to 2013 and at the Samara Station from 2014 to 2018. The Dubti and Samara Stations are approximately 10 km apart. The mean annual precipitation from 1986 to 2018 is 215 mm.

3. Result and discussion

3.1. Climate change

Although it was reported that the annual precipitation in eastern Africa has been significantly declining since 1982 (Seleshi and Zanke, 2004; Climate Change Knowledge Portal, 2021), there has been no distinct trend in annual precipitation since 1986 in the Dubti District. On the other hand, the years below the mean annual precipitation of 215 mm since 1986 were three times from 1989 to 1996, six times from 1997 to 2007, and six times from 2008 to 2018, which indicated that the number of years with the below-mean precipitation tended to increase in the last two decades. In particular, the drought, 93 mm of annual precipitation, happened in 2002, 75 mm in 2014, and 117 mm in 2015, which showed that the annual fluctuation was large

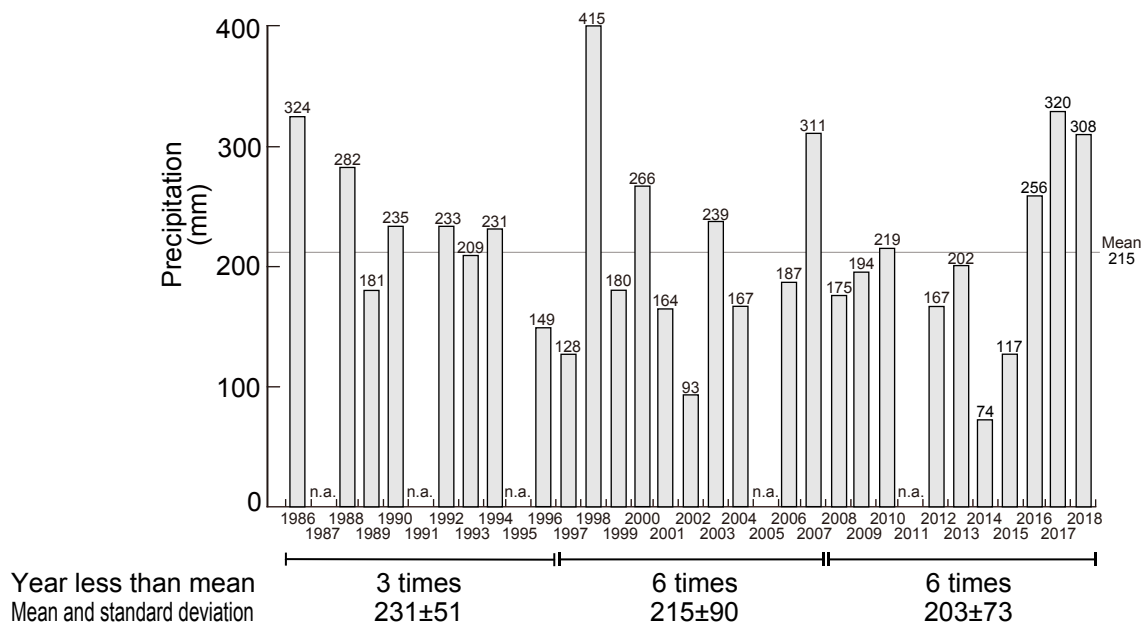


Fig. 2. Annual precipitation from 1986 to 2018 in Dubti District.

Meteorological data: the Dubit Station from 1986 to 2013, and the Samara Station from 2014 to 2018.

Source: National Meteorology Agency, Ethiopia.

Table 2. The case study of changes in livestock numbers (head) since 1960, selling numbers (head) and slaughter numbers of livestock (head) in 2019 in the Serdo and Secoita communities.

	Serdo community													
	Household 1				Household 2				Household 3					
	2020	2010	Selling in 2019	Slaughter in 2019	2020	2010	Selling in 2019	Slaughter in 2019	2020	2010	1960	Selling in 2019	Slaughter in 2019	
Camel	25	50	4	0	14	20	2	0	16	50	100	0	0	
Cattle	0	0	0	0	0	0	0	0	15	35	50	1	0	
Sheep	0	0	0	0	0	0	0	0	26	50	100	10	3	
Goat	28	80	10	5	120	200	20	0	30	200	400	20	5	

	Secoita community													
	Household 4				Household 5				Household 6					
	2020	2010	Selling in 2019	Slaughter in 2019	2020	2010	Selling in 2019	Slaughter in 2019	2020	2010	1960	Selling in 2019	Slaughter in 2019	
Camel	0	6	0	0	18	28	1	0	5	20	80	0	0	
Cattle	0	4	0	0	0	15	0	0	1	20	40	0	0	
Sheep	7	20	6	0	15	80	10	2	10	50	80	5	6	
Goat	5	50	6	0	30	100	10	4	30	50	100	15	3	

(Climate Change Knowledge Portal, 2021). According to the testimony obtained in the Secoita community, a drought also occurred in 2019. Furthermore, standard deviation of annual precipitation was 51 mm from 1986 to 1996, 90 mm from 1997 to 2007, and 73 mm from 2008 to 2018, which indicated that the annual precipitation was more dispersed in the last two decades.

Hence, it can be pointed out in the Dubti District that there was the tendency for precipitation to become more

variable in the last two decades.

3.2. Decrease of livestock numbers

Table 2 shows the case study of changes in livestock numbers since 1960, selling numbers in a local market, and slaughter numbers for their own consumption in 2019. It was understood that the number of livestock in all households has been decreasing, and the livestock decline has been particularly severe in the last 10 years. Household 1

in Serdo did not currently keep any cattle or sheep, but 25 camels and 28 goats. Household 1 sold 4 camels and 10 goats in 2019. The head of Household 1 went to a market in Assaita to sell their livestock, approximately 40 km away from Serdo, which took a total of 4 days: 2 days to walk from Serdo to the market, 1 day for sale at the market, and 1 day to return. He said that the selling of 10 to 20 goats and 2 to 4 camels per year could supply a minimum living. Household 1 slaughtered 5 goats per year for their own consumption on ceremonial occasions. They do not eat meat in their daily lives. The number of camels has been halved, and goats have decreased sharply to 35% of the original number in the last 10 years in Household 1. A similar tendency can be observed for Households 2 and 3. Household 2 did not slaughter any livestock for their own consumption in 2019, and purchased meat from a market in Samara if they needed it.

Although Households 3 still maintained a relatively large number of livestock, it was understood that the number of livestock has decreased sharply compared to 1960. Household 3 sold sheep, goats and camel, and did not sell camels even if they went to the livestock market. The head of Household 3 said that they did not try to sell camels because camels were important livestock for Afar pastoralists. Even among Afar pastoralists, who place a high value on camel keeping, currently the number of camels is decreasing.

Although Household 4 in Secoita kept 6 camels, 4 cattle, 20 sheep, and 50 goats 10 years ago in 2010, they did not currently own any camels or cattle, and only kept 7 sheep and 5 goats in 2020. The head of Household 4 said that the reason for the disappearance of the camels was that two were missing, three were killed by wild animals, and another one was killed by a pastoralist from a neighboring community. All cattle died because of diseases. Household 4 sold 6 sheep and 6 goats in 2019. They could manage to feed their family for a year by selling a total of 12 head, but not to purchase necessary supplies such as clothes and medicines other than food. It was understood that 12 sheep and goats sold in a year is the minimum number to support a family of 5 persons. Household 4 did not slaughter livestock for their own consumption in 2019, and purchased meat from a market in Samara. Households 5 and 6 also experienced a severe decrease in the number of livestock. Neither Household 1 nor Household 4 had a major source of income other than the sale of their livestock.

All households said that the main reason for the recent drastic decrease in livestock was the decrease in precipita-

tion. They also said that there was more precipitation and native plants grew well in the past, but droughts have become more frequent in recent years. In addition to the rainy season from July to September, there was a small amount of frequent precipitation in the dry season in the past that allowed herbaceous plants to grow over many periods of the year. The head of Household 5 said that there used to be precipitation every one to two months.

According to the head of Household 6, drought began in the 1980s, and the amount and frequency of precipitation has decreased year by year. He also mentioned that there was recently limited precipitation during the rainy season from July to early September, and almost no precipitation during other periods. Fig. 2 also shows the increase of low precipitation years and more dispersed annual precipitation in the last two decades, which supports the testimony of the head of Household 6.

The annual amount of herbaceous plants decreases with a decrease in precipitation and its dispersion. As feed resources decrease in the rangeland, the amount of feed intake by livestock inevitably decreases, which causes livestock to lose weight and their nutritional status to deteriorate. Livestock are more susceptible to various diseases and die in their weaker condition. In the past, even if many head of livestock were sold or slaughtered, the size of their herds could be maintained by a good breeding efficiency to reproduce enough offspring in the growth of herbaceous plants in the rangeland. It is assumed that, due to climate change in the last two decades, herbaceous plants are decreasing and the nutritional status of livestock is deteriorating, which leads to a decrease in the reproductive efficiency of livestock and their death by disease. As a result, the number of livestock continues to decrease with the addition of the sale and slaughter of livestock. Household 2 mentioned that they dared to sell their livestock and reduce the number of their livestock, because herbaceous plants in the rangeland had become scarce and local Afar pastoralists could no longer keep a large number of livestock. A decrease in livestock numbers due to climate change has also been reported in the northern Afar region (Berhe *et al.*, 2017).

The proliferation of *Prosopis juliflora*, called *Weyani* in Afar, has also led to a decrease in feed resources available for livestock grazing. *P. juliflora* is a leguminous tree that was planted in the arid areas of Africa by international organizations in the 1980s to help combat desertification and promote agricultural development (Nawata, 2013). *P. juliflora* has drought tolerance and can develop roots faster than other plants, resulting in vigorous growth in arid

areas (Yoda, 2013). However, *P. juliflora* growth inhibits the growth of other plants due to allelopathy and soil water absorption by *P. juliflora* (Fujii, 2013). In fact, *P. juliflora* was widely observed in the study area, and almost no herbaceous plants were growing around the places where *P. juliflora* thrived. The leaves of *P. juliflora* are not grazed by livestock, which means *P. juliflora* is almost no value as the feed resource. This overgrowth of *P. juliflora* causes also certainly one of the reasons for the reduction of feed resources in the Afar region.

Hence, it was confirmed from the testimony of pastoralists, the precipitation data, and the recent trend of precipitation analyzed by Seleshi and Zanke (2004) that the number of livestock raised by Afar pastoralists has decreased drastically in recent years, which was caused mainly by climate change in the last two decades.

3.3. Change of seasonal migration and sedentarization

Afar pastoralists adopted a nomadism strategy of seasonal migration to graze their livestock. If the authors asked them when and where they grazed, all of the households answered that it depended on the rain. They said they moved to places where it rained and to the sound of the rain. In arid areas such as Afar, when there is rainfall, most herbaceous plants sprout, grow, flower, and bear fruit, and their life cycle closes promptly. Therefore, Afar pastoralists move to places with rainfall as soon as it rains. They used to be able to stay in one place for up to three months if there was sufficient rainfall. Since precipitation fell over a wide area, the pastoralists did not gather their livestock to live in a limited place. The pattern of seasonal migration depended on precipitation, and the places to move were different every year. They sometimes moved 100 to 200 km in cases of drought or other emergencies. During the dry season, they moved to areas with water resources, such as ponds and rivers.

Seasonal migration was carried out with all household members. They moved in a single household or groups of 10 to 20 households. They moved place to place using male camels to carry their luggage. At a destination, they formed a herd with several other households and worked together to graze livestock. The households that formed a herd were always close relatives. Even if several households herded livestock together, milking was inevitably done separately by each household. They were free to choose where to graze and did not need to ask permission from the leader of the community to which grazing land belonged. Camel and ox grazing is the work of men, while sheep and goat grazing is often the responsibility of women. When people died

in a place they moved to, they built a grave there.

In the case of the households in Secoita, grazing land shifted seasonally around the Secoita community where there was precipitation. During the rainy season, *Karma*, they returned to the central area of the Secoita community to graze because of their right to land use, an artificial water reservoir, and a deep well that provided water resources (Hundie and Padmanabhan, 2008). Wild plants in the area around the Secoita community now grow poorly due to the recent climate change, which makes grazing impossible. They started grazing at Kello in Assaita District, about 100 km southeast of Secoita, in the dry season, *Gilala* and *Hagaya*. Kello is close to the Awash River and becomes a floodplain during the rainy season. Since there is a relatively large amount of wild plants remaining and there are water resources in the dry season, they have begun to graze in Kello during the dry season. They still return back to Secoita to graze in the rainy season, *Karma*. In other seasons, they graze in areas with precipitation where there is precipitation, and graze in Kello when there is no precipitation. As a result, the pattern of seasonal migration has changed with climate change, and they are forced to migrate long distances in search of water resources. As seasonal migration tends to cover long distances in search of water resources such as rivers, the number of migrating people has changed from the whole household to a part of the household. Some of the people, especially the youth, continue to migrate seasonally with most of their livestock, while the majority of the households have settled in the center of Serdo and Secoita with a few lactating camels and some sheep and goats. They said that it was possible to raise livestock year-round by grazing on a day trip from the settlement if the number of livestock was small. The sedentarization began about 20 years ago in Serdo and 3 years ago in Secoita.

In the case of Secoita, an elementary school for Grades 1 to 4 was built in the center of Secoita three years ago. The Afar pastoralists began to stay in the center year-round for their children's education. In addition, a water supply facility was constructed in the center three years ago. Although the water supply is not available at present, pastoralists have stayed in the center for the whole year in anticipation of this water resource. Moreover, the Safety Net Program, a support program for poor communities, also started in Secoita five years ago. Local pastoralists engage in local governmental work, such as road building and watershed protection, and in return they are provided with food, not money. A total of 50 kg of wheat grains per month is provided to each of four households for six months. During the

six months when food is supplied, a local government employee will come to deliver the supply food every month. If any one of the four households is present, they can receive the food, but if no one is present, they will not be able to receive the food. An increasing number of households have decided to stay in the center with the launch of the Safety Net Program. Education, water resources, and the Safety Net Program have led pastoralists to sedentarize in the center. The background to this resettlement is assumed to be that the number of livestock has decreased due to climate change, and it is no longer possible for all members of the households to move together for grazing management.

Hence, as the climate in the last two decades changed in the study area, seasonal migration tended to increase in distance in search for water resources such as rivers and ponds, and the seasonal migration style has changed from all members to some members of households, which has resulted in an increase in the sedentarization of Afar pastoralists.

3.4. Change of dietary intake

Climate change and the market economy have also led to significant changes in the dietary intake of Afar pastoralists. When the whole household moved together with the livestock seasonally in the past, the basis of the dietary intake was the milk from their own livestock. Camels, cows, sheep, and goats were milked, and milk was abundant throughout the year. They said that camels did not have a breeding season and could be milked all year round if there was enough rainfall and enough feed resources in rangeland. Milking was performed 3 to 4 times per day in the rainy season and once a day in the dry season. Cows, sheep, and goats were also breeding year-round, with cows milking for 6 months and sheep and goats for 3 months. Camel milk was consumed as raw milk, without any processing. Raw milk from cows, goats, and sheep was consumed as it was and processed into naturally fermented milk, butter, butter oil, and buttermilk (Hirata *et al.*, 2013). Naturally fermented milk and buttermilk were consumed or used in maize meals. Butter oil was used as a garnish for the maize meal. Butter was not consumed as food, but was applied to the skin and hair as a cream. It was usual that the meal of the day was only milk. In particular, during the dry season, such as *Gilala* and *Hagaya*, camels continued to lactate, and Afar pastoralists often drank only raw camel milk for several months. According to the head of Household 3, only 2 camels suffice to provide milk for the needs of all household members.

Besides milk, maize was rarely used in the diet in the past. Each member of a household would carry a small amount of maize on his back when leaving Serdo or Seco-ita for seasonal migration. Since they primarily consumed milk and maize rarely, carrying a small amount of maize was sufficient for them. Maize was cooked as boiled grains, porridge, or bread and consumed with dairy products of naturally fermented milk, buttermilk, and butter oil. Boiled maize was called *Mudda* or *Mududo*, maize porridge was *Butti derro*, and maize bread was *Nufie gersiblla*.

It was around the mid-socialist period that this dietary pattern began to change. Socialism under the military regime lasted from 1984 to 1991 in Ethiopia. Local socialist governments began to provide wheat flour to pastoralists. Afar pastoralists first became aware of bread made from wheat flour and began to eat wheat during this period. The market economy was then promoted by the democratic regime, which significantly changed the diet intake of Afar pastoralists. They could obtain many kinds of goods in the market, as much as they had money. Wheat bread was more delicious and became a more attractive food resource than the maize diet. They began to sell their dairy products and livestock in the market to obtain large quantities of wheat flour. The consumption of wheat bread by Afar pastoralists increased dramatically with the transition to a market economy following the democratization of 1991. The transition to democracy in 1991 was also a time when droughts began to occur frequently and annual precipitation was more dispersed.

The deterioration of feed resources in the rangeland and the decrease in livestock numbers caused milk production to decrease. Afar pastoralists stated that they were no longer able to maintain a diet that depended mainly on milk, and were forced to rely more on wheat flour.

Currently, wheat bread is the main dietary staple. During the field survey in Serdo, the meals served in Household 1 on 5th January were a dish of wheat bread and a bean paste called *Shiro* for breakfast, rice with tomato sauce for lunch, and wheat bread and *Shiro* for dinner. Currently, pastoralists consume rice in well-developed distribution areas with paved roads. Since January was the dry season and most livestock owned by Household 1 grazed in other areas where herbaceous plants grew better, Household 1 could not obtain raw milk in the settlement of Serdo. They said that a cup of milk would be added to these meals during the rainy season when all livestock stayed in Serdo. On the other hand, the meal served on 18th February in Household 4 was wheat bread and bean paste for breakfast, lunch, and

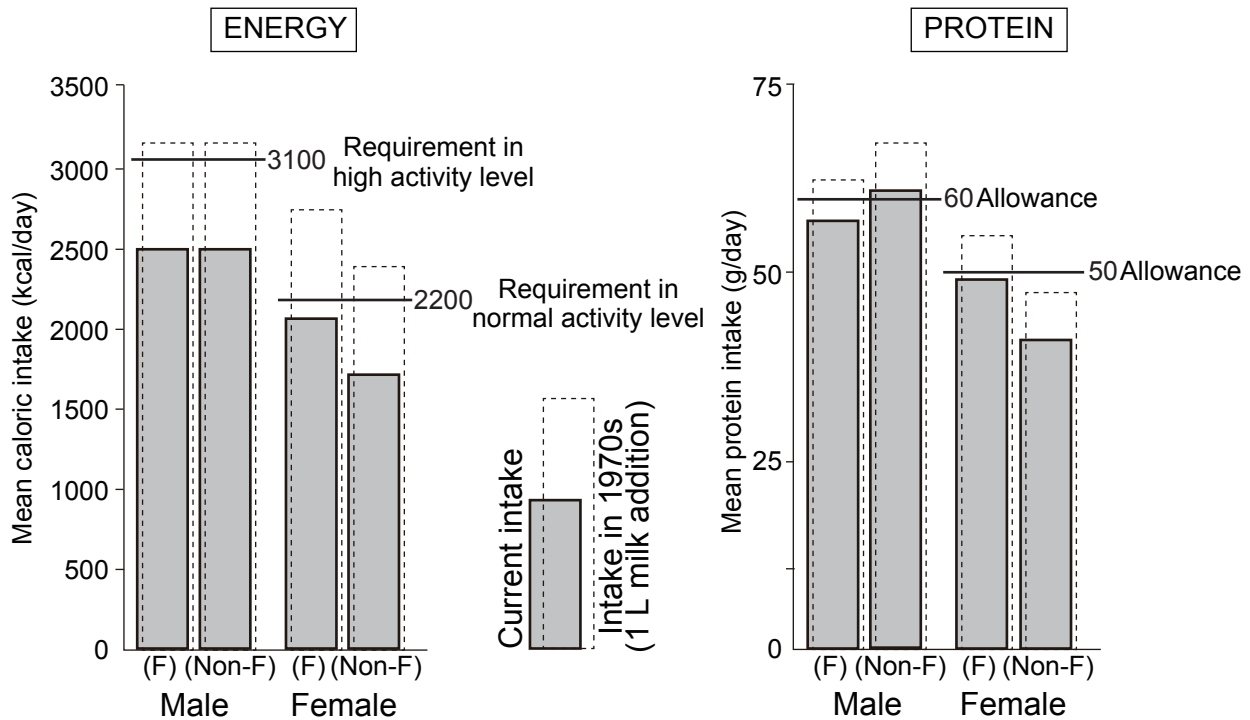


Fig. 3. Case study of dietary intake of Tigray farmers (Modified from Hirata *et al.*, 2021).

Mean dietary intake of the males and the females during the fasting period and during the non-fasting period, and the situation of nutrient intake if consuming 1 liter of additional milk per day.

(F): Fasting period, (Non-F): Non-fasting period

dinner; this was in Secoita, where paved roads did not pass and the distribution situation was poor. The current situation of Afar pastoralists is that there is almost no milk in their diet intake, which means the change to a basic diet consisting of a large amount of wheat bread and a small amount of bean paste.

We measured the amounts of consumed foods of total 10 Tigray farmers in Tigray, northern Ethiopia, and interviewed total other 10 local farmers aged from 49 years to 75 to understand dietary intake, number of livestock and amount of milk production, contribution of milk products to dietary intake around 1970 (Hirata *et al.*, 2021). The characteristics of the dietary intake of the surveyed Tigray farmers were that they consumed a large amount of injera and bread, mainly with bean dishes and chili pepper sauce, and seldom depended on meat and milk products in their daily meals. It was suggested that the intake of calories and protein tended to be insufficient in their daily meals. Since livestock numbers, milk production, and milk intake have decreased in Tigray farmers, they have faced malnutrition and other negative impacts on their health (FAO, 2008). It was considered that if the Tigray farmers consumed one liter of milk a day as in the 1970s, they would get their energy and protein requirements and avoid nutritional deficiencies (Figure 3). The same situation is occurring to the

Afar pastoralists as to the Tigray farmers. It is inferred that even current Afar pastoralists can hardly consume milk, and the dietary intake mainly composed of wheat bread has led to insufficient nutritional intake.

Food aid from local governments is provided as part of the Safety Net Program. Wheat flour (50 kg/month) is provided to each household for 6 months in Serdo, and to each of 4 households for 6 months in Secoita. Neither of these distributions is sufficient throughout the year. There is no other support from the local government besides the wheat support. Thus, the support from the local government assists and promotes a diet that mainly consists of wheat bread.

Thus, the dietary intake of Afar pastoralists has transformed from a milk-based diet to a wheat-bread-based diet with bean paste. As a result, Afar pastoralists will be in a state of malnutrition. It can be pointed out that the factors that have brought about these changes are climate change, which causes a decrease in livestock number and milk production, and a market economy accompanying democratization.

3.5. Changes of values

In addition to the decrease in the number of livestock, changes in seasonal migration patterns, and changes in diet

intake, changes in Afar pastoralists' sense of values can also be identified.

Before democratization in 1991, Afar pastoralists had a sense of value in raising livestock. They spent their lives following their value by seeking precipitation and raising livestock better. The head of Household 3 said that they had no education or money, but they listened to the sound of precipitation, sought better rangeland, raised their livestock better, and drank plenty of milk in the past, which was their joy and value. Livestock was also the source of charity from those well-off to the poor. If households did not have enough livestock to live on, Afar pastoralists would share their livestock with them. Because livestock was an important resource, they shared it among Afar neighbors, which enabled them to function as a group formation with deep reciprocity.

Afar pastoralists were abundant in the past. According to the testimony of the owner of Household 3, "In the past, we went to the regular market during the rainy season. During the rainy season, more milk was produced, and more butter oil could be produced. This butter oil was sold in a regular market. The only dairy product we sold was butter oil, and 3 to 4 bags called *Okosa* containing butter oil (about 25 kg/bag) were worth 1000 Birr^A). At that time, 100 Birr was enough to buy all the necessities for a household. One adult goat cost about 100 Birr." This shows that Afar pastoralists were once extremely wealthy. It is considered that there was a surplus of livestock resources for the background of their reciprocity of sharing livestock with poor households.

Regarding the value of milk, the head of Household 3 said, "In the past, we loved each other. When we milked a camel, we drank it together. Even if we were not relatives, we shared it with those who were there. It was a pleasure to drink milk in abundance. Camel milk was not sold. Camel milk was something to be shared. That was the value of milk." The head of Household 6 said, "Money was needed to visit the market to buy clothes, maize, and various other goods, but was not needed for daily life. In the past, we were only allowed to sell dairy products, such as butter oil. Selling butter oil alone was sufficient to buy clothes and maize. We did not need a lot of money. We lived with our livestock, drank milk, and that was our world." It is understood that the value of milk was to be shared with each other, the joy of drinking together among groups, and the satisfaction of life by drinking abundantly.

Since democratization in 1991, the market economy and money economy have become more prevalent in Afar. Although regular markets were held one day a week in the

past, an increasing number of retail stores began to open on a daily basis, and Afar pastoralists became more familiar with money. The flow of public funds from local governments to community leaders and/or other public officials also encouraged a shift in values toward money. Attractive goods flooded in retail stores and Afar pastoralists were exposed to urban-like areas and their lifestyles. Afar pastoralists learned gradually that livestock could become money, money could purchase all their goods, and they could earn a comfortable life. The head of Household 3 said, "We are living in an era when communities and local cities are flooded with various goods. People have learned that they can obtain these goods with money. They have saved money and want various goods such as food, cell phones, *Khat*^B), cars, and fixed houses with electricity and water. Now it is important to be educated and make money better, which becomes our value." Household 1 started selling raw camel milk in plastic bottles for 100 Birr per 2 L on the side of the paved road 3 years ago.

Although raw camel milk in the past was valued for drinking and sharing with others, it has now become a cash commodity. Afar pastoralists have gradually changed their consciousness of money to something more important and focus on how to obtain it, which marks a shift in the Afar pastoralists' sense of value from livestock and livestock products to money. Nori (2010) reported that it was taboo to sell camel milk at a market among Somali pastoralists, but they have started to sell camel milk in north-eastern Somalia.

As if to coincide with the shift to a market economy, climate change occurred in the Dubti District. As a result, herbaceous plants do not grow as well in the rangeland as they had in the past, feed resources became scarce, and the number of livestock decreased due to poor reproduction and death from disease. Furthermore, as feed resources became scarce, it became impossible to raise livestock as before, and livestock were sold on the market. The depletion of feed resources due to climate change, in parallel with the spread of the monetary economy, coincided with the movement to sell livestock to obtain cash.

Even today, Afar pastoralists have a spirit of reciprocity. They frequently visit relatives to build relationships. There was a traffic accident on the paved road on 4th January and the head of Household 1 was asked for traffic control and received extra income. When he received his cash, he immediately spent it by purchasing the drug *khat*, bottled pure water, and sugar. About 5 relatives and friends happily joined in chewing *khat*. One of the camels belonging

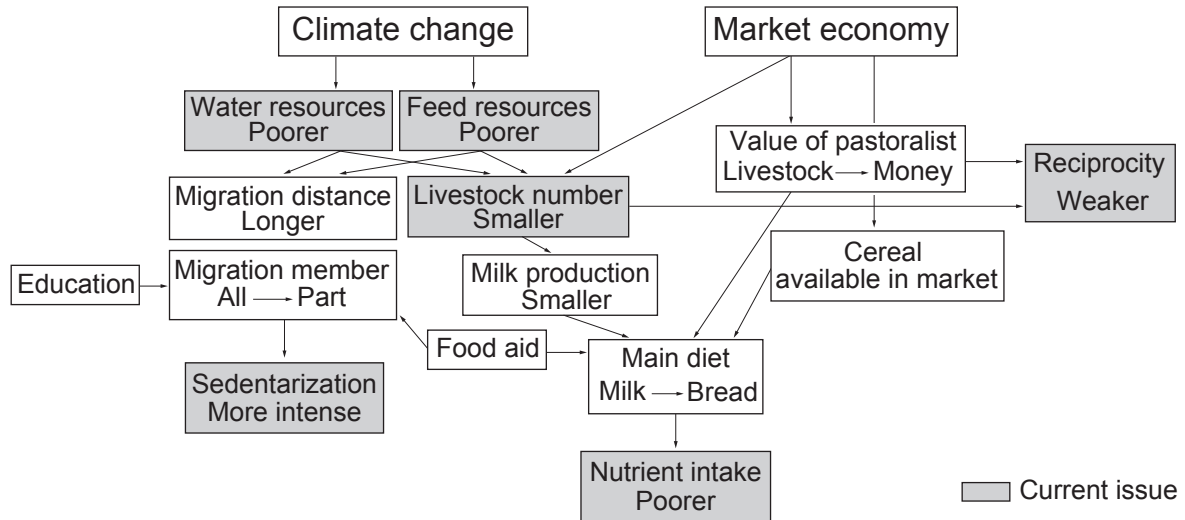


Fig. 4. Diagram of how climate change and market economy affect the subsistence of Afar pastoralists.

to Household 1 died during an accident in the autumn of 2018. After hearing the news, many pastoralists gathered from surrounding areas. They said that many of the pastoralists ate the meat of the dead camel and consumed it in 2 days. In a place where there are resources and money, the have-nots gather, and the resources are shared as a matter of course and consumed together even now. It is confirmed that the spirit of reciprocity of Afar pastoralists is still inherited today. However, the head of Household 6 said, “Even if there is a poor household with only a few livestock, we no longer share our livestock. People have become self-centered. The heavens have become dry, the earth has become dry, and the hearts of people have also become dry.” The weakening of reciprocity relationships by the development of a market economy was also reported in the case of rural Tanzania (Kasper and Mulder, 2015).

Hence, due to the effects of climate change and the spread of a market economy, the current situation of Afar pastoralists is that although they continue to share resources, they no longer share resources in the form of livestock sharing as they once did, and reciprocity relationships have weakened.

4. Issues to be solved

As discussed in this paper, climate change and market economy have significantly transformed the subsistence of Afar pastoralists in recent years. This has resulted in a decrease in feed resources, drastic reductions in livestock numbers, long-distance seasonal migration and sedentarization, reductions in milk production and milk intake, dependence on cereal intake, an increased value of money, and a weakening of reciprocity (Figure 4). Schidt (2016) also reported that drought profoundly affected the subsistence

of Afar pastoralists, leading to a crisis that threatened their lives.

It appears that Afar pastoralists are in a state of malnutrition caused by a decrease in livestock numbers and milk intake, and greater dependence on grains. Climate change and the market economy have thus not only brought about changes in the subsistence structure and values of pastoralism, but also a crisis in the existence of a healthy life. Household 4 in Secoita currently owned only 12 head of sheep and goats. If climate change continues, it is doubtful that they can continue to practice subsistence pastoralism in the next several years. The situation is similar for the other households: the number of livestock has rapidly decreased in recent years, and the Afar pastoralism system is likely to end within a dozen years. The head of Household 5 said, “If precipitation continues to be low, there will be no more pastoralists. If it starts raining well again, we will have more livestock and our lives will be easier.” Since eastern Africa is expected to become increasingly dry due to global climate change (Seleshi and Zanke, 2004; Williams and Funk, 2011; Mekuyie *et al.*, 2018), it will be difficult for precipitation to increase in Afar.

If pastoralism is no longer possible, Afar pastoralists should become agro-pastoralists by starting crop cultivation using irrigation (Berhe *et al.*, 2017), or become refugees. In fact, Afar pastoralists use the water resources of the Awash River for irrigation, and many Afar pastoralists have settled down and run agro-pastoralism in Assaita District. Mekuyie *et al.* (2018) reported that agro-pastoral households are more resilient than pastoralists to climate-induced shocks. However, the areas where water resources are available are extremely limited in the Afar region, and most of the vast land is arid, with only rainwater available. If some Afar

pastoralists become refugees, they will rush to local cities such as Samara, become slum dwellers, and experience social turmoil, which has already started in Samara.

The Afar pastoralists now need humanitarian assistance such as water, feed, livestock disease medicines, and food. The situation is serious and requires immediate action, because the Afar pastoralists are now severely struggling to earn their livelihoods (Berhe *et al.*, 2017). However, the fundamental problem of decreasing precipitation and the difficulty of raising livestock has not been solved, even if these humanitarian aid programs are implemented. A strong policy is urgently needed for Afar pastoralists, such as the relocation of pastoralists to a place where water resources in rivers and ponds are available, and/or support for job opportunities that will allow them to move from pastoralism to other livelihoods.

Note

- A) Birr is the unit of currency in Ethiopia. 1 Birr was 3.7 Japanese Yen in February 2020. One L of cow's milk was 20 birr.
 B) Khat is young leaves of *Catha edulis*. It contains alkaloids and have a wakefulness effect

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気候変動と市場経済化がもたらすアファール牧畜民の変貌

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要旨：本研究は、エチオピア北東部のアファール州のアファール牧畜民を対象とし、気候変動と市場経済化に伴った、1) 家畜頭数の変化、2) 季節移動の変化、3) 食料摂取の変化、4) 価値観の変化を明らかにすることを目的とした。調査は、エチオピア北東部のアファール州第1ゾーン Dubti 郡の Serdo 村と Secoita 村で滞在調査を実施した。家畜頭数、家畜売却頭数、家畜屠殺頭数などの家畜管理、食料摂取、家畜や市場に対する価値観、近年の気候変動と植生状況について合計6つの世帯に対してインタビュー調査した。アファール牧畜民が飼養する家畜頭数は近年急激に減少していた。その原因は、最近20年間において、降水量が平均降水量よりも少ない年が多発するようになり、年間降水量の変動が増加する傾向にあることが、降水量データと牧畜民の証言から把握された。この気候変動に伴い、河川などの水源を求め、家畜の季節移動が長距離化する傾向にあった。また、季節移動するのは世帯全員から世帯一部に変化し、世帯の大部分は定住するように変化していた。食料摂取は、乳中心の食事からコムギパン中心の食事へと変貌していた。その結果、アファール牧畜民は栄養摂取不足に陥り、飢餓の状態にあることが推測された。これらの変化をもたらした要因が、降水量の減少と民主化に伴った市場経済化であると考えられた。気候変動の影響と市場経済の導入により、資源を共有する習慣は継続するものの、家畜分与という資源共有はなくなり、人々の互助関係は脆弱になっているのが現在のアファール牧畜民の状況である。このまま気候変動が続けば、アファール牧畜は十数年の内に終焉する可能性が高い。牧畜ができなくなれば、灌漑農業を始めて半農半牧となるか、難民となるかである。河川や池の水資源が利用できる場所に計画的に牧畜民を移住させる、牧畜民から他の生業に移れる仕事を用意するなど、抜本的な対応が迫られている。

キーワード：気候変動、市場経済化、家畜頭数、飼料資源、互助

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