Article

Linking Cultural and Marketing Practices of (Agro)pastoralists to Food (In)security

Derib Woldeyohannes Benti 1,*, Worku Tuffa Birru 2, Workneh Kassa Tessema 3 and Messay Mulugeta 4

1 Department of Agribusiness and Value-Chain Management, College of Agriculture, Wolaita Sodo University, Wolaita Sodo 0138, Ethiopia
2 Center for Rural Development, College of Development Studies, Addis Ababa University, Addis Ababa 1176, Ethiopia; worksha2010@gmail.com
3 Department of Management, College of Business and Economics, Addis Ababa University, Addis Ababa 1176, Ethiopia; workneh.tessema@gmail.com
4 Center for Food Security, College of Development Studies, Addis Ababa University, Addis Ababa 1176, Ethiopia; mesay.mulugeta1@aau.edu.et
* Correspondence: derib.woldeyohannes@aau.edu.et

Abstract: Many pastoralist communities around the world rely on the traditional livestock farming sub-sector for a living and to meet their food consumption needs. Food insecurity, on the other hand, is a growing concern in these communities, and the reasons for this must be understood in order to implement appropriate policy measures to improve food security. Based on data collected from Aramis-Adaar and the Asale pastoralist and agro-pastoralist (hereafter (agro)pastoralist) communities in Afar, Ethiopia, this study investigates the relationship between social–cultural–economic characteristics and food (in)security. To measure the severity of food insecurity and assess the associations, we used the household food insecurity access score (HFIAS) and ordered logistic regression, respectively. Our findings show that food insecurity in the study area is persistent where improvement in food security is significantly constrained by some culture elements (the (agro)pastoralists’ cultural orientation). It has also been found that the (agro)pastoralists’ market exchange practices, as well as the centuries-old practice of guro (livestock mobility as a traditional coping strategy), help to reduce food insecurity. These findings contribute to our understanding of food insecurity in the (agro)pastoralist context and thereby add to the ‘move-up’ or ‘move-out’ pastoralist development policy debate. Therefore, the results suggest that there is a need for a combination of approaches that combine pastoral production services and market production orientation and capitalize on (agro)pastoralist traditions, such as mobility, to promote sustained (agro)pastoral livelihoods and ‘move-up’ the pastoral production system.

Keywords: food security; pastoralism; marketing; culture; Ethiopia

1. Introduction

At the heart of the development goals of poor countries comes the achievement of food security, which is commonly perceived as a state in which everyone has access to adequate, safe, and nutritious food at all times for a healthy and active life [1]. In this sense, food security encompasses sufficiency, access, security, and sustainability and is related to both the physical and the economic access to food that meets the dietary needs and (cultural) preferences of the people [2,3]. Food security is therefore a complex phenomenon that can be applied at the individual, household, community, and national levels and can be achieved through three consecutive pathways: availability, accessibility, and utilization [4,5]. The stability of these three pillars (often considered as a fourth pillar), which is mainly influenced by the dynamic interactions between agro-ecology and socio-economics, determines food security [5]. Food insecurity, on the other hand, is a condition in which people have limited/uncertain physical and economic access to safe, adequate,
and nutritious food to meet their dietary needs or food preferences for a productive, healthy, and active life [1]. According to the FAO [6], severely food-insecure people are ‘those who have likely run out of food, experienced hunger and, at the most extreme, gone for days without eating, putting their health and well-being at grave risk’. Although such a severe level of food insecurity has the greatest impacts on people’s lives around the world, it is increasingly concentrated among the drought-prone regions in developing countries such as those in sub-Saharan Africa [6]. Thus, there is a need to discuss how to increase the resilience of vulnerable groups and to raise understanding about food insecurity. Consequently, food insecurity has currently attracted the attention of academia and policies that provide better risk management and support for those people who are considered vulnerable to food insecurity [7,8], as well as appropriate policies for food security in developing countries [4,9–11].

The overall socio-economic circumstances and well-being of the people in the (semi)arid regions have been extensively studied. To mention but a few recent ones, vulnerability [12–14], resilience [15], poverty and income inequality [16,17], livelihoods [18], and food security [19–21] are among many others. In analyzing the status of poverty, Teka et al. [17] employed the expenditure approach (calorie intake per adult equivalent), while Jemal et al. [16] used a multidimensional poverty index (capability, economic wellbeing, and social exclusion). Furthermore, Kahsay et al. [21] used the consumption (calorie) approach (kcal/AE/day) to measure household food security status, while Asenso-Okyere et al. [20] used the availability of food in the household as a proxy for food security. Yet, in another study, the resilience to food security was explained using measures such as total income, per capita expenditure, asset levels, level of education, and social network [15].

Thus, from the available literature, at least three forms of arguments dominantly appear. First, the groups identified as “food-insecure” are often gauged as such from the food availability component, with the view that these groups may not have enough food to feed their families, mainly because of production failures caused by climate-extreme events [22]. However, previously, Sen [23], in his seminal work, challenged such views of food insecurity from mere availability and introduced food entitlement (accessibility). Accordingly, food insecurity is not only caused by the shortage (supply), but also by a lack of purchasing power and access. In this regard, the FAO [6] confirms that despite global efforts and gains in food production towards a food-secure world over the decades, today close to 822 million and over 2 billion people are still hungry and experiencing moderate/severe food insecurity, respectively. From the (agro)pastoral context in particular, the availability of food alone cannot tell a true story of food security conditions, as better off families with resources such as livestock and livestock products may be identified as food-insecure due to constraints on access to markets. Pastoralists with livestock might still experience food insecurity because of limited access to markets where they can sell their livestock to purchase food items. There is, therefore, a need to measure the access component of food security so that food insecurity can be examined from the point of view of markets and limited purchasing power [24]. Second, existing studies almost invariably employ indirect (proxy) measures, such as income, food expenditure, household poverty status, dietary intake, or nutritional and health status [25]. These measures are strongly blamed for not adequately reflecting food access at the household level and thereby capturing only the sufficiency element in household food security analyses [3]. Thus, food insecurity needs to be addressed using direct measures where previous work has only focused on other aspects. Thirdly, while (agro)pastoralists are largely dependent on their cultural reciprocities [26] and market exchanges for their food needs [27,28], these elements are rarely considered in the food security analyses. This appears to be a weak link of the food security studies of these areas, and thus, the hypotheses regarding food insecurity determinants appear to be not well-grounded.

To fill these gaps, the current study seeks to understand the causes of (agro)pastoralist food insecurity from the perspective of food accessibility (access), based on data from the (semi)arid regions of Ethiopia, which are among the most food-insecure areas of the
world [6,29]. Most of the people in these areas depend on traditional mobile livestock production for food and livelihoods [27], and mainly due to the recurring droughts, the livestock-based pastoralist production method fails to sustainably support their livelihoods [30,31]. These areas also commonly suffer from problems such as low productivity, high poverty [32], food shortages [29], food insecurity [31,33], and environmental shocks [34]. Consequently, the quality of life in these areas is endangered, and they achieve low welfare outcomes [35].

In attempting to address such stresses and secure livelihoods in (semi)arid regions, the pastoral development policies focus on how to sedentarize pastoralists [36,37]. Such policy orientation has given rise to development prescriptions that advocate ‘moving pastoralists out of pastoralism’ [38] and sedentarism evaluations towards food security [39]. Yet, the existing policy efforts deemed to improve wellbeing have attained limited successes [36]. Addressing (agro)pastoralist food (in)security from the ‘access’ pillar using experience-based measures uncovers how the pastoral resources are used to tackle food insecurity and provides a complete picture of the causes of food insecurity in the (semi)arid regions. Thus, the study contributes to the body of knowledge by especially considering pastoralist culture elements as determinants of household food (in)security. In addition, adding to either side of the ‘move up’ or ‘move out’ diverging policy debate, it serves to inform policy direction.

The remainder of the paper is organized as follows: Section 2 addresses the (agro)pastoralists’ food (in)security and vulnerability. Section 3 provides an overview of the approaches to and measurement of food (in)security, while Section 4 outlines the methods used. Section 5 reports on the empirical findings, and Section 6 discusses the findings. Section 7 concludes the paper.

2. (Agro)pastoralist Food (In)security and Vulnerability: A Background Understanding

Food security in rural communities, often measured by the absence of hunger or the low prevalence of food insecurity [2], is regarded as the state of rural peoples in which they have secured access to food for a healthy life at all times [1], while the reverse is a state in which people experience a lack of or a limited access to nutritious food to meet their dietary needs for an active life, which constitutes food insecurity [1,40]. Furthermore, food insecurity occurs when households lack or face an inadequacy of the resources by which to obtain enough food to acquire nutritionally adequate and safe foods in a socially acceptable way [2]. In the most extreme cases, food-insecure groups may last for days without eating anything, or in its modest state, they may be likely to run out of food or go hungry, endangering their health and well-being [6]. Therefore, when it comes to conceptual development and research, food security and food insecurity are inseparable. While the former is used to refer to ‘sufficiency’, the latter refers to an ‘inadequacy’ or a ‘lack’ of resources by which to have command over food. Additionally, due to the recent food crises and the increase in the number of vulnerable populations at both the regional and the global levels, there seems to be a growing interest in food insecurity [7,8].

There is a high degree of vulnerability to food insecurity among the (agro)pastoral communities around the world [12,41]. In this respect, food insecurity is widespread and remains a major development problem for Ethiopia’s pastoralist communities as well [42]. Because of this, a high level of malnutrition is often a feature among the pastoralist communities of these regions [19]. Studies widely report that a significant proportion of (agro)pastoralists are vulnerable to climate-induced shocks and stresses, often leading to production failures [13,14,42]. This, in turn, leads to the depletion of pastoral resources, leading to food shortages. Thus, food security among the (agro)pastoralist communities largely depends on their capacity to produce and/or purchase non-pastoral food grains [43] where livestock sales are the main source of income [44]. In response to extreme environmental events, pastoralists are heavily engaged with markets and towns to sell livestock and buy grains [45]. Some studies even consider that (agro)pastoralist communities are becoming more dependent on markets than crop farmers [29,45]. An anthropological study
of the Afar (agro)pastoralist communities in Ethiopia showed that pastoralists increasingly turn to the market to meet basic household needs [26].

In light of this, a range of social, cultural, and economic causes contributing to the higher incidence of food insecurity in (agro)pastoral communities elsewhere have been identified. To name but a few, an empirical study conducted to identify the determinants of food security at the household level among the agro-pastoral communities found that climate and climate change-induced hazards (e.g., drought) are the main causes of food insecurity, followed by market and service problems (e.g., poor transport facilities) and human factors (e.g., mobility restriction and conflict) [14]. Furthermore, Mayanja et al. [46] found that the livelihood system, livestock holdings, involvement in social networks, and landholding are used to explain food (in)security among the (agro)pastoral communities. Siraje and Bekele [47], on the other hand, found that herd size, income from livestock production, and non-farm incomes were positively associated with the food security level of pastoralists. Yet another study identified livestock ownership (herd size), sex, family size (adult equivalent), and the mothers’ time constraints as significant factors determining food insecurity [21]. In addition to the size of resources owned, such as farmland and livestock, peace and security also influences food security among the (agro)pastoralist communities [20]. Thus, it follows from these that most households in (agro)pastoral areas are characterized by low incomes and a low level of human capital, as well as limited access to markets and service institutions, such as veterinary services, credits, and extension services, which directly or indirectly explain food (in)security situations. Yet, cultural elements appeared to be a loose link in understanding food (in)security in these regions.

3. Overview of Current Approaches to Measuring Food (In)security

To address food insecurity, the research efforts so far have developed models based on supply, demand, and market failure theories, indicating that the failures are caused by the vulnerability factors [48]. Hence, food insecurity can be explained from both the availability (supply side—represented by Food Availability Decline models referring to the decline in per capita food availability) and the accessibility (demand side—known as Food Entitlement Decline models) directions [23]. In this explanation, food availability and entitlement, respectively, are used to refer to the supply of food and the household’s/individual’s command over food. Thus, the focus of attention has shifted to the lack of access by households/individuals to food because of low incomes (entitlements) or the lack of purchasing power as the cause of food insecurity [23,49,50]. The adequate supply of food at the national level may not in itself guarantee household-level food security [49]. Ensuring enough food is not a sufficient condition for food security unless access to food is guaranteed [51,52]. It follows from this that it is important to examine the access to available food in order to understand the persistence of food insecurity in vulnerable communities [5]. Accessibility to food is ensured when households have adequate resources to obtain appropriate food for a nutritious diet [50]. It depends upon the income available to the household, the distribution of income within the household, and food prices. Thus, concerns about insufficient food access have resulted in a greater policy focus on incomes, markets, and prices in addressing food insecurity objectives.

There are different measures commonly used to assess food insecurity [25]. The measures are broadly identified as indirect or derivative measures (e.g., dietary intake, per capita expenditure on food) [15,20,21] and a fundamental or direct measure (e.g., experience-based food insecurity scales) [53]. The latter is advantageous in capturing the physical as well as the psychosocial dimensions of food security as it uses scales based on the experiences perceived by the affected individuals [25].

Given the food insecurity vulnerability context of (agro)pastoralist communities [19], this study used a direct measure of food access, developed based on coping strategies [5]. This method is recommended for use with vulnerable communities [9]. Thus, a nine-item food insecurity scale, a widely used welfare index called the household food insecurity access scale (HFIAS), which has been tested in Ethiopia [8] and was developed by USAID’s
FANTA Project [54], was used to measure food (in)security. The measure relies on direct responses to the nine questions on (in)secure access to adequate food for the members of the household at a point in time (one month previously) [54]. The measurement instrument follows a progression that begins with anxiety about food supplies either from own production or the markets (item 1), followed by a decrease in the quality of consumed food (items 2–4), a decrease in the quantity of food (items 5–7), and finally going to sleep hungry (item 8) and going all day and night without eating anything (item 9) [54,55]. The maximum score is 27, when a household responds ‘often’ to all the nine questions, and the minimum is 0, when the household did not experience any occurrence in the previous four weeks; hence, the score is within the range of 0–27. The higher the score, the more food-insecure the household is. The final scores in the HFIAS scale are assessed using a scoring algorithm to determine whether the household fits into one of four different categories of household food access, ordered as severely, moderately, and mildly food-insecure access or food-secure access (for details, see Coates et al. [54]).

Following Coates et al. [54] and Knueppel et al. [55], the assessment and grouping was done as follows:

(a) Food secure—experience none of the food insecurity conditions, or just worry, but ‘rarely’;
(b) Mildly food insecure—worry about not having enough food ‘sometimes’ or ‘often’, and/or unable to eat preferred foods, and/or eat a more monotonous diet than desired, and/or eat some foods considered to be ‘undesirable’, but only ‘rarely’. However, do not cut back on quantity or experience any of the three most severe conditions (running out of food, going to bed hungry, or going whole day and night without eating);
(c) Moderately food insecure—sacrifice quality more frequently by eating a monotonous diet or undesirable foods ‘sometimes’ or ‘often’, and/or started to cut back on quantity by reducing the size or number of meals, ‘rarely’ or ‘sometimes’. However, do not experience any of the three most severe conditions;
(d) Severely food insecure—graduated to cutting back on meal size or number ‘often’, and/or experience any of the three most severe conditions, even as infrequently as ‘rarely’.

4. Materials and Methods
4.1. Study Area Description

The Afar region is one of the dominantly pastoral regions of Ethiopia. It is estimated that 90% of the region’s population depends on pastoralism—herding camels, cattle, sheep, and goats. The area is a sparsely populated dryland region with low and erratic rainfall and agricultural potential along the Awash River valley. Half the region consists of semi(arid) rangeland that can only sustain mobile livestock production, and even the higher rainfall areas are unable to support reliable rain-fed agriculture [56]. The region is divided into five administrative zones, namely Awsi-Rasu, Kilbeti-Rasu, Gebi-Rasu, Fenti-Rasu and Hari-Rasu and constitutes eight livelihood zones (Asale pastoral, Asale agro-pastoral, Teru pastoral, Eli-Daar pastoral, Awisa-Gewane agro-pastoral, Aramis-Adaar pastoral, Namalefane-Baadu pastoral, and Chenno crops Livelihood Zones).

For this study, two livelihood zones, Aramis-Adaar pastoral and Asale agro-pastoral, were purposively selected, mainly to address cultural variations (see also Figure 1). Aramis-Adaar pastoral zone is located within the Awash drainage system in the southwestern quadrant of the region. Its altitude ranges from 500–600 m above mean sea level (amsl) in the east to 600–1000 m amsl in the west. The climate is generally dry with an annual average temperature in excess of 30 °C and a total annual rainfall of 250–400 mm. It was selected for the study because pastoralism is the main livelihood in this zone. The larger part of the zone is adjacent to the neighboring Amhara region and largely dependent on its markets to sell livestock and to purchase grains for food. Hence, it has access to major markets (Bati, Kemissie, Sembete) outside the zone. Livestock sales play a dominant role
for household cash needs. Food sources are predominantly purchases of cereals (e.g., maize, wheat, and sorghum), in addition to livestock products. They spend most of their income on food. Aramis-Adaar is the most populated livelihood zone in Afar with an estimated population of 426,108 in 2017 (estimates based on the 2007 census), constituting more than half of the regional rural population [57]. (Ethiopia has been unable to conduct a census in recent days for various reasons, including political instability, with the country’s most recent population census taking place in 2007. As a result, population projections for the country were made using data from the 2007 census as well as the three Demographic and Health Surveys conducted in 2000, 2005, and 2011).

Figure 1. The location of the three study sites (circles) in Aramis-Adaar pastoral and Asale agro-pastoral zones in Afar, northeastern Ethiopia; the Asale agro-pastoral livelihood zone is located within the Asale pastoral livelihood zone and is distributed across the zone’s four districts (Dalol, Koneba, Berhale, and Abala), rather than as a separate zone. It is seen scattered between the four districts on the map due to its small size, which supports only 4.2 percent of the region’s population [57]. Source: adapted from Livelihoods Integration Unit (LIU)/Ethiopian Ministry of Agriculture and Rural Development [58].

The Asale agro-pastoral zone, on the other hand, is located in the northwest of Afar, and consists of a number of non-contiguous areas within the larger geography of the Asale pastoral livelihood zone. It comprises areas along the escarpment and in the foothills of the east–west Tigray highlands and areas in the (semi)arid lowlands. The average annual rainfall is less than 250 mm, but crop production is based on flood waters harvested from the Tigray escarpment. Crop production, mainly maize and sorghum, and livestock raising, mainly cattle and small ruminants, are the main livelihoods. This zone is defined by its relationship with and connections to the highlands of Tigray. The ‘kremt’ (the main rain season in Ethiopia) rain in Tigray is an important indicator of agricultural production in this zone. The main markets in Tigray, rather than in Afar, are vital for the zone. The estimated 2017 population of the Asale agro-pastoral zone was 77,973 [57].
4.2. Sampling Techniques and Sample Size Determination

Multi-stage purposive and random sampling procedures were employed to select the study settings and sample households, respectively. First, the Aramis-Adaar pastoral and Asale agro-pastoral livelihood zones were purposively selected. From the two livelihood zones, three districts (two from Aramis-Adaar and one from Asale) were randomly selected. To reduce bias in selecting the study kebeles (the smallest administrative unit in Ethiopia), the kebeles of the three districts were first coded as ‘road-side’, ‘mid-distance’, and ‘distant’, based on their proximity to major roads and different service centers, in consultation with the enumerators and experts. The study kebeles were then chosen at random from the three coded groups, proportional to the number of kebeles in the selected districts, bearing 13 kebeles for the study. Permission to enter the interview sites was obtained from local authorities and the respective clan elders via the recruited local guides (facilitators). Finally, a random selection of representative pastoral and agro-pastoral households, proportionate to the size of the households in each kebele, was made under the supervision of pastoral rural development experts working in the three research sites (Figure 1). In total, 319 households were surveyed.

In determining the appropriate sample size for a study, one usually takes account of factors such as the purpose of the study, the population size from which the sample was taken, the level of precision, and the confidence level or risk and degree of variability in the attributes being measured [59]. Given these, Cochran [60] proposed a useable formula to yield a representative, proportionate sample in cases of large populations:

\[ n_0 = \frac{Z^2 pq}{e^2} \]  

(1)

where \( n_0 \) is sample size, \( Z^2 \) is the abscissa of the normal curve that cuts off an area \( \alpha \) at the tails (\( 1 - \alpha \) equals the desired confidence level), \( e \) is the desired level of precision, \( p \) is the estimated proportion of an attribute that is present in the population, and \( q \) is \( 1 - p \). However, this formula does not consider the population from which sample is taken. Hence, accounting for population size, it can be adjusted using:

\[ n = \frac{n_0}{1 + \left( \frac{n_0 - 1}{N} \right)} \]  

(2)

where \( n \) is the adjusted sample size and \( N \) is the population. However, in populations of a considerable degree of homogeneity, such as (agro)pastoralists, it is wise to rely on smaller sample sizes than the one scientifically determined [61]. Thus, in this study the actual size is adjusted to be 341 (though the formula yielded approximately 384). Accordingly, a semi-structured questionnaire survey involving 341 households was administered as the main survey. However, some 22 recklessly filled and incomplete questionnaires were dropped, and the remaining 319 were used for the analysis (\( n = 319 \) is the sample size for the study; it is for the three districts in total).

4.3. Data Type and Data Collection

This study examines the association between social–cultural–economic characteristics and the level of food (in)security (which is numerically measured and analyzed using a range of statistical techniques), and hence, quantitative research (cross-sectional research design) was used to collect data from the randomly selected households using a pre-tested survey questionnaire. (The original form questionnaire was pretested with a small number of respondents, and the final version used in the study was modified by removing some questions and restructuring others. We dropped dietary diversity questions because we learned from the pre-test that pastoralists eat a limited variety of foods and thus decided to use only HFIAS to measure food (in)security). We also removed questions about selling animal products because they have no tradition of doing so. Furthermore, we learned from the tests that some questions were irrelevant to the agro-pastoral context (for example,
they share traditions with the neighboring Tigray Region and are not loyal to some Afar cultural practices; so, we used the skip rule while conducting the interview [59]. The data were collected, among others, on the household’s socio-economic variables, livestock holdings and herd characteristics, livestock sales participation, cultural practices, and food security indicators (using the nine generic HFIAS questions with minor modifications to use in (agro)pastoralist context). The data collection process was assisted by trained enumerators who speak the languages of Afar and Tigray (for the cases of Aramis-Adaar and Asale, respectively). The Afar culture does not allow talking to married women unless the husbands are part of the discussion; hence, almost all the respondents (above 97%) interviewed were married men with their spouses around. The wives were made part of the discussions mainly to get information related to food preparations. There were few cases corresponding to interviewed widowed or divorced women (less than 3%). During the interviews, the husbands at times asked their wives when in need of additional information to convey. The enumerators talked to men and the women were used to supplement to what the men said, when invited by the husbands.

4.4. Method of Data Analysis

Household food insecurity is explained as an anxiety about either food supply or the reduced quality or quantity of the food consumed. In this study, the food insecurity was measured using HFIAS (these groups are well-known for their traditional support networks and sharing resources during times of adversity, such as drought. However, meeting the day-to-day family consumption needs and decisions on the sale of livestock other than camels and cattle are household responsibilities that necessitate individual efforts. This ensures that HFIAS can be used to assess the food security status of households in such communities). An ordered logit model was employed to predict the associations between food (in)security and the social, cultural, and economic factors. The objective of applying the ordered logistic regression was to estimate the odds of being at or below the given category and to identify the factors associated with the increased likelihood of being in the highest levels of food security. The actual values taken on by the outcome variable (severity levels of food insecurity measured using HFIAS), as 0, 1, 2, and 3, are irrelevant. However, the larger values (say, value 3) are assumed to correspond to 'higher' outcomes (food secure access), and the smaller values (say, value 0) designate the 'lower' levels (severely food insecure access) (for details, see also [54]). Assuming that there are 'n' independent observations with 'p' predictor variables, the response variable (the HFIAS scores, ordered as 'mildly', 'moderately', and 'severely' food insecure access and food 'secure' access) falls into 'K' ordered categories (1, 2, . . . , k) [62]. Letting 'Y' denote the response variable, the cumulative distribution for 'Y' would likely be:

\[
F_j(x_i) = Pr(Y \leq j \parallel X_i = x_{i1}, \ldots, X_{ip} = x_{ip}); j = 1, 2, \ldots, (K - 1)
\]

(3)

The cumulative odds model predicts the odds and probability of an observation being at or below a specific outcome level based on a set of explanatory variables [63]. Because there are 'K' possible ordinal outcomes, the model makes 'K - 1' predictions, each of which corresponds to the accumulation of probability across successive categories. If we let \( \pi(Y \leq j \parallel x_1, x_2, \ldots, x_p) = \pi_j(x) \) represent the probability that a response falls in a category less than or equal to the jth category \( j = 1, 2, \ldots, K - 1 \), then we would have a collection of cumulative probabilities for each case [62]. The final category has a cumulative probability of 1.0. With an extension from the general logistic regression model, the predictions are logits for the cumulative probabilities which relate to the cumulative logit:

\[
\ln(Y'_j) = \ln \left( \frac{\pi_j(x)}{1 - \pi_j(x)} \right) = \alpha_j + (\beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_p X_p)
\]

(4)

The cumulative logits associated with being at or below a particular category 'j' can be exponentiated to arrive at the estimated cumulative odds, which are used to find the
estimated cumulative probabilities associated with being at or below category \( j \). Hence, the regression equation for the proportional odds model is given as:

\[
L_j (x_i) = \log \left( \frac{F_j (x_i)}{1 - F_j (x_i)} \right) = \beta_0 j + \beta_1 x_{1i} + \beta_2 x_{2i} + \cdots + \beta_p x_{pi} 
\]

where \( j = 1, 2, \ldots, k \) categories; \( x_{1i}, \ldots, x_{pi} \) are the values of the \( p \) predictor variables for the \( i \)th observation; \( \beta_0 \) is the intercept/constant; and \( \beta_1, \ldots, \beta_p \) are the coefficients.

Following Asenso-Okyere et al. [20], Coates et al. [54], Kahsay et al. [21], Lemma et al. [14], Maxwell et al. [8], Mayanja et al. [46], Siraje and Bekele [47], and Vaitla et al. [64], groups of predictor variables, such as household characteristics, livestock wealth, market inaccessibility, pastoralist norms, livelihood strategies, and production risk factors were used to estimate the outcome variable (the severity level of the food insecurity).

4.5. Reliability and Validity of the Data and Instrument

Two livelihood zones—Aramis-Adaar pastoral and Asale agro-pastoral (Figure 1)—were included in this study because taking into account different livelihood zones optimizes the variations and ensures equal representation of the study participants. The decision on which livelihood zones to include as the target populations was made after consulting with experts from the regional bureau of pastoral development, who confirmed that the two zones chosen were fairly representative. This improves the data’s generalizability and reliability. We then developed the survey instruments after conducting a thorough review of previous studies in the fields of pastoralism and food (in)security. We adopted the nine-item HFIAS questions developed by Coates et al. [54], with minor modifications to fit the (agro)pastoral settings. In some instances, we used pre-existing instruments that had been published in peer-reviewed journals (e.g., [39,47]). Because developing a valid and reliable instrument necessitates multiple iterations of piloting and testing, we called for a “subject matter expert review” to assess the instrument’s content validity, involving well-known experts from Addis Ababa University and the regional bureau of pastoral development. Then, the original form of the questionnaire was pretested with 15 respondents, and the final version used in the study was modified by removing some questions and restructuring others. For example, we dropped the dietary diversity questions from an earlier version of the instrument because we learned from the pre-test that pastoralists eat a limited variety of foods, and thus, we decided to use only HFIAS questions to assess food (in)security. We also removed questions about selling animal products because they have no tradition of doing so. Furthermore, we learned from the tests that some questions were irrelevant to the agro-pastoral context (for example, they share traditions with the neighboring Tigray Region and are not loyal to some Afar cultural practices); so, we used the skip rule while conducting the interview.

5. Results
5.1. Descriptive Results
5.1.1. Household Characteristics and Human Capital

Table 1 presents the social, cultural, and economic characteristics of the sample households. As shown in the table, the average age of the respondents (heads) is 48.6 years. The average available family labor force size—aged between 15 and 64—is 2.8, indicating that each household has at least two and at most three labor force members supporting the household. The average numbers of persons under 5, between 6 and 14, and above 64 years old are 1.4, 2.1 and 0.089, respectively, indicating that there are more dependents in each household. Nevertheless, unlike in the highlands, (agro)pastoralist children aged 6–14 serve in the herding of small stock near the homestead. Therefore, the dependents in the families are under 5 and above 64. The average household size is 6.4. In addition, the data show that 87.8% of the respondents cannot read and write. (We have segregated between ‘unable to read and write’ and ‘read and write’ to measure ‘literacy level’, which
is a commonly used technique in predominantly illiterate communities, such as that of the (agro)pastoralists, who do not follow the formal education ladder).

Table 1. Social, cultural, and economic characteristics of sample households.

| Household Characteristics | Mean or % | SD or n | Minimum | Maximum |
|---------------------------|-----------|---------|---------|---------|
| Livelihood Zone           |           |         |         |         |
| Aramis-Adaar (pastoral)   | 154 (48.3)|         |         |         |
| Asale (agro-pastoral)     | 165 (51.7)|         |         |         |
| Age, head                 | 48.59     | 8.50    | 30      | 80      |
| Family size               | 6.44      | 1.58    | 2       | 11      |
| Available family labor    | 2.81      | 1.155   | 1       | 8       |
| Dependency ratio          | 0.239     | 0.133   | 0       | 0.6     |
| Livelihood wealth (herd size), TLU | | | | |
| Livestock sales volume, TLU | 2.02 | 1.58 | 0.2 | 7.8 |
| Livestock sales income, ETB | 18134.17 | 16184.85 | 900 | 86800 |
| Livestock marketing costs | 216.30 | 148.13 | 10 | 850 |
| Livestock consumption, TLU | 0.42 | 0.52 | 0 | 3.6 |
| Livestock purchases, TLU  | 0.06 | 0.22 | 0 | 1.4 |
| Livestock given out, TLU  | 0.13 | 0.52 | 0 | 6.2 |
| Livestock received, TLU   | 0.093 | 0.301 | 0 | 2 |
| Non-livestock incomes, ETB | 974.26 | 2275.82 | 0 | 19500 |
| Consumption expenditure, ETB | 4158.1 | 2719.1 | 1000 | 12900 |

| Purpose of husbandry | Own consumption | Accumulations | Marketing (for sale) |
|----------------------|-----------------|---------------|----------------------|
| Livestock sales volume, TLU | 191 (59.9) | 73 (22.9) | 55 (17.2) |
| Livestock sales income, ETB | 18134.17 | 16184.85 | 900 | 86800 |
| Livestock marketing costs | 216.30 | 148.13 | 10 | 850 |
| Livestock consumption, TLU | 0.42 | 0.52 | 0 | 3.6 |
| Livestock purchases, TLU  | 0.06 | 0.22 | 0 | 1.4 |
| Livestock given out, TLU  | 0.13 | 0.52 | 0 | 6.2 |
| Livestock received, TLU   | 0.093 | 0.301 | 0 | 2 |
| Non-livestock incomes, ETB | 974.26 | 2275.82 | 0 | 19500 |
| Consumption expenditure, ETB | 4158.1 | 2719.1 | 1000 | 12900 |

| Walking times (nearest market) | Half an hour or less | Up to an hour | Up to 1 h and a half | 2 h and more |
|-------------------------------|-----------------------|---------------|----------------------|-------------|
| Livestock sales volume, TLU   | 37 (11.6)             | 134 (42.0)    | 42 (13.2)            | 106 (33.2)  |
| Livestock sales income, ETB   | 266 (83.6)            | 27 (8.49)     | 21 (6.29)            | 5 (1.57)    |
| Livestock marketing costs     | 17 (5.33)             | 52 (16.30)    | 147 (46.08)          | 103 (32.29) |
| Market information access/sources | Percent users | Percent reliability |
| Visiting nearby market         | 57.4                  | 34.17         |
| Dagueing                       | 29.5                  | 45.45         |
| Mobile phone                   | 13.2                  | 20.38         |
| Season livestock sold          | Gilaal (83.65)        | Hagai (8.49)  | Sugum (6.29)         | Karma (5.33) |
| Extension visit frequencies    | Once (5.33)           | Twice (16.30) | Three times (46.08)  | More than 3 times (32.29) |
| Reasons for not receiving credits | No access to credit | No need of repayment | Fear of repayment | No money to repay |
| Credit services (no/yes)       | 132 (41.38)           | 92 (28.84)    | 53 (16.6)            | 42 (13.17)  |
| Memberships in coops (no/yes)  | 266 (83.4)            | 274 (86.89)   | 53 (16.6)            | 45 (14.11)  |
| Guro (mobility) (no/yes)       | 221 (69.3)            | 213 (66.8)    | 98 (30.7)            | 106 (33.2)  |
| Clan consent to sell LS (no/yes) | 127 (39.8)         | 288 (90.3)    | 192 (60.2)           | 31 (9.7)    |
| Sanction payments in LS (no/yes) | 213 (66.8)         | 212 (66.5)    | 107 (33.5)           | 106 (33.2)  |
| Conflict occurrences (no/yes)  | 262 (82.1)            | 212 (66.5)    | 57 (17.9)            | 107 (33.5)  |
| Livestock deaths due to drought/diseases (no/yes) | 212 (66.5) | 212 (66.5) | 57 (17.9) | 107 (33.5) |
Table 1. Cont.

| Household Characteristics          | Mean or % | SD or n | Minimum | Maximum |
|------------------------------------|-----------|---------|---------|---------|
| Food self-sufficiency (food availability) | 298 (93.42) | 21 (6.58) |
| Food coping strategies             | Purchases 203 (63.64) | Aids 104 (32.60) | Sharing/borrowing 12 (3.76) |
| Meals a day                        | Once 71 (22.3) | Twice 101 (31.7) | 3 times and more 131 (41.1) | As obtained 16 (5.0) |
| Food insecurity prevalence         | Severely 85 (26.65) | Moderately 132 (41.38) | Mildly 79 (24.76) | Food secure 23 (7.21) |

TLU = Tropical Livestock Unit equivalent to 250 kg of live animal weight, where 1 TLU = 10 heads of sheep/goats = 0.7 cattle = 1 camel [65]; LS = Livestock; numbers in parenthesis = %; ETB = Ethiopian currency.

5.1.2. Livestock Wealth, Herd Characteristics, and Purpose of Husbandry

Nearly 48 percent of the respondents are from the pastoral (Aramis-Adaar) livelihood zone, while the remaining are from the agro-pastoral (Asale) zone. The two zones vary in terms of the social, cultural, and economic variables used in the analysis. The TLUs (Tropical Livestock Units) were aggregated for each household to constitute the measure of livestock wealth. The average herd size for the entire sample is 12.52 (15.1 for pastoralists and 10.5 for agro-pastoralists). The sizes of the small stock (sheep and goats) relative to the large stock (camels and cattle) and the male stock compared to the female stock are smaller as they are more likely to be sold. The main purpose which the herders give to the livestock is food (milk and dairy products and meat); the majority of them (77.1%) are most likely to use livestock for food purposes, either directly consuming livestock and/or livestock products or selling livestock to purchase food grains. Wealth accumulations in livestock, keeping a number as big as they wish as a sign of wealth, is another reason why they like to keep livestock. In this regard, 22.9% and 17.2% of the respondents responded that ‘accumulations’ and ‘marketing’ were their main purposes (see also Table 1). (Separately analyzed, the ‘pastoralist groups’ were found to be inclined to ‘accumulations’ (61%) as their main purpose of husbandry, whereas the ‘agro-pastoralist’ groups tended to devote their livestock to sale (53%).

5.1.3. Livestock Marketing Practices

All the respondents had participated in selling a minimum number of their holdings; so, there were no records of non-market participants. They sell livestock all year round, but the seasons with the highest sales are the driest seasons between October and January and between May and June, which are locally called ‘gilaal’ and ‘hagai’, respectively. The average TLU of livestock sold (sales volume) and the average income generated from sales were ETB 2.02 and ETB 18,134.17, respectively. The reasons for why they sell range from grain purchases, transportation fees, family clothing, and medical costs to social commitments. The largest expenditure was spent on consumption, as assured by the food purchase costs, averaging ETB 4,158.00. The results also show that households buy livestock and replace depleted animals with the money left over after they pay for food grains. However, it is a minimal and rare case with average purchases of 0.06 TLU, less than a sheep or a goat. The marketing costs incurred in the sale of livestock include transportation, taxes, brokerage/witnesses, and information (mobile phone charges), with an average of ETB 216.3. Regarding access to the market, the majority (88.4%) walk for more than an hour to the main road and the district town to access the livestock or grain markets. They access market information through walking to market center, dagueing (the Afar’s traditional information exchange) or using their mobile phones. About 57% of them prefer to go to a nearby market rather than dagueing or making cell phone calls to access market information. In terms of frequency and earnestness of accessing information, dagueing is a more reliable tool (45%) than the others because it is used on a daily basis and
makes up their tradition. The data also revealed that accessible households were visited more often by extension workers who reside at the district towns and who frequently move to the easily accessible villages using motorbikes. Close to 80% of them were visited three or more times a year for counseling. Yet, some villages are too far from the center and not easily accessible; they were visited less frequently (once or twice a year). About 83% of respondents do not receive credit for any purpose, mainly due to a range of reasons, such as ‘no access to credit’ (42%), ‘no need of credit’ (29%), and ‘fear of or no money for down payment’ (30%). Those who received credit (16.6%) reported that they received the credit from their relatives and neighbors (unofficial sources) and used it primarily to purchase grain and cereals. Among the sampled respondents, only 14% are members in local pastoralist cooperatives (see Table 1).

5.1.4. Pastoralist Social Norms

Through the decision of the clan chiefs, each clan watches all the affairs of the individual pastoralists. The clan leaders’ responsibilities include, among others, controlling livestock sales and managing communal resources. Individual pastoralists are not free to choose sales over individual holdings (especially camels) based on their own interests. The clan chiefs intervene in livestock sales, asking “why?” and saying “no!” to sales for unjustified reasons. If a pastoralist wishes to sell one from his herd for unavoidable reasons (e.g., cash needs for non-pastoral food grain purchases), he must first obtain the permission of his clan. Believing that the owner is doing so for a silly reason, that it is something for his joy, the clan through the chief would certainly not allow the sales. More than 60% of the households in the sample said that their clan chiefs decide on their sales plans, and it is common for livestock to be subject to restrictions in the event of a breach. Sanctions paid in times of offenses in livestock terms is customary. They also have a tradition to give or receive cattle in the form of gifts or loans. The communal nature of the community is used to balance the wealth gap through the exchange of resources, and in turn, their social ties are strengthened. Those who do not have enough to sustain their lives receive livestock from those who have enough. The practice of sharing livestock comes in different forms. It takes the form of giving/receiving as gifts or loans, where, in the latter case, the loaner uses the milk of the loaned animal. The loaner is also given the right to sell or breed the offspring of the loaned animals but has to return the parent stock to the owner. The data indicated that 33% of the households were involved in livestock transfers (sharing); they had either given out or received livestock of different species in the year before the survey. In TLU terms, a maximum of 6.2 is given as a gift or loan, equivalent to 6 camels or 62 goats/sheep. Another traditional custom for them is to move along with cattle (called ‘guro’ in Afar) in search of pasture and water. It defines their system of husbandry and is often practiced in times of drought as a coping strategy (see also Table 1).

5.1.5. Production Risk Factors and Coping Strategies

Conflict between clans and within clans (18%) commonly occurs due to competition for limited resources in pasture and water supplies, resulting in loss of animals and lives, assaults on livestock, and physical damage. About 34% said that they had experienced livestock death due to drought/diseases, which in turn led to production failures and food shortages. While for only a few (less than 7%) what they produced was sufficient for consumption, the vast majority suffer from insufficiencies. In addition, with regard to the frequency of daily meals, almost 60% of households reported that they were served a meal once or twice a day or ate as they got it, which they attributed to a lack of food or the resources to obtain food. Their long experience and tradition of pastoralism has helped them develop coping mechanisms such as mobility (69.3%) and food sharing (3.76%). Livestock sales (63.64%) also serve as a coping strategy. Furthermore, food aids for about 33% of the sampled households serve as another scheme with which they smoothen the food deficit seasons, especially the prolonged dry periods. Moreover, non-pastoral activities
and crop farming (for agro-pastoral groups) also serve as risk-minimizing practices (see also Table 1).

5.1.6. Prevalence of Food Insecurity: HFIAS Results

Based on the answers to the nine-item HFIAS questions, more respondents reported affirmatively (‘rarely’, ‘sometimes’ or ‘often’) to the items indicating less severe food insecurity, such as ‘not being able to eat the kinds of food they preferred’, than to items indicating more severe food insecurity, such as ‘going a whole day and night without eating’ (Table 2). Affirmative responses to the items range from 22.3% to 97.2%. The item most frequently receiving an affirmative response was: ‘how often are you worried that your household would not have enough food?’, while that receiving the least affirmative responses was: ‘how often do you or any household member go a whole day and night without eating anything?’ Thus, a month before the survey period, nearly all the respondents (97.2%) worried that their households would not have enough food to eat due to a lack of resources to create food access. However, a few (22.3%) responded that at least one member of the household had experienced going the whole day and night without food. This means that nearly all of them have experienced anxiety about whether their household would have enough food. More than 90% of them had to do without preferred foods and ate foods of less quality that they did not want to eat because of a lack of resources. Close to 70% had to reduce the amount of food that they ate or cut the number of meals due to the economic constraints on obtain food to eat. Again, 27% mentioned that there was at least one time within the last thirty days where there was no food to serve the family. For about 24% of the households surveyed, hunger was reported as a daily experience as at least one (adult) member of the household had gone to sleep at night hungry or gone the whole day and night without eating anything. Accordingly, the households had experienced all the food insecurity signals—from anxiety about the supply of food to consuming less preferred (quality) food and a lesser quantity of food to passing a day and night without eating anything (Table 2). Additionally, the HFIAS results indicate that more than ninety percent of households fall under the food insecure category, i.e., in the mildly (24.76%), moderately (41.38%), or severely (26.65%) food-insecure category, while only 7.21% of them fall under the food-secure access category (Table 1).

Table 2. Distribution of affirmative responses (‘rarely’, ‘sometimes’ or ‘often’) to HFIAS items.

| Because of a Lack of Food or Resources to Obtain Food, in the Past Four Weeks . . . | Affirmative Responses (%) ¹ |
|-------------------------------------------------------------------------------------------------|-----------------------------|
| How often do you worry that your household would not have enough food?                         | 97.2                        |
| How often are you or any household member not able to eat the kinds of foods you preferred?    | 92.8                        |
| How often do you or any household member have to eat a limited variety of foods?               | 90.9                        |
| How often do you/amember have to eat some foods that you really didn’t want to eat?            | 86.8                        |
| How often do you/amember household member have to eat a smaller meal than you felt you needed?  | 69.0                        |
| How often do you or any other household member have to eat fewer meals in a day?               | 67.7                        |
| How often is there no food to eat of any kind in your household?                              | 27.3                        |
| How often do you or any household member go to sleep at night hungry?                          | 25.4                        |
| How often do you or any household member go a whole day/night without eating anything?         | 22.3                        |

¹ We learned whether households experience anxiety about food supplies from their own production or markets (item 1); a decrease in the quality (items 2–4) or quantity (items 5–7) of food consumed, going to bed hungry (item 8), and going all day and night without eating anything (item 9). The percentage values are meaningful on their own and indicate how many of the households responded affirmatively (“Yes” responses) to each of the items, across the two livelihood zones.

5.2. Econometrics Model Results: Ordered Logistic Regression

Table 3 presents the results of an ordered logistic regression model. The social, cultural, and economic characteristics that are found to predict food (in)security are livestock wealth and sales volumes (values), pastoral development workers’ visits, market inaccessibility, livestock slaughters for rituals (ritualization), guro (mobility), occurrences of inter- and intra-clan conflicts, non-livestock incomes, and livelihood zone effects. Some culture variables
(such as sanction paying) were not found to predict food (in)security. This might be because such elements are a rare case, where less than ten percent of the sampled households responded affirmatively to the variables of concern (e.g., sanction payments in livestock, Table 1). Due to the heavy impositions for violations of customary norms, members of the study community tended to obey customary rules and refrain from activities deemed ‘wrong’ in the community. However, excluding the other socio-economic characteristics from the model, culture orientation and market inaccessibility alone exert significant effects on food security, where all the variables but one (guro) are significant (Table 4).

Table 3. Results from ordered logit model.

| Variables                  | Coefficients | p > |z| | Marginal Effects (Level of Food Security) |
|----------------------------|--------------|-----|---|-----------------------------------------|
|                            |              |     |   | Severely | Moderately | Mildly | Secure |
| Livestock sales            | 0.317 ***    | 0.002 | -0.0410026 ** | -0.0116073 | 0.0459582 ** | 0.0066516 * |
| Livestock wealth           | 0.034 **     | 0.031 | -0.0044085 * | -0.001248 | 0.0049413 * | 0.0007152 * |
| Livelihood                 | 2.893 ***    | 0.000 | -0.373585 ** | -0.105757 | 0.4187374 ** | 0.0606046 ** |
| Age                       | -0.013       | 0.383 | 0.0016167 | 0.0004577 | -0.001812 | 0.0606046 |
| Family size                | -0.098       | 0.206 | -0.0121737 | -0.0036059 | 0.0142772 | 0.0020664 |
| Livestock consumption      | -0.152       | 0.639 | 0.0193956 | 0.005965 | -0.0221332 | -0.0032274 |
| Livestock accumulation     | 0.180        | 0.700 | -0.022523 | -0.008233 | 0.0267804 | 0.0039658 |
| Livestock slaughters       | -1.045 ***   | 0.000 | 0.1349084 ** | 0.0381908 | -0.1512137 ** | -0.0218854 * |
| Extension services         | 0.401 ***    | 0.007 | -0.0518158 ** | -0.0146684 | 0.0580783 ** | 0.0084058 * |
| Market access              | -0.475 ***   | 0.000 | 0.0614067 ** | 0.0173834 | -0.0688284 ** | -0.0099617 ** |
| Coping by sharing          | 0.324        | 0.656 | -0.0376239 | -0.0206544 | 0.0504248 | 0.0078535 |
| Coping by purchase         | -0.185       | 0.468 | 0.0235329 | 0.00764 | -0.0271885 | -0.0039444 |
| Livestock sharing          | 0.448 *      | 0.089 | -0.0550396 | -0.022479 | 0.0673513 | 0.011673 |
| Sanctions                 | -0.071       | 0.861 | 0.0093919 | 0.0022243 | -0.0101629 | -0.0014533 |
| Conflicts                  | -0.787 **    | 0.027 | 0.12036 * | -0.0084779 | -0.0986528 * | -0.0132923 * |
| Mobility (guro)            | 0.706 *      | 0.042 | -0.08334 * | -0.0428275 | 0.1090015 | 0.017166 |
| Clan consent               | -0.065       | 0.849 | 0.0082857 | 0.0024346 | -0.0093613 | -0.001359 |
| Non-Livestock income       | 0.002 ***    | 0.001 | -0.0000244 ** | -6.90e-06 | 0.0000273 ** | 3.95 \times 10^{-5} ** |
| Credit access              | -0.202       | 0.466 | 0.03668 | 0.0067209 | -0.028966 | -0.0041681 |

Obs. = 319, LR $\chi^2(19) = 213.50$, Prob. > $\chi^2 = 0.000$, Log likelihood = $-292.88569$, Pseudo $R^2 = 0.2671$

***, **, * significant at 0.1, 0.05, 0.01 level of significance, respectively.

Table 4. Culture and market inaccessibility variables on food insecurity: an ordered logit.

| Variables                  | Coefficients | p > |z| | Marginal Effect |
|----------------------------|--------------|-----|---|----------------|
| Livestock accumulations    | 0.5479312 *  | 0.096 | 0.0990574 |
| Livestock slaughters (ritualization) | 1.177119 *** | 0.000 | 0.196275 |
| Livestock sharing          | 0.335985 **  | 0.041 | 0.2893918 |
| Sanctions paying in livestock | 0.6487281 * | 0.090 | 0.1239526 |
| Livestock mobility (guro)  | -0.080485    | 0.788 | -0.013301 |
| Clan consent for selling livestock | 1.374176 *** | 0.000 | 0.211739 |
| Market inaccessibility     | 0.3494806 ***| 0.001 | 0.0582731 |

*, **, *** significant at 0.1, 0.05, 0.01 level of significance, respectively.

5.2.1. Livelihood Strategy

The results from the econometrics analysis show that the state of food insecurity markedly varies between pastoralists and agro-pastoralists. Noticeably, pastoralists have about a 37% chance of being severely food-insecure as compared to agro-pastoralists. The result further confirms that the probability for pastoralists to be food-secure is only 6%, which means that food insecurity among the pastoralists is more severe than it is with the agro-pastoralists. Unlike pastoralists, agro-pastoral groups engage in non-pastoral activities such as growing crops (crop production is usually done once or twice a year, using flood waters harvested from the Tigray escarpment), which helps them diversify their income
to ensure food security. In this regard, the result corresponding to non-pastoral activities confirms that crop income contributes significantly to food security ($p$-value = 0.000).

Similarly, livestock wealth and food security show a positive link. Increasing herd size can cause a transition from lower levels of food security to higher levels. A TLU increase in herd size reduces the probability of being severely food-insecure by 0.44% and increases the probability of food-secure access by 0.07%. Livestock serve as the main source of animal source foods that support consumption and can be converted into cash to facilitate access to non-pastoral food grains. The results confirm that there is a positive relationship between food security and livestock sales, which is expressed as sales volume (TLU) or sales revenue (cash value). The results of the model show that a unit increase in sales volume or total revenue from sales reduces the probability of the severity of food insecurity by 4.1%.

5.2.2. Access to Market and Extension Services

The association between market access and food security is found to be the inverse, indicating that as pastoralists and (agro)pastoralists walk farther to reach the nearest market to trade with pastoral or non-pastoral products, their level of food security significantly reduces. Specifically speaking, an hour increase in the walking distances to market centers causes the likelihood of food security to decrease by 1%. Furthermore, a significant positive association is found between the frequency of extension services and food security, suggesting that as the number of visits by extension workers increases the tendency for households to improve their food security increases by a factor of 0.4.

5.2.3. Conflict—A Risk Factor

An increase in the likelihood of conflict worsens food insecurity by 12.04%. As the inhabitants are more exposed to inter- and intra-clan conflicts, they suffer from damage such as livestock raids, loss of life, and physical damage to the available labor force. This in turn results in a decline in stock. As the level of yield and income derived from livestock is a function of the level of stock (herd size), the overall result is thus to assume production and income levels less than the actual potential, limiting its contribution towards food security.

5.2.4. Mobility (Guro)—A Coping Strategy

The mobility of livestock, which is often viewed as a coping strategy, has a positive effect on food security, at a significance level of less than 0.05 ($p$-value = 0.042). For herders moving along with their livestock in search of better pasture and water, a unit increase in the likelihood of mobility leads to a reduction in the severity of food insecurity by 8.3 percentage points.

5.2.5. Ritualization—A Culture Orientation

As can be seen from Table 3, a TLU increase in livestock slaughters for rituals (ritualization) leads to 13.5 percentage point increases in the probability of severe food-insecure access, and 2.2% decreases in the probability of food-secure access. More appreciably, when treated separately, cultural elements (except guro) and market inaccessibility are positively and significantly associated with severe food insecurity levels. The cultural variables cause the severity levels (in probability terms) of food insecurity to increase by 10–30 percentage points (Table 4).

6. Discussions

Pastoralists entirely and agro-pastoralists partly are culture-oriented in the sense that the purpose of raising their livestock is more for accumulation or rituals. For example, for the ritual, large-scale slaughter is practiced, in which a large number of villagers gather in groups for celebrations and meals. This happens occasionally and may not help to smoothen a person’s daily consumption; rather, it depletes livestock resources. They dedicate livestock to rituals, which means that they have less of a livestock product supply to use as food or for exchange in the market in order to have a command over food. This
suggests that such a culture orientation greatly exacerbates the severity of food insecurity in the study area to a considerable degree. In addition, pastoral communities are vulnerable to and live under various production risk factors, such as drought, conflict, and animal disease. Conflict, for example, is a major risk factor for (agro)pastoralist production. Due to these risk factors, livestock deaths and raids are common and erode pastoral resources (livestock), thereby weakening consumption. Market inaccessibility is another issue that constrains (agro)pastoralist food security. The long travel period for entry into the market means that herders would be discouraged to trade with their produce, which in turn constrains them to trade in non-pastoral foods for consumption. Therefore, it emerges from the findings that cultural orientation, production risk factors, and poor marketing infrastructures are aggravating food insecurity among (agro)pastoralists. Conversely, the externally induced and infrastructure-constrained market exchange practices by (agro)pastoralists and their long-lived tradition of ‘guro’ contribute to improving food security.

6.1. (Agro)pastoralist Market Exchange Practices and Food (In)security

In fact, households with a greater number of livestock resources of different species are advantaged in terms of consumption smoothing. They are affluent with animal source foods and with the marketable surplus of livestock and livestock products. In the first case, they directly consume animal products for food. In the latter case, they sell livestock and products in the market for income and buy non-livestock food to complement or supplement consumption. The non-livestock foods are used to complement consumption in times of drought when the animal-source foods are scarce. In times of affluence, however, purchased grains are used as supplementary food sources. In either case, market exchange makes a considerable share of the consumption of (agro)pastoralists. The implication of livestock wealth and sales participation (incomes) for food security is presumably immense as it appears that (agro)pastoralists are dependent on livestock selling to fulfill consumption. In the face of recurring drought, they sell livestock and in return purchase food grains and other consumption requirements to supplement their food needs as livestock products are not sufficient to smooth consumption. Therefore, surplus pastoral production is not sufficient to bring about food security improvements. Marketing practices, mainly selling out livestock and purchasing in non-pastoral food items, make-up a major component of accessing food in the (agro)pastoralist context. While (agro)pastoralists have enough food available in their vicinity or in the market, they may be food-insecure because they cannot access it. Hence, market exchange for building purchasing powers and marketing infrastructure (accessibility) to sufficiently engage in markets for food security are equally important. In this regard, Rocha [22] contends that lack of participation in markets is the most prevalent cause of food insecurity as the economic accessibility of food is intimately related to income security. Therefore, market accessibility is an important element of food security at the household level in the (agro)pastoralist context. It is the degree to which (agro)pastoralists obtain the markets necessary for their exchange needs, or the opportunity, the capacity, and the ability that they have to engage in selling their products. Nevertheless, while an improved market access plays a part in determining food security, our results suggest that the (agro)pastoralists’ lack of market orientation (mainly due to their culture orientation) and market inaccessibility are hindering food security. (Agro)pastoralists walk for long hours to get into market centers where market inaccessibility is an impediment to them when participating in the market, leading to deteriorated food security levels. Their use of marketing technologies (e.g., mobile phones to access marketing information) that reduce marketing transaction costs, the availability of marketing infrastructures, and the availability of and memberships in a formal local group are not that dependable. Thus, in terms of time and cost, the use of innovations and memberships in cooperatives to achieve food security and their access to markets remain challenging for them. Consequently, increased transaction costs are barriers that increasingly become impediments for them when accessing markets. Therefore, in dealing with market accessibility and participation, the expansion and adoption of technologies that ameliorate market inaccessibility by reducing
the problems created by transaction costs are needed [66] as the divide between improved and constrained access to markets for food security is the use of innovations to reduce transaction costs [67]. Rural infrastructure in the context of access to markets needs to ease market participation for better food security outcomes. Jacoby [68], in this regard, stressed that rural roads and transport infrastructures are particularly important forms of rural infrastructure, providing cheap access to both input and output markets. Market accessibility in terms of reduced distances and walking times to roads, services, towns, and market outlets is important to improving food security [69]. Additionally, the extent to which pastoralists bargain in the market depends on their ability to take collective actions [70], where the actions enable them to take advantage of new value chains [71]; marketing costs can be shared by many producers, making market participation feasible [22], and they can deal with existing market imperfections [72] for better food security. Thus, it emerges that pastoral/livestock development services—improved techniques of production and marketing through extension services—are typically important for (agro)pastoralists for improvements in production and marketing sustainably for food security goals. In terms of the frequency of extension visits, it has been noted that (agro)pastoralists in the study area are visited by development workers more often. Yet, the type, timeliness, and quality are priority concerns in terms of the effectiveness of the services for desired livelihood goals. Hence, frequent visits with quality and timely extension services with proper service packages have paramount importance to improvements in market participation for better food security achievements.

6.2. (Agro)pastoralist Cultural Orientations and Food (In)security

Livestock are the central element defining pastoralism as a production system. In the face of recurrent droughts, a large herd size matters not only when determining the amount of food available for consumption but also to sustaining pastoralism as a viable system. Pastoralists often prefer to adopt a traditional accumulation strategy to avoid/reduce the risks associated with herd loss due to risk factors, such as drought [73]. Their orientation towards livestock accumulation serves them as a traditional insurance risk and coping strategy in overcoming natural or man-made calamities [74]. With this rationale, pastoralists and agro-pastoralists raise different species of livestock mainly as a traditional way to make a living. They raise livestock (especially large stock—camels and cattle) for milk and prestige, showing social status, and as wealth indicators, keeping the number as large as they wish with all the costs. The inherent motive behind herd maximization is that it safeguards the community from undue circumstances [75]. Additionally, livestock are the subject of social relations in the community in that they are shared with those who do not have enough. They are considered as common assets and shared among the members of a particular clan. Livestock are also subject to slaughter in large numbers or are given to another party as amends for the owners’ wrongdoings (e.g., violating customary norms) and as compensations to the victims in times of intra- and inter-clan conflicts. A large number of livestock are often sacrificed to serve cultural ceremonials and for rituals typical of their tradition and the sanction paid to the victims. Thus, cultural orientation in Afar tradition is predominant, wherein the entire societal fabric is tied up with livestock accumulation and sharing, slaughters (ritualization and festivities), and sanction paying (in livestock). The social setting and cultural fabric on which pastoralism is founded encourages accumulation at all costs and the excessive use of livestock for cultural purposes such as mass slaughtering. This endures among them and explains the importance of solidarity against the individually based sedentary mode of lifestyle. Added to the natural or induced risk factors (e.g., droughts, conflicts, and diseases), these practices put pressure on the pastoral assets. Consequently, the drought-remnant livestock resource gets depleted as it is accumulated to be shared, used, paid in sanction, and sacrificed. Thus, it ends up falling short of sufficiently supporting consumption, leading to sever food insecurity.
Furthermore, such a cultural orientation is not in the direction of engaging in marketing practices to supplement consumption for food security. Livestock are the object of pastoralist cultural practices. Selling is not encouraged, mainly for cultural reasons. Thus, pastoralists attach more importance to their livestock for cultural uses than for trading for cash to support consumption. Due to cultural obligations, they are not ready to provide pastoral produce to market for exchange. As also documented in Tessema et al. [76], cultural orientations stand at odds with markets orientations. (Agro)pastoralist cultural orientation stands to constrain pastoralism against improved livelihoods in terms of food security. Hence, the more that households engage in cultural practices such as rituals, the worse will be their food insecurity as the herds are subject to accumulation in large numbers and mass slaughter for ritualization and festivities and to being shared and paid to others for sanctions. Thus, selling livestock is not appreciated because the social status, social power, and social authority of an individual in the community are measured based on the number of livestock that one possesses. The conflict between the persisting culture orientation, such as the communal practices of pastoralism, and market ideals is real [77], resulting in a lack of adequate supply to trade. This leads to low off-takes for (agro)pastoralists who are presumed to consume the cereals which would be gained from livestock sales.

6.3. Production Risk Factors and Traditional Coping Strategy

Production risk factors, such as climate factors and livestock death due to either diseases or conflicts, impede production and market orientation and thereby exacerbate food insecurity among (agro)pastoralists. For instance, inter- and intra-clan conflicts are very common in the study area, causing loss of livestock and lives, physical damage, mobility restrictions, and the probability of commercial orientation declining, thereby impeding food security efforts. Moreover, the climate-induced factors are increasingly challenging (agro)pastoralist production and are regarded as the most important causes of food insecurity in these areas [14]. Pastoralists and agro-pastoralists, from their long experiences of living with environmental uncertainties, have developed a traditional coping strategy that has helped them cope with these challenges. Among these is mobility, a tradition practiced to escape unfavorable circumstances arising from climate variability. Seasonal mobility, known as guro in Afar, is a tradition of moving along with livestock in search of better pasture and water for the moving stock. It is their main practice, a part of their tradition and livelihood, and they think that it is good for the health of the livestock. In the pastoralist setting, it is a common practice to move along with animals, where mobility enables them to use the still unexploited pastures and water sources [78]. It remains fundamental as a strategy for coping with unpredictable rainfall and livestock diseases. This helps them to escape exhausted resources in their permanent base villages and to take advantage of the opportunities of resource abundance elsewhere. Moving herders can also get better access to and interactions with buyers along the moving routes as it might be easy and inexpensive to trade livestock over the long distances. This could attract them towards the market, which in turn promotes market production for better food security. However, while mobility is a risk-managing and coping strategy, market facilities across the moving routes and guro terminus hardly exist. Mobility is constrained by market access and safety issues such as resource conflicts, and livestock raids are likely to occur [33]. Both the local and the terminal markets are, respectively, set near villages and at regional towns distant from the ‘guro’ terminus, where buyers often go to visit these sites. Hence, during guro, pastoralists move far away, along with their livestock, and little or nothing remains for the market at their permanent settlements. Their move farther away from the base villages often means that the value of the livestock falls, fetching them poor prices. In effect, they are obliged to sell with minimum prices at guro terminus. Moreover, the costs and risks associated with guro, such as inter- and intra-clan conflicts, animal theft and raids, long hours of trekking (labor) costs, and uncertainties, are persistent [79]. Therefore, our result demonstrating a positive relationship between mobility and food security holds under better market access along the moving routes and guro terminus and no or reduced
risks and costs constraining mobility. Hence, sustainable conflict management led by the elders needs to be promoted so that guro sufficiently serves traditional coping strategy to enhance food security.

7. Conclusions

The findings of this study show that food insecurity persists in the study area and that food security concerns in Ethiopia’s (agro)pastoral areas are, for the most part, related to the cultural orientation of these communities. While some cultural elements (for example, ritualization) exacerbate food insecurity, others (for example, guro, although it is restricted by conflicts) help to reduce food insecurity levels in these areas. It also appears that while (agro)pastoral production is intertwined with a variety of pressures, resulting in severe food insecurity, poor infrastructure-constrained market exchange practices play a rescuing role. These findings have implications for promotion of pastoralism as an important livelihood option. Pastoral culture norms, in particular, as well as exchange practices, emerge as policy considerations. This can be accomplished by designing policies that can balance and align the marketing practices within pastoralism. First, the role of customary institutions in policymaking must be recognized. Second, markets should be built around existing pastoral culture norms. Furthermore, market expansion opportunities must be accompanied by the development of the necessary infrastructure and the access to market facilities, which can be sought by utilizing the existing pastoralists’ knowledge and expertise as the foundation that drives market production within the context of pastoralism. Thus, this paper concludes that food (in)security in the context of (agro)pastoral settings cannot be understood solely in terms of inefficiency in the management of risks, production, and distribution. It necessitates a multifaceted approach that situates it not only within the networks of food production, distribution, and consumption, but also within the broader context of the cultural relations and social networks in which the households invariably seek to secure their food needs and reproduce their livelihoods. In order to comprehend food security in the (agro)pastoral setting, emphasis should be placed on pastoral culture orientation as well as market exchange practices. As a result, a mix of approaches that combines livestock production services, market production orientation, and a market infrastructure development that is consistent with the pastoralist tradition remains critical to ‘move-up’ pastoralism. Furthermore, capitalizing on guro as a traditional coping strategy can contribute to pastoralism’s long-term viability. It would also be better if the designated locations (or villages) of the moving (agro)pastoralists were properly known, in order for them to have access to infrastructure, as it is difficult to locate them during guro.

8. Limitations of the Study and Future Research Directions

The results of this study should be used with caution for the following reasons. First, cultural variables are difficult to quantify numerically, which implies that these elements need to be addressed qualitatively to better capture their links with food (in)security. If the question of ‘how the specific pastoral culture elements relate to food (in)security?’ had been approached qualitatively, the results might have been different. As a result, future research needs to investigate pastoral food (in)security using qualitative methods to capture the ‘how’ and the ‘why’ elements, while linking the pastoralists’ culture with the food (in)security issues. Second, the variables identified in this study as influencing (agro)pastoralists’ food security are based on cross-sectional data collected only once during one season. Thus, for the consistency of the findings, further conformity of the findings is required by research using panel data that capture the influencing variables as well as the food (in)security itself across multiple time periods.

Author Contributions: Conceptualization, D.W.B., W.T.B. and W.K.T.; Formal analysis, D.W.B.; Investigation, D.W.B.; Methodology, D.W.B.; Supervision, W.T.B. and W.K.T.; Validation, W.T.B., W.K.T. and M.M.; Writing—original draft, D.W.B.; Writing—review & editing, D.W.B., W.T.B., W.K.T. and M.M. All authors have read and agreed to the published version of the manuscript.
Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data used in this paper were collected as a part of a PhD project entitled “Relating Pastoralists’ Culture Orientation, Livestock Marketing Practices, and Household Food Security among the Afar Pastoralists of Northeastern Ethiopia”. Hence, at this point in time, we cannot share the data. However, it can be accessed by requesting the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

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