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Gendered impacts of cereal crop price increases on multidimensional poverty using short panel data from Ayina Bugna Woreda in Ethiopia

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Abstract

Multidimensional poverty remains one of the biggest challenge facing Ethiopia, its incidence and intensity are very high in country. An overlapping of different shocks exacerbates this critical issue. Consequently, this study aim to investigate impacts of cereal crop price rise on “unpacking” dimension of poverty and “unmasking” gender disparity in vulnerable area of Ayina Bugna woreda, Ethiopia. To effectively fill the gap: The study address two main issue that are overlooked by previous authors: disregarding of non-monetary dimension of poverty and disregarding specific market dynamics of individual district. The analysis draws on panel survey data from 377 households (202 male-headed, 175 female-headed) collected over two time periods, together with monthly price data collected from major local markets. Rural multidimensional poverty index, Laspeyres-type of household specific price index and fixed effect models were employed to identify casual relationships. The multidimensional poverty status result revealed that 68.8% and 74.7% of male and 74.8% and 87.4% of female headed household are multidimensionally poor in 2024 and 2026 respectively. Accordingly, the negative impact of high cereal prices on overall poverty status and some considered dimension of poverty was found, controlling for unobserved heterogeneity across households. Ceteris paribus, the multi-threshold linear probability model with fixed effect indicates that a 10% increase in price of cereal crop associated with increase the probability of crossing to multidimensional poverty threshold by 2.3 percentage point and severely multidimensional poverty threshold by 3.7 percentage point. Regarding gender disparity result indicates, female headed household additionally penalized by 2.76 and 4.5 percentage point in crossing to official multidimensional poverty and severely poverty status. Additionally, raising price of cereal crop increase deprivation score of food insecurity and nutrition, risk exposure, and living standard dimension by 0.044, 0.0095, and 0.0018 unit respectively. Thus, rather than improving their livelihood increase price of such main staple crop worsen the poverty level of rural poors. Consequently, policy implication is that the ultimate goals of eradicating poverty cannot achieved without alleviating the negative impacts of cereal crop price.

Keywords: - Gender, Multidimensional poverty, Fixed effect, Panel data, Cereal

1. Introduction

Global food prices have increased nearly 52% since 2019, driven by the global pandemic and shortages caused by the war in Ukraine [1]. This sharp rise in food prices also erodes real incomes and impedes the continual access to sufficient and nutritious food for many households [2]. These effects are more acute for the lower end of the income distribution primarily because poor households spend large shares of their incomes on food consumption and many poor farmers are net buyers of staple food [3]. Moving forward, climate change and political instability are forecast to make reliable access to food increasingly difficult, especially in Sub-Saharan Africa [4, 5]. This puts staple crops further out of reach for large numbers of population in Sub-Saharan Africa, thereby threatening food security and deepening poverty in a region where one in four people struggle with hunger [1]. According to recent UNDP data from 1.1 billion multidimensionally poor people 83.2% of poor are live in rural area of Sub-Saharan Africa (553 million) and South Asia (402 million)[6].

This phenomenon has remained the main feature of Ethiopia where agriculture is the mainstay of country economy, and the primary source of livelihood for about 78% of rural households [7]. Although the government of Ethiopia together with development partners has put poverty reduction a priority agenda in its development policies and strategies [8], poverty remain high, specifically in rural areas where their income source is predominantly dependent on traditional agriculture. Moreover, recent UNDP report shows that from top five countries with the largest numbers

of people live in multidimensional poverty Ethiopia is put on 3rd level in the world and 1st level in Africa with (86 million) [6, 9]. GDP per capita is extremely low and most of the social and human development indicators, such as life expectancy, mortality, literacy, school enrolment and child malnutrition are among the worst in the world [6, 9].

In the past, vulnerability to poverty in Ethiopia was largely associated with bad weather and natural disasters [10, 11]. Recently, however, inflation seems to have become another important factor making people more vulnerable to poverty [12]. The dramatic increases in prices of food and non-food items observed since 2019 could have shifted many people to poverty [13]. Although the food price rise in the years 2021/2022 seemed to be a world phenomenon, the magnitude is exceptionally high in Ethiopia [14]. Since 2019, the rise in cereal food prices has been tremendous in Ethiopia. According to ESS data in the mid-2019 prices of Teff rise by 35%, sorghum, by 39%, maize by 32% and wheat by 32%. Even if prices of food and non-food items have been rising since 2019, the rapid rise in prices of especially agricultural cereal crop has been historically high since 2022. Given that about 70% of the consumption expenditure of households is spent on food [15], such rises in prices could have a substantial impact on the welfare of society. According to Engel's law, poor people spend a large proportion of their income on food. Unless this is followed by a pro-poor growth strategy, such rise in prices disproportionately affect the poor more than it does the non-poor [16].

Empirical evidence also shows that the aggregate impacts of rises in cereal crop prices on poverty are generally negative [17-33]. [34] However, existing literature investigate poverty or poor as lack of monetary or consumption expenditure, and analyze the price/inflation impact on poverty as a country level via using large-scale national dataset like, census data, or standard LSMS. Primary, they focus on the impact of their prices on income-based poverty, nutrition, consumption expenditure or caloric intake, and they failing to model the causal impact of price spikes on the specific dimensions (non-monetary) of the MPI, such as access to nutritious food, access to clean water, sanitation, asset accumulation, access to credit, exposure to risk, and education. As reported by scholar's [9], households experiencing deprivation may adopt several coping strategies. They may stop using modern cooking technologies, such as stoves and electric *mitad*, and instead rely on firewood and animal dung for cooking. They may also reduce their consumption of nutrient-rich foods and shift toward cheaper, less nutritious alternatives. In addition, households may stop accumulating household assets such as televisions, radios, cars, and refrigerators. Instead, they may be forced to sell productive and valuable assets, including land and jewelry, to meet their basic needs. Economic hardship can also affect children's education. Some households may withdraw their children from school when they reach school age because they cannot afford educational expenses. Children may instead engage in income-generating activities to support their families. In some cases, children may be sent to cities to work as domestic workers or in other forms of low-paid labor. Early marriage may also be used as a coping strategy to reduce the household's economic burden. Secondly, they use the aggregate, repeated cross-sectional national dataset approaches, and due to this they faced two distinct limitation [35, 36]. First, they overlook highly localized vulnerable community and this leads to one-size-all-fits conclusion. Second, because of they fail to capture data by tracking from same household, they only show net poverty shift rather than individual poverty dynamics. So, there are a significant gaps exist in understanding its impact on multidimensional poverty, particularly at a specific district or *woreda* level in a gender perspective.

Hence, the goal of this study is to fill the gap of existing studies by focusing closely on impacts of cereal crop price on "unpacking" dimension of poverty and "unmasking gender disparity" in vulnerable area of Ayina Bugna woreda. In recent years, the woreda has faced severe humanitarian crisis related to multidimensional poverty, exacerbated by a combination of factors such as armed conflicts, climate variability and food price inflation [37-39]. While, erratic rainfall and flood devastated crop and livestock production, armed conflict severely disrupted aid distribution, obstructed basic services, like transport access, bank services, credit access, input delivery and agricultural markets [10, 11]. This prevented farmers from acquiring vital seeds and fertilizers for their planting seasons and thousands of households face difficulties in maintaining adequate nutrition, sustaining productive assets, accessing drinking water, healthcare services, investing in education, and left tens of thousands of resident's particularly vulnerable populations including female and children under five have suffered immensely from acute hunger [37-40].

The data is gathered from two rounds Panel Survey from the same households over time, in order to evaluate impact of over-time changes in local prices of main staple crop (teff, wheat and sorghum) on household multidimensional poverty. The study try to investigates whether female-headed households are more likely affected by cereal food price shock, or not, by controlling individual, household, and community characteristics. It then examines the impact of

cereal crop price rise on overall poverty and each dimension of poverty, accounting for differential impacts across male and female-headed households in Ayina Bugna woreda, North wollo zone, Ethiopia.

2. Research methodology

2.1 Descriptions of study area

This research was conducted in North Wollo Zone of Ayina Bugna Woreda, Amhara Region, Ethiopia. The woreda is bordered on the north by Wag Hemra Zone, on the west by South Gondar Zone, on the south by Meket Woreda, and on the east by Lasta Woreda. The woreda is comprise 16 rural kebele [41]. Based on the ESS,[42] population projections report, the woreda has 91,134 total population from this (45,455 men (49.88%) and 45,679 women (50.12%). 94.2% population in the woreda dominated by rural resident while the remaining 5.8% of population are urban resident [42]. Over 90% of population in the woreda is dependent on subsistence agriculture with rain-fed cultivation of major staple crops including teff, wheat, sorghum and barley [41]. As documented by [43-45], the area is well known for a historical vulnerability to natural and human-made disasters and catastrophic historic famines of 1966 ("Wag-Lasta" famine), 1973, and 1984 famine.

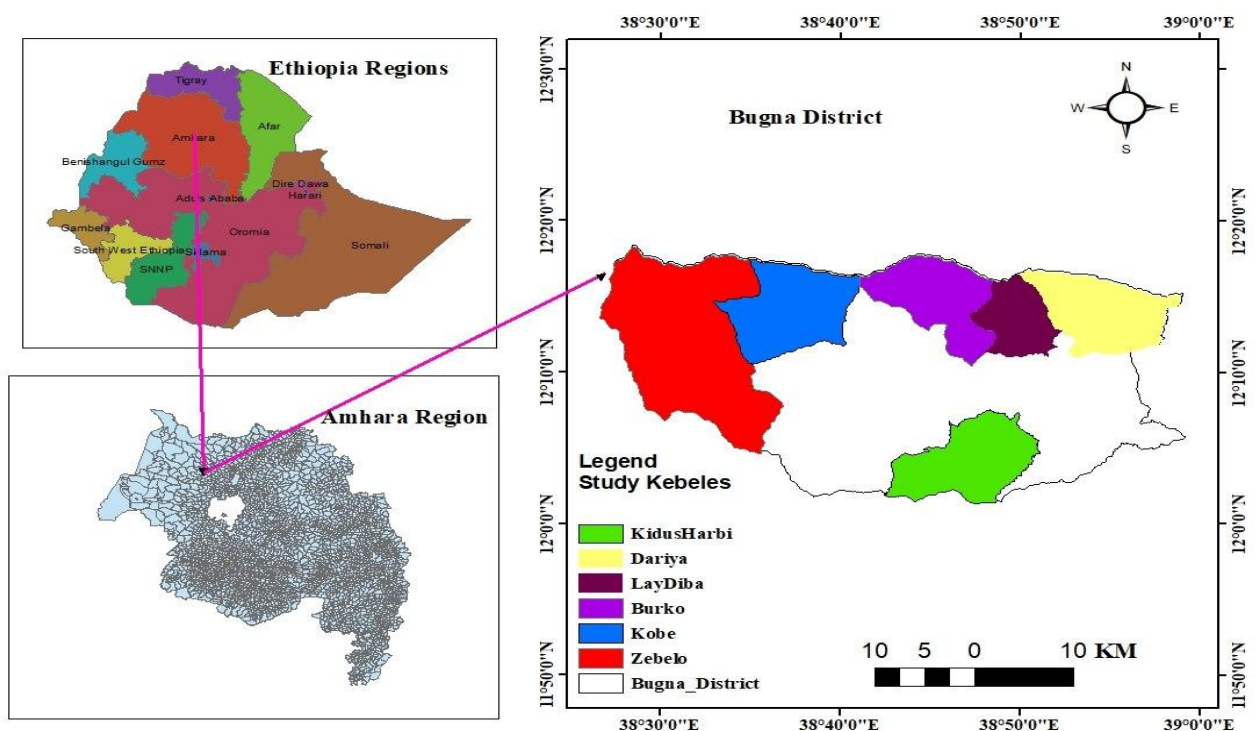


Fig. 1 Map of the Study Region, Zone and Districts

2.2 Research Design

On this study, mixed research design was employed within a cross-sectional panel survey data, which allows for mixing quantitative and qualitative data in a single study. The primary rationale for employing a mixed research design is that (i) it enables us to collect the two types of data simultaneously; (ii) It is advantages to triangulate the data and hence, to enhance the reliability and validity of findings; (iii) A researcher can gain perspectives from the different types of data or different levels within the study; and (iv) Utilizing both approaches was allow for a more comprehensive study [46]. So, that it was an appropriate plan that enables to analyses gendered impacts of cereal crop price rise on multidimensional poverty, which was measure, interpret or explain depending on the scope and objectives of the study.

2.3 Sampling procedure and sample size determination

Purposive and multi-stage stratified sampling techniques was used jointly to select sample households and study area locations. First stage, North wollo administrative zone was purposively selected as study area because of they are characterized by most drought-prone, food insecure and poverty-affected areas in the region. Second stage, Ayina

Bugna woreda were selected purposively because of woredas are characterized by high levels of rural poverty, food insecurity, unpredictable rainfall pattern, flood, conflict, and recurrent drought.

To ensure the area coverage across market proximity, in third stage, we classified the whole kebele in to two main groups, near to woreda market ($\leq 20\text{km}$ from main town), and far from woreda market ($> 20\text{km}$ from main town). This classification is align with [47]. Hence, a stratified random sampling method was used to select three kebeles from each stratum, resulting in a total of six kebeles. In the fourth stage, disproportionate stratified sampling was used to select the sample respondents because female-headed households are underrepresented in rural Ethiopia. Female-headed households constitute only about 20–30% of rural households in the country [48-50]. We obtained the sample frame from the kebele administration office then we split all household into male headed and female headed households. Then systematic random sampling was used to pick sample household from each strata. The required sample size was determined by Yamane [51] as follows:

$$n = \frac{N}{1 + N * e^2} \quad (1)$$

Where: n = desired sample size for the study, N = total number of households in all Kebeles, e =level of precision.

$$\text{So, } n = \frac{6462}{1 + 6462 * 0.05^2} = 377$$

After calculating the overall sample size, the sample sizes for each Kebele was allocated proportionately based on their respective populations

$$n_i = \frac{n * N}{\sum N_i} \quad (2)$$

Where: N_i is the total number of households in the i^{th} Kebele, and n_i is the required sample size in the i^{th} Kebele.

Based on the above formula, the minimum sample size were 377. To achieve the stated level of precision, and considering the possible non-responses and non-valid answers the calculated sample sizes was increased by 5%. Following, the total sample size of 396 households were proportionally distributed to 6 Kebeles in the study area. Surprisingly, due to sample attrition in the second wave 19 (4.8%) of household excluded from analysis. We analyzed our result by 377 (95.2%) response rate (175 Female and 202 Male headed).

Table 1 Number of sampled households in each sample kebele

Proximity to main market	Kebele	Total Male HH	Total Female HH	Total HH	Sample HH	Male HH	Female HH
Near to main market ≤ 20 km	Lay Diba	780	233	1013	59	32	27
	Kidus harbie	741	185	926	54	29	25
	Birko	953	223	1176	69	37	32
Far from main market > 20	Zeblo	756	189	945	55	29	26
	Kobe	885	250	1135	66	35	31
	Debre Egzi	988	279	1267	74	40	34
		5103	1359	6462	377	202	175

Note: “FHH” refers to Female headed household, and “MHH” refers to male headed household.

Source: Author computation, 2024

2.4 Type and Sources of Data

For this study, primary and secondary data were used. Primary data were collected through face-to-face personal interviews using a structured questionnaire in two rounds cross-sectional panel survey data from the same household in the study area. Focus group discussion, key informant interview and field and market observation were also used to gather sufficient information and to capture relevant data from household and local markets. We organize two focus groups with 8-10 number of participants, and 4 key informant interviews in each survey round. The focus group discussions covered diverse groups of people from each community, with a focus on women, youth, mixed groups (gender, age, occupation, religion, etc), and those engaged in cereal production, and traders. Key informants included local administrators and other government officials, farmers, traders, consumers, and representatives of local organizations. Likewise, secondary data were collected from existing sources with intensive desk review of published and unpublished literatures such as peer reviewed journals, books, conference paper, and dissertations reports.. While

ethical considerations was seriously taken into account to ensure the protection of concern, integrity, consents and other human elements of the informants.

2.5 Method of data collection

This study used two round cross-sectional panel survey data from same sample households. The data for the first round was collected in September 10-30, 2024 G.C, and the data for second round was collected in August 01-20, 2026 G.C of the consecutive year. The data includes, information on household demographics, health, education, living standard, access to basic service, food and non-food consumption expenditure, and perceptions of wellbeing. Furthermore, it covers production and income data, the size, type and utilization of land, credit and savings, household assets (including livestock ownership and housing), employment status, remittances, public aid, and time preferences of households. In addition to the household survey data, monthly local market retail price data were collected by directly visiting cereals (teff, wheat, and sorghum) to the main market in the woreda. This approach provides a major advantage over estimating prices from households' reported expenditure patterns, as is common in comparable studies where reliable market price data are unavailable.

2.6 Methods of data analysis

Once the data is carefully checked and organized, demographic data were first examined using descriptive statistics to summarize key variables, followed by econometric modeling to identify causal relationships and to measure their magnitude.

2.6.1 Construction and Aggregation of the Rural Multidimensional Poverty Index (MPI)

Unlike multidimensional poverty index which was developed by UNDP in 2010 [52], this study used recent rural multidimensional poverty index developed by FAO & OPHI [53] which comprise five dimension and 18 indicators [53, 54]. Each dimension is equally weighted and each indicators in their corresponding dimension is also equally weighted. Household deprived in at least 0.333 of weighted indicators considered as multidimensionally poor. Each household is assigned according to his/her deprivation score out of 18 indicators. The maximum deprivation score is 100%, which each dimension weighted equally. Hence, in this study the maximum deprivation score for each dimension is 20%. While, the weight of each indicators vary across country and study area context. To identify the multidimensionally poor person, we summed the obtained deprivation score of the corresponding household. A cutoff 33% distinguish between poor and non-poor peoples. If the deprivation score is 33% or higher, that household is multidimensionally poor. Household with a deprivation score of 20% or higher but less than 33% are categorized as vulnerable to multidimensional poverty and a deprivation score equal to or lower than 20% is considered as non-poor. While, a deprivation score of 50% or higher are categorized as severely multidimensionally poor [9, 55].

Headcount ratio, (H), or incidence of poverty shows the share of multidimensionally poor peoples in the population and can be calculated as follows:

$$H = \frac{q}{n} \quad (3)$$

Where q the number of people who are multidimensionally poor and n is the total population.

Intensity of poverty, (A) indicates average proportion of the weighted component indicators in which multidimensionally poor people are deprived [55].

$$A = \frac{\sum_{i=1}^q s_i}{q} \quad (4)$$

Where s_i the deprivation score that the i^{th} multidimensional poor person experiences, q is the number of people who are multidimensionally poor.

Adjusted R-MPI is the product of incidence of poverty and the intensity of poverty:

$$R - MPI = H * A \quad (5)$$

Contribution of each dimension and indicator to rural multidimensional poverty:

As expressed by UNDP & OPHI [55], percentage contribution of each dimension to multidimensional poverty can be expressed as:

$$\text{Contrib}_d = \frac{\sum_{j \in d} w_j h_j}{R - MPI} * 100 \quad (6)$$

Where d each dimension of poverty, w_j is weighted assigned to each indicator j , h_j is the censored headcount rate of indicator j which refers to the proportion of people who are multidimensionally poor and deprived in that indicator and R-MPI is adjusted rural multidimensional poverty index.

$$\text{Contribution of each indicators} = \frac{h_j * w_j}{R - MPI} * 100 \quad (7)$$

Where h_j the censored headcount ratio is computed by adding up the number of people who are poor and deprived in that indicator and dividing by the total population, w_j is the weight of j^{th} indicator, and R-MPI is the adjusted headcount poverty [54].

Table 2 Dimensions, indicators and weights of R-MPI

Dimension	Indicators	Deprived if....	Weight
Education	Years of schooling	No HH member have completed eight years of schooling	.1
	School attendance	No school-aged child in HH attending school	.1
Food security & nutrition	Food insecurity	Food security status is above mildly food insecure category	.1
	Child mortality	At least one child in HH member died in the last five years	.1
Standard of living	Housing	Roof not covered with galvanized steel but thatched by grass.	.04
	Sanitation	No adequate toilet, or improved are shared with others.	.04
	Cooking fuel	Uses firewood, charcoal, crop residue, and cow dung.	.04
	Drinking water	No access safe drinking water or located above 30-min	.04
	Electricity	No access to electricity, biogas, or solar energy	.04
Rural livelihood and resource	Extension Service	No members have access to extension services.	.0286
	House	No house or land for a house in the nearby town.	.0286
	Land Holding	Do not own land more than local average.	.0286
	Livestock Holding	Do not own livestock more than local average (in TLU).	.0286
	Social Protection	No HH enrolled in any social protection programme	.0286
	Child Labour	Child below 7 years of age is engaged in employment.	.0286
	Assets	Do not have more than one TV, radio, cassette player, mobile phone, hand insecticide pump, water pump, fridge, bike, or and do not have a vehicle	.0286
Risk	Credit denial	Did not provide credit due to inadequate reasons.	.1
	Risk exposure & coping mechanism	HH affected by drought related shock, high agricultural input costs, high food prices or non-adequate coping strategies like, selling agricultural land, reducing meal quantities/frequency, and taking on exploitative work arrangements.	.1

Note: “HH” refers Household Adapted from [53-55]

2.7 Construction of household specific price index

Unlike previous studies [56-59], which use consumer price index this study used household specific price index like [31, 32, 60]. Consumer price index is designed to reflect the average price change experienced by entry population or country as a whole using single, generalized goods and service based on regional aggregate expenditure survey. In this way expensive goods and service bought by rich household influence the weight because it aggregates total spending of goods and service in the entire population. So, consumer price index represent average price [58]. While household specific price index is built for evaluating the performance of specific groups of peoples by using actual purchasing goods and service. The weight are linked to their corresponding household budget [31, 61].

As written by Mukasa [32], in order to develop Laspeyres-type of household specific price index we use household cereal budget share response and monthly cereal crop price data. First, we obtain household cereal consumption budget share from our household survey that was collected in September, 2024 (round one) and August 2026 (round two). We also obtain monthly cereal crop price data that was collected from main woreda market of the study area. So, we

use September 2024 as base year's price and remaining average month price as current price (average price October 2024 to August 2026). Then we have a base year price and we construct a current price so, according to Mukasa [32], it is possible to calculate the price relative of each cereal crops using the formula:-

$$P_r = \frac{P_{it}}{P_{i0}} \quad (8)$$

Where P_r price is relative, P_{it} is base year price and P_{i0} is current year's price. After gaining a relative price of each major cereal crops it is possible to construct household specific price index for each individual by this formula:-

$$HSCPI_{ht} = \sum_i^3 w_{ih} \left(\frac{P_{it}}{P_{i0}} \right) * 100 \quad (9)$$

Where $HSCPI_{ht}$ Household specific cereal price index of each household, w_{ih} is weight of i major cereal crops (teff, wheat and sorghum) for each h household.

2.8 Estimating price impact on MP poverty

Previous empirical studies have examined the impact of food and cereal price changes on poverty and household welfare using different analytical methods and datasets. For example, Dessus et al. [62] employed the Compensating Variation (CV) method to measure the income required to maintain household welfare after price increases, highlighting that rising food prices can substantially reduce real purchasing power among poor households. Likewise, [63] and [27] used Computable General Equilibrium (CGE) models based on Social Accounting Matrices to simulate the economy-wide effects of food price shocks on poverty and income distribution in Ethiopia. Moreover, Gelaw & Sileshi, [25] used random effect model show that a one-percent rise in grain prices is expected to increase the incidence of poverty, the poverty gap and the severity of poverty by 0.25%, 0.13% and 0.08%.

While this study adopts a different methodological approach particularly, a fixed effects econometric model is employed to achieve the main research objectives. By applying a fixed effects model, the study attempts to isolate the specific impacts of cereal crop price increase on multidimensional poverty and it dimensional deprivation score while controlling for other household and socioeconomic factors that may also influence poverty outcomes [64].

Moreover, when our dependent variable is categorical we use multi-threshold linear probability model with fixed effect over logit or probit model because of two main reasons. First, they control incidental parameter problem, [65, 66]. Second, using and interpreting interaction term in non-linear model like probit or logit is very complex and misleading as the sign and magnitude of interaction coefficients vary across covariates [67, 68]. So, in order to investigate the impacts of cereal crop price rise on various depth of multidimensional poverty we apply Multi-threshold linear probability model with fixed effect. Following cumulative probability approaches for ordinal outcome we classify of multidimensional poverty status in to (0= Non-poor, 1= Vulnerable, 2= multidimensionally poor and 3= severely multidimensionally poor) in to three distinct binary threshold:

Threshold 1 (At least Vulnerable): $Y_{1t}=1$ if the category ≥ 1 (Vulnerable to MP, MP and Severely MP) otherwise 0. This estimate the probability of non-poor falling to vulnerable category.

Threshold 2 (At least MP): $Y_{2t}=1$ if the category ≥ 2 (MP and Severely MP) otherwise 0. This estimate the probability of non-poor and vulnerable household falling in to official Multidimensional poverty.

Threshold 3 (At least Severely MP): $Y_{3t}=1$ if the category $=3$ (Severely MP) otherwise 0. This isolates the extreme tipping point, estimating the probability of less-deprived households collapsing into deep destitution. We apply this econometric specification as follows:

$$Y_{ijt} = \alpha + \beta_{it}x_{it} + \mu_i + \varepsilon_{it} \quad (10)$$

In this study, Y_{it} denotes the poverty of individual i at time t (measured by MP Poverty status and deprivation score), x_{it} includes time-varying factors affecting poverty. The term μ_i captures unobserved time-invariant factors not explicitly measured.

Furthermore, to differentiate their impact between male and female headed household we use an interaction terms like used by [29, 69]. We apply this econometric specification:

$$Y_{ijt} = \alpha + \beta_1 x_{it} + \beta_2 (x_{it} * Gender) + \mu_i + \varepsilon_{it} \quad (11)$$

Where, β_1 Measure the impacts of cereal crop price rise on falling to any poverty threshold j for male headed household, β_2 capture the differential effect of cereal price rise between male and female headed household. A positive and statistical significant result of β_2 indicates that female headed household face higher probability of falling to a given poverty threshold. Furthermore, $(\beta_1 + \beta_2)$ indicates that the total impacts of cereal crop price on female headed household.

Table 3 Variable, type and measurement, and literature

Variable	Type and measurement	Literature
Age	Continuous (number)	[29]
Education_HH	Continuous (grade)	[29, 70]
Family size	Continuous (Number)	[25, 71]
Dep_ratio	Continuous (Number)	[29]
Livestock (TLU)	Continuous (TLU)	[25, 29]
Farm size (Hec)	Continuous (Number)	[25, 29, 71]
No any oxen	Dummy (1=yes; otherwise=0)	[29]
Price of fertilizer	Continuous (In ETB Birr)	[25]
Exten_contact	Dummy (1=yes; otherwise=0)	[25, 70]
Off/non-farm activity	Dummy (1=yes; otherwise=0)	[70, 71]
Annual income	Continuous (In ETB Birr)	[25]
Net buyer of food	Dummy (1=yes; otherwise=0)	[29]
Production shock	Dummy (1=yes; otherwise=0)	[25]
Access to credit	Dummy (1=yes; otherwise=0)	[25, 70]
Access to aid	Dummy (1=yes; otherwise=0)	[71]
Remittance	Dummy (1=yes; otherwise=0)	[71]
Bank Service	Dummy (1=yes; otherwise=0)	[29]
Lack of Transportation	Dummy (1=yes; otherwise=0)	[72]
Lack of Market Linkage	Dummy (1=yes; otherwise=0)	[72]
Access to Irrigation	Dummy (1=yes; otherwise=0)	[25]
Log cereal price index	Continuous (Log price index of (Teff, Wheat, Sorghum))	
Dependent variable		
MP Status	Categorical	
Deprivation score	Continuous	

Source: Author compilation, 2024

Chapter 3: Results and discussion

This section present descriptive statistics, price movement, multidimensional poverty profile of household and empirical results. Finally they conclude and put relevance policy implication.

3.1 Descriptive Statistics

Table. 4 Characteristics of the sampled household over years by the gender of the household head.

Household head	Female headed		Male headed		Mean differ (Female- Male)	
Variable	N=175		N=202		Mean differ and t-value	
	2024	2026	2024	2026	2024	2026
Age	42.77 (11.07)	44.77 (11.07)	42.22 (11.11)	44.22 (11.11)	0.55 (0.48)	0.55 (0.48)
Dep_ratio	2.08 (1.01)	2.12 (1.04)	1.78 (0.99)	1.89 (0.95)	0.3*** (-2.87)	0.23** (-2.3)
Family Size	4.08 (1.38)	4.16 (1.26)	3.9 (1.507)	3.98 (1.25)	0.18 (-1.29)	0.18 (-1.39)

TLU	1.68 (1.73)	1.43 (1.57)	1.9 (2.29)	1.86 (2.22)	-0.22 (1.043)	-0.43** (2.15)
Land size	0.66 (0.39)	0.64 (0.38)	0.75 (0.46)	0.76 (0.46)	-0.096** (2.14)	-0.122*** (2.77)
Education_HH	3.56 (3.78)	3.6 (3.8)	5.76 (5.28)	5.8 (5.3)	-2.2*** (4.59)	-2.2*** (4.55)
ln(Annual income)	11.36 (0.39)	11.39 (0.4)	11.4 (0.43)	11.5 (0.41)	-0.08* (1.8)	-0.106** (2.52)
Log_Cereal_price	1 (0)	1.57 (0.063)	1 (0)	1.48 (0.07)	0 (0)	.09*** (-12.53)
Price_Fertilizer	1919.4 (1358.9)	3741.7 (2275.5)	1675.25 (1391.38)	3401.24 (2405.69)	244.18* (-1.7179)	340.47 (-1.4052)

Note: Standard deviations are in parentheses under the means; t-statistics are in parentheses under the Mean Difference column. *p < 0.05, **p < 0.01, ***p < 0.001. Source: Authors household survey, between 2024 & 2026.

On average female-headed household have 0.3 and 0.23 higher dependency ratio than male-headed household in both survey round respectively. Moreover, they also have 2 years lower education attainment than male-headed household. This low education attainment might leads female-headed household to low adaptive capacity and barraging power than male household. Additionally, female-headed household also have lower land and livestock than counterparts. Male-headed household on average 0.76 hectares of land than 0.66 for female headed. Male headed also 0.43 higher TLU than counterparts. As land and livestock are main income source for large proportion of rural population the observed mean difference in those resource can leads female headed household more disadvantage and more vulnerable to economic shock than male headed household. Furthermore, price of fertilizer double for both group, household specific price index affect differently. Female headed household rise their cereal price index by 1.57 than 1.48 male. This indicates that female-headed household have lower market integration, lower bargaining power as compared to male headed. While price of fertilizer affect equally and increase universally, cereal price rise coincide with lower annual log income disproportionally affect female-headed household.

Table. 5 Household Budget Share Analysis over years by Gender of household

Household head	Female headed		Male headed		Mean difference (Female-Male)	
Variable	N=175		N=202		Mean difference and t-statistics	
	2024	2026	2024	2026	2024	2026
Cereal Budget share (%)	55.5 (0.148)	63 (0.123)	52.2 (0.149)	57 (0.1462)	3.3*** (-2.35)	6*** (-4.22)
Other Food Budget Share (%)	21.6 (0.061)	19.8 (0.069)	22.4 (0.062)	22.9 (0.078)	-0.8* (1.653)	-3.1*** (4.07)
Non Food Budget Share (%)	22.9 (0.095)	17.2 (0.067)	25.4 (0.097)	20 (0.079)	-2.5*** (2.57)	-2.8*** (3.67)

Note: Standard deviations are in parentheses under the means; t-statistics are in parentheses under the Mean Difference column. *p < 0.05, **p < 0.01, ***p < 0.001. Source: Authors household survey, between 2024 & 2026,

As presented in Table. 5, they have gender disparity between cohort's in terms of household budget share allocation to cereal foods, other food and non-food. While the share of cereal food budget increase for both cohorts the magnitude of this budget, adjustment is asymmetric. Female-headed household share on average large proportion of their income for cereal food shares as compared to male headed with increasing their gap from 3% in 2024 to double in 2026. This shows that those female-headed households' more affected by cereal price inflation and highly dependency on staple crops to fulfil their caloric requirement than counterparts are. Moreover, this expenditure more on food consumption asserts the Engel's law that, states that a poor household allocate large proportion of their income to food. As cereals price increase their proportion of share budgets, spending on both other food (like pulse, oil, meat, and etc) and non-food (like health, education, nutrition, clothe and etc) compromised sharply, exposing severe consumption trade-offs within the household economy. This indicates that when the price of major staple crops rise female headed household forced to restrict expenditure on non-food budget items as compared to male-headed household.

Table. 6 Descriptive Statistics of dummy variable by Gender of Household Head over years

Household head	Female headed		Male headed		Proportion difference (Female- Male)	
Variable	N=175		N=202			
	2024	2026	2024	2026	2024	2026
No any oxen%	111 (63.4)	123 (70.3)	87 (43.07)	94 (46.5)	5.15*** (20.33)	5.23*** (23.8)
Net buyer position%	129 (73.71)	155 (88.57)	125 (61.88)	146 (72.27)	2.44*** (11.83)	3.93*** (16.3)
Credit exclusion (%)	108 (61.7)	125 (71.43)	91 (45.05)	102 (50.5)	3.23*** (16.65)	4.31*** (20.93)
Lacked Market Linkage (%)	100 (57.14)	146 (83.43)	64 (31.68)	87 (43.07)	4.97*** (25.49)	8.04*** (40.36)
Lack Transportation Service (%)	52 (29.71)	135 (77.14)	49 (24.26)	143 (70.8)	1.19 (5.45)	1.4 (6.34)
Experienced Production shock%	50 (28.6)	115 (65.71)	46 (22.77)	145 (71.78)	1.29 (5.83)	-1.27 (6.07)
Did not Received Remittance%	132 (75.43)	107 (61.14)	179 (88.6)	170 (84.16)	-3.36*** (-13.17)	-5.05*** (-23.02)
Did not Received aid %	67 (38.3)	48 (27.43)	127 (62.87)	117 (57.92)	-4.76*** (-24.57)	-5.95*** (-30.49)
Did not use Chemical Fertilizer%	82 (46.85)	133 (76)	65 (32.17)	106 (52.47)	2.91*** (14.68)	4.73*** (23.53)
Had not Extension contact%	113 (64.57)	125 (71.43)	68 (33.66)	86 (42.57)	5.99*** (30.9)	5.63*** (28.85)
Did not use irrigation%	123 (70.3)	145 (82.8)	114 (56.4)	131 (64.8)	2.78*** (13.9)	3.94*** (18)
Did not Participate in off/non-farm activity%	141 (80.57)	147 (84)	125 (61.88)	138 (68.3)	3.97*** (18.69)	3.54*** (15.68)

Note: Parentheses indicate percentages under absolute participant count. For proportion differences, parentheses denote percentage point gaps beneath absolute z-statistics values. Source: Authors household survey, between 2024 & 2026.

Our survey result shows that while the proportion of net buyer position of household is higher in the baseline survey (2024) their gap between male headed and female headed also remain wide. In 2026 survey round, about 88.5 % of female-headed household occupied as net buyer position compared to 72.3% of male-headed household and the gap between male and female-headed household significantly increased to 11.83-percentage points to 16.3-percentage point. Microeconomic theory suggests that rural households can resist price inflation by scaling up production to generate a positive income effect. However, households in our study area were structurally unable to respond in this way. This was due to the onset of drought caused by delayed summer rainfall at the end of 2024, and ongoing conflict that began in mid-2023 [39].

Furthermore, in both survey round the proportion of female-headed household deficit from use of fertilizer, extension contact, and irrigation is higher by 14.68, 30.9 and 13.9 percentage point respectively than male-headed household is. Additionally, more male-headed household participation in credit service and have better market link as compared to their counterparts. This gap was again widen in second wave between household (Table. 6). This implies that only small numbers of female-headed household are accesses in fertilizer, extension contact and irrigation respectively. Therefore, while climate induced and conflict affect groups symmetrically, access to fertilizer, extension contact and irrigation locked female headed household into low productivity, low output, and low-yield and ultimately low bargaining power as compared to male household, when the price if major staple crops spike. Despite to this female-headed household accessed more to remittance and aid as compared to male household. Because remittance and aid are defensive rather than transformative, they failed to build resisted economy.

3.2 Cereal Price Dynamics and Market Volatility: 2024–2026

3.2.1 Price Trends and Market Volatility

Between the survey years, substantial price volatility shown Fig. 2 in major staple crops of teff, wheat and sorghum in the study area. The monthly cereal crop price data from January 2024 to August 2026 shows that price of teff raised by 93% from the base years and price of wheat and sorghum also raised 122% and 100% respectively. As shown in Fig. 2, in mid-2025 major price volatility shown where a rapid price increment in single quarters. This was done because of confluence of shock has been occurred in the area. As written by WDU, [39], ECHO, [37], APA news, [73] at the end of 2024 a massive humanitarian shock caused by drought, flood and armed conflict was occurred in Ayina Bugna woreda. While, erratic rainfall and flood devastated crop and livestock production, armed conflict severely disrupted aid distribution, credit access, input delivery and agricultural markets. This prevented farmers from acquiring vital seeds and fertilizers for their planting seasons and many farmers shift to net buyer position and make it market dependent. Ultimately, price of major crops rise rapidly and left tens of thousands of resident's particularly female-headed household suffered immensely from acute hunger. In addition to local conflict and drought highly increasing growth of money in the country, overestimation of the cereal production and balance of payment and foreign exchange crisis increase price of such crops [74].

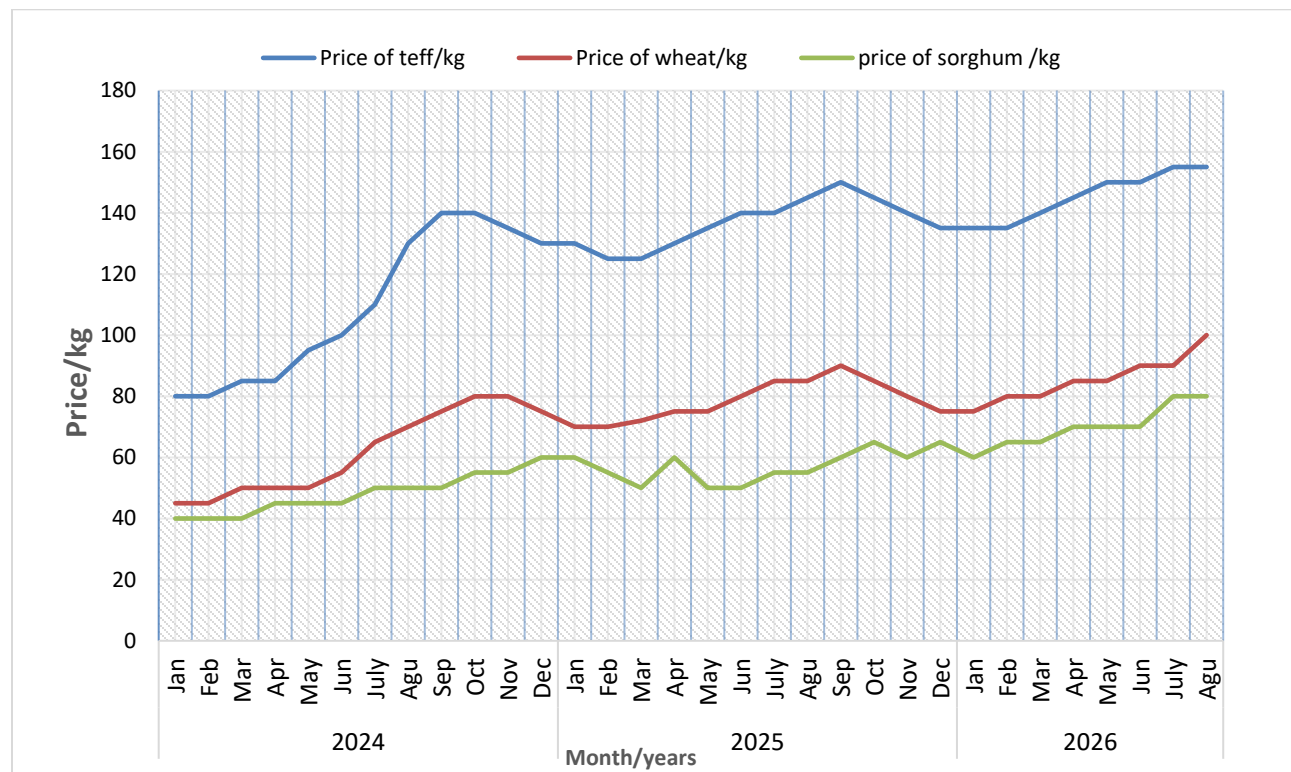
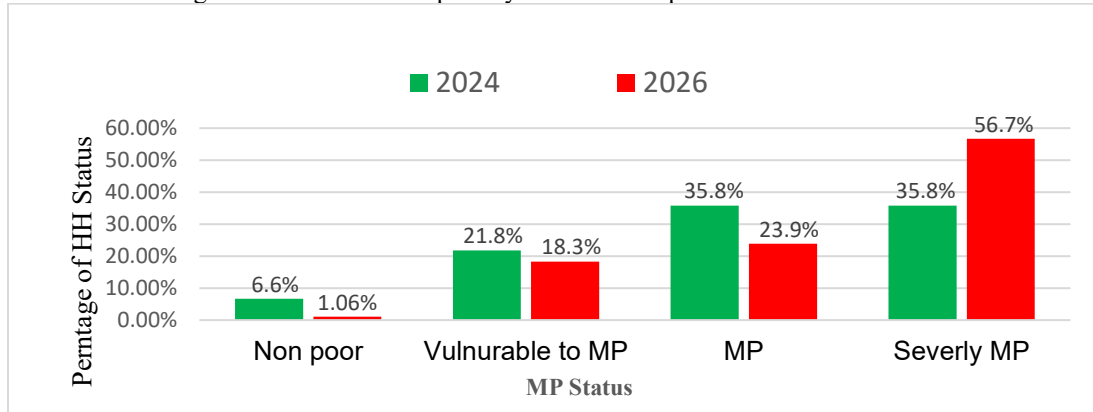


Fig. 2 Monthly Price Trends of Major Cereal Crops in Ayina Bugna Woreda (Jan 2024 =100)
Source: Author's field survey and market monitoring data (2024–2026)

3.3 Multidimensional Poverty Profile of Rural Households

In this study, the R-MPI framework is adapted from [53], with some indicators modified to better reflect our countries context. Following the Alkire Foster framework, a people categorized as poor if it deprived in at least 33.3% of the weighted indicators. People deprived in 20% out of 33.3% indicators considered vulnerable to multidimensional poor, those below 20% are considered as non-poor, while those deprived in 50% or more are classified as severely multidimensional poor. The R-MPI measures rural multidimensional poverty is outcome of its incidence (H) and intensity (A), defined as $M_0 = H \times A$. R-MPI is measured for rural areas only, using the national definitions of rural areas endorsed by the national statistical agencies [75].

Fig. 3 Multidimensional poverty status of Sample household 2024-2026



Source: Authors' computations, 2026

Fig. 3 presents headcount ratio of poverty across survey rounds using varying poverty cut-offs (k). It categorize the sample in to four mutual poverty groups: non-poor, vulnerable to multidimensional poverty, multidimensionally poor, and severely multidimensionally poor based on their deprivation scores. As shown in Fig. 3, in the 2024, the proportion of peoples categorized as non-poor, vulnerable to poverty, multidimensionally poor, and severely poor were 6.63%, 21.75%, 35.8%, and 35.8%, respectively. However, a notable shift observed in the 2026, which is gathered after three years. The proportion of non-poor declines to 1.06%, while the proportion of the vulnerable to multidimensional poverty and official multidimensional poverty also decrease to 18.3% and 23.9%, respectively. In contrast, the incidence of severely multidimensional poverty increases markedly, rising by approximately 22 percent compared to the previous, reaching 56.7%. This indicates that large numbers of peoples are experiencing deprivation across multiple indicators at the same time. Overall, the results shows that higher levels of poverty headcount ratio are tight with a decreasing proportion of non-poor and vulnerable peoples, while concentration of deprivation compressed to severely multidimensional poverty.

Based on the previous varying cut-off results more than 70% of the sample population identified as multidimensionally poor in each round. The intensity of poverty rises from 0.51 in to 0.59 in round two, implying that the average poor person deprived in just over half of the weighted indicators initially, increasing to nearly 60% over time. In parallel, the headcount ratio increases from 0.71 to 0.81, indicating that nearly four out of five sample population is multidimensionally poor in 2026. This result reveals that poverty is not only high but also spreading across a larger proportion of rural households. Consequently, the R-MPI rises from 0.36 to nearly 0.48 in 2026, capturing both the expanding headcount ratio and intensifying severity of deprivation. The overall result is align with 72% of national headcount ratio, 53.5% of intensity and 0.367 of overall MPI [9].

Table 7 Overall Household Multidimensional Profile.

Year	Incidence of poverty (H)	Intensity of poverty (A)	Adjusted Headcount Ratio ($M0$)= $H \cdot A$
2024	.714476	.507880	.362868
2026	.813968	.592622	.482375

Source: Authors' computations, 2026

3.3.1 Gender-Differentiated Analysis of Multidimensional Poverty

Table 8 Gender-Disaggregated Multidimensional Poverty status in Ayina Bugna Woreda

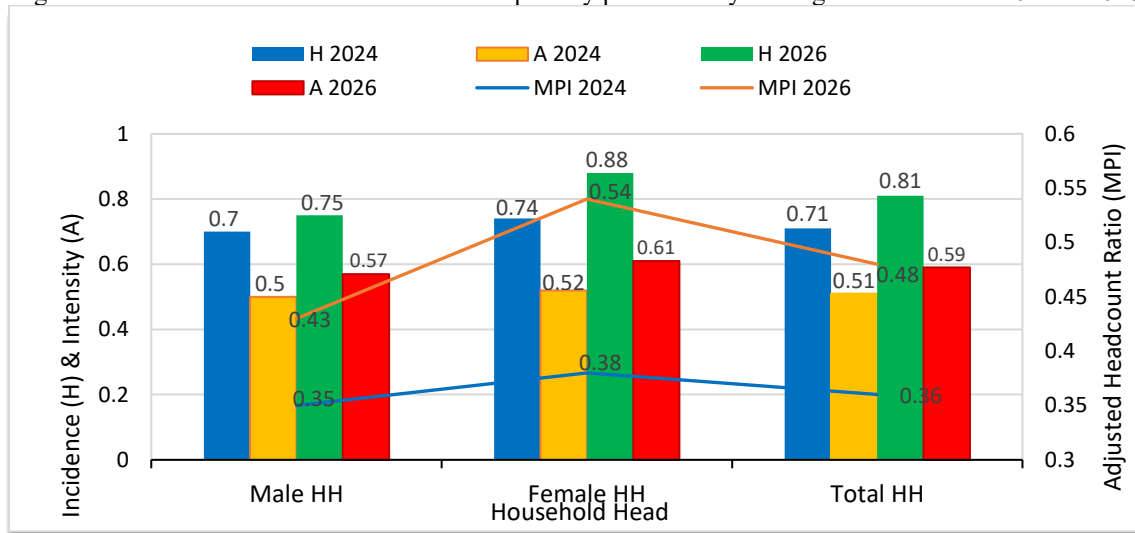
Year	2024		2026	
MP Status	Male HH N=202	Female HH N=175	Male HH N=202	Female HH N=175
Non-poor	8.4%	4.6%	2%	0%
Vulnerable to MP	22.8%	20.6%	23.3%	12.6%
Multidimensionally poor	35.6%	36%	26.2%	21.1%
Severely MP	33.2%	38.8%	48.5%	66.3%

Source: Authors' computations, 2026

Table 8, discussed gender disaggregated incidence of poverty across survey years using varying poverty cut-offs (k). As presented in the table, by 2026, the shares of non-poor for female-headed households is completely decreased to 0%, while their share to severely multidimensional poverty rapidly increased to 66.3% show additional 9.6% above the total household average of 56.7% (Fig. 3). Additionally, the shares of non-poor male-headed households reduced to 2.0% and increasing their severe poverty to 48.5%, which sits -8.2% below the total household result. This shift is further illustrated by severe poverty gap between male and female headed household, which more than triples from 5.6% in 2024 (33.2% for male heads vs. 38.8% for female heads) to 17.8% in 2026 (48.5% for male heads vs. 66.3% for female heads). The overall result shows that the incidence poverty is increased unequally; inadequate land, shortage of labor, inadequate access to credit, lower market integration leave female headed household more exposed compared to their counterparts.

When we show the incidence (H), intensity (A), and adjusted headcount ratio (M0) by gender-disaggregated the results reveal that while multidimensional poverty is widespread across the entire sample, female-headed households (FHHs) systematically affected more than male-headed households (MHHs).

Fig. 4 Gender-differentiated Multidimensional poverty profile of Ayina Bugna woreda from 2024 to 2026



Source: Authors' computations, 2026

As we shown in Fig. 4 in the first wave, female-headed households already have higher poverty headcount ratio (H) of 74% and an intensity (A) of nearly 52%, with the adjusted R-MPI (M0) of 0.38. Comparably, male-headed households also have large but lower than female-headed baseline poverty headcount ratio of 70%, an intensity of 50%, and an adjusted R-MPI score of 0.35. This lower initial disparity show that female headed household are already multidimensionally poor than male headed even before the occurrence of 2024 drought and conflict in the study area.

By 2026, after the introduction of severe shocks like drought, production shock, and conflict and surgical rise of major food and non-food items including cereal crop in the study area substantial prevalence of poverty registered for male and female-headed households but the prevalence of poverty is asymmetric between groups. The percentage of poor female-headed households increased by 14%, reaching headcount ratio (H) of 88%. Similarly, the intensity of female-headed household raised to 61% (A) of the weighted indicators. The adjusted R-MPI (M0), which drive from incidence and intensity, reached to 0.54 from 0.38 in the baseline data. Simultaneously, male-headed households also experienced notable shift with 75% incidence and 57% intensity, leading to an increased adjusted headcount R-MPI to 0.42 from 0.35 (Fig. 4). This result indicates that when a confluence of shock occurred [39] in vulnerable area like Ayina Bugna the prevalence of multidimensional poverty spread rapidly.

3.3.2 Decomposition of Multidimensional Poverty by Indicator and Dimension Contribution

Understanding the contribution of each dimension and indicator to poverty is need prior attention for targeted poverty reduction strategies. As presented in Table 8, the empirical results indicate that the Risk dimension reveals the largest and fastest-growing share of total deprivation across both groups. For Male-Headed Households, the contribution of Risk dimension raised from 24.44% to 27.7% by 2026, while for Female-Headed Households (FHH), expanded even more largely, from 26.46% to 30.14% by 2026.

On the other hand, the rural livelihood dimension shows a relative decrease across both groups, decrease roughly 25% in 2024 to approximately 20% in 2026 (Table 9). Unfortunately, this reduction occurred in relative contribution rather than decrease in absolute deprivation. These occur because of two main reasons. First, other dimensions specifically food security and nutrition and risk dimension show a high and rapid increment in their censored headcount ratios, thereby raising their weight in the overall poverty and crowding out the relative share of other dimension. Second, notable increase in the adjusted multidimensional poverty create a statistical denominator effect, whereby dimensions with comparatively slow growth account for a reduced proportion of total deprivation [76]. When we illustrate the contribution of indicators across male and female head, credit denial and food insecurity indicators show higher proportion with a large gap between male and female heads. Credit denial accounts 15.64% of total multidimensional poverty among female-headed households in 2026, compared to 14.51% for male-headed households. This result confirms that credit denial severely compromise the capacity of female heads to navigate systemic covariate shocks. Similarly, the relative burden of Food Insecurity rose to 14.3% for FHHs, compared to MHHs (13.4%). This shows that nutrition related deprivation is strongly different between male and female. Highlighting that when local food supply shocks hit and women-led households face significantly increase their poverty level (Table 9).

Table 9 Percentage contribution of each indicators and dimention to R-MPI by gender of household head.

		Male headed				Female headed			
Dimension	Indicator	Indicators contribution to R-MPI (%)	Dimension Contribution to R-MPI (%)	Indicators contribution to R-MPI (%)	Dimension Contribution to R-MPI (%)	Indicators contribution to R-MPI (%)	Dimension Contribution to R-MPI (%)	Indicators contribution to R-MPI (%)	Dimension Contribution to R-MPI (%)
		2024		2026		2024		2026	
Education	Years of schooling	8.03	11.65	7.12	12.35	7.30	11.37	5.54	10.5
	School attendance	3.62		5.23		4.07		4.96	
Food security and Nutrition	Child mortality	3.46	15.45	3.42	16.85	2.64	15.06	3.24	17.53
	Food insecurity	11.99		13.4		12.41		14.3	
	Housing	5.49	23.49	4.25	22.17	4.93	21.99	4.35	21.84
	Sanitation	4.5		4.53		4.62		4.90	
Standard of living	Cooking fuel	6.93		5.69		6.62		5.45	
	Drinking water	5.01		5.90		4.56		5.02	
	Electricity	1.56		1.79		1.26		2.12	
	Assets	4.01	24.96	3.40	20.93	4.23	25.49	3.06	19.98
	House	5.23		4.28		5.66		4.33	
Rural Livelihood and resource	Land Holding	2.41		2.69		2.89		2.47	
	Livestock Holding	2.50		2.40		2.66		2.19	
	Social Protection	3.23		2.64		2.63		1.66	
	Child Labour	3.64		2.99		3.78		3.57	
	Extension Service	3.94		2.53		3.64		2.70	
Risk	Credit Denial	12.84	24.45	14.52	27.7	14.35	26.1	15.64	30.15
	Risk exposure and coping strategies	11.61		13.2		11.75		14.51	
		100	100	100	100	100	100	100	100

Source: Authors' computations, 2026

3.4 Estimate Cereal price rise impact multidimensional poverty

Before estimating our regression result Multicollinearity of between variable checked using variance inflation factors. The result shows that there is no Multicollinearity as all the VIFs are below ten, which is the rule of thumb [77]. We also check hetroskedasticity and normality distribution of our data. Result shows there is no hetroskedasticity and normality problem. Furthermore, In order to investigate the impacts of cereal price rise on different outcome of multidimensional poverty both random and fixed effect model executed. A formal Hausman [78], specification test was employed between the two models for testing the null hypothesis that the time-invariant household characters are uncorrelated with the control variables. As shown in the table the Hausman test result indicates Chi-square = 48.43 with p-value 0.000 and this shows that strongly reject the null hypothesis at 1%. This indicates random effect model is inconsistent because of correlated with unobserved household characteritics and fixed effect model is consistent.

Table 10 Hausman Goodness of model-fit test results

Hausman Goodness of model-fit test results
Chi-square = 48.43
Prob > chi2 = 0.0000
Decision: Reject H0. The Fixed Effects model is preferred.

Econometric results

In this section, we estimate impacts of cereal crop price rise on household multidimensional poverty. Two-outcome variable used for analysis, namely multidimensional poverty status and Deprivation score. We also estimate their impact on each dimension of poverty. As discussed in the methodology, Multi-threshold linear probability model with fixed effect was used to estimate the effect of cereal crop price rise on different category of poverty and linear probability model with fixed effect was used for estimating cereal price rise on overall deprivation score and dimensional deprivation score. The result of the analysis presented in (Table 11) and (Table 12). However, this study primarily focuses on estimating the impacts of cereal price rise on multidimensional poverty status rather than examining its underlying determinants. Therefore, this section provides only a brief description of these variables without an in-depth discussion.

The multi-threshold linear probability model in Table 11) shows that multidimensional poverty significantly influenced by several factors. These include high prices for major cereal staples and households' status as net food buyers. Local transport shortages and disrupted market linkages also play a role. Ownership of oxen, exposure to household production shocks, and higher fertilizer prices further matter. In addition, blocked bank services and lack of access to personal bank accounts contribute to multidimensional poverty. These factors are increasing the probability of household crossing to each threshold of poverty. On the other hand, TLU, access to aid and credit can reduce probability of crossing to official multidimensional poverty and severely MP threshold.

Overall poverty effect:- the model result of Table 11), shows that holding other variables constant, a 10% increase in price of cereal crops has increasing the probability of household falling to at least multidimensional poverty threshold by 2.3 percentage point, and 3.7 percentage point to at least severely multidimensional poverty category. While there, is an insignificant effect for non-poor household (at least vulnerable) falling in to vulnerability threshold? The impacts of this cereal crop price rise on different threshold of poverty indicates that there is inequality in net position status, and cereal budget share. Non-poor household are allocate a small portion of income for cereal budget share, when the price of such crops rise they require minor adjustment and even they are benefiting from rising price of such crops. Therefore, they can easily absorb the price of such crops through farm revenue gain or selling asset. Conversely, most of multidimensionally and severely multidimensional poor household in developing countries are net food buyers and who spend about 60% of their budget for staple crops (Table. 5). Consequently, cereal price increases are worsen for the poor, forcing severely poor in to reducing food intake and this is attributed to the rural poor.

The result get from the focus group discussion confirm this empirical result. The “participant says that our production largely decreased because of continuous conflict, recurrence of drought, unable use of fertilizer due to high cost plus shortage of delivery in the area. While ongoing conflict limit their agricultural activity, their movement, their market

linkage, blocked bank service with their own account, now we can't mobilize our account, "our birr is still blocked in bank" for the last three years, drought has also devastated their agricultural production especially in 2024 production season. They say that staple crops, mainly teff, sorghum, barley, beans, and wheat, have been particularly affected, leaving farmers without sufficient food supplies. The production is already affected by a confluence of shock and our market system is disrupted by different instability ultimately price of our major cereal crop rise sharply. Who says that "We are unable to afford this price and finally we are forced to live in hunger".

The finding is consistent with [25], the result states that a 1% rise in grain prices is expected to increase the incidence of poverty, the poverty gap and the severity of poverty by 0.25%, 0.13% and 0.08%, respectively. Additionally, the result also agree with [79] his finding shows that maize price increases have unequivocal deleterious effects on the incomes of rural households experience differential impacts. Net seller households in rural areas benefit from price increases while poor household are affected from maize price rise.

Table 11 Multi-Threshold LPM with fixed effect result of Cereal price impact on different category of multidimensional poverty.

Variable	At leas Vulnerable	At least MP	At least MP
Log_Cereal_price	0.107 (0.091)	0.239 (0.07)***	0.375 (0.074)***
TLU	0.014 (0.014)	-0.017 (0.010)	-0.018 (0.011)*
Dep_ratio	-0.008 (0.046)	-0.023 (0.042)	-0.019 (0.045)
Net_buyer_food	0.099 (0.059)*	0.287 (0.047)***	0.288 (0.051)***
Land size	0.076 (0.091)	-0.036 (0.084)	-0.080 (0.090)
Lack Transport	0.167 (0.072)**	0.341 (0.055)***	0.313 (0.06)***
Lack_Mkt_linkage	-0.030 (0.038)	0.093 (0.032)***	0.078 (0.033)**
No_Any_oxen	0.275 (0.079)***	0.353 (0.062)***	0.302 (0.063)***
Production Shocks	0.396 (0.067)***	0.115 (0.035)***	0.133 (0.036)***
Non_farm_income	0.025 (0.039)	0.018 (0.033)	0.034 (0.034)
Access_to_Credit	-0.096 (0.087)	-0.170 (0.069)**	-0.131 (0.072)*
Use_Irrigation	0.009 (0.069)	0.009 (0.058)	0.011 (0.060)
Blocked account	0.248 (0.093)***	0.377 (0.089)***	0.327 (0.090)***
Price_of_fertilizer	0.207 (0.058)***	0.245 (0.040)***	0.084 (0.053)
Access_to_aidd	-0.022 (0.047)	-0.058 (0.036)	-0.084 (0.037)**
Accesssto_REM	0.060 (0.042)	-0.046 (0.050)	0.036 (0.050)
Exten_contact	-0.054 (0.082)	0.058 (0.068)	0.067 (0.072)
_cons	-0.444 (0.154)***	0.063 (0.141)	0.043 (0.146)
R-squared (Within)	0.35	0.48	0.433
Observation	754	754	754
Numbers of HH	377	377	377

Note: Robust Standard error (adjusted for clustering on the HH level) are in parenthesis beneath the estimated coefficient, significance level are as follows: *** p<.01; ** p<.05; * p<.1. Source Author survey result, 2024-2026.

Dimensional effect:- A 10% increase in price of cereal crop increase overall deprivation score by 0.0134 units, food insecurity and nutrition deprivation, living standard deprivation and risk deprivation score increased by 0.044, 0.0018 and 0.095 units respectively.

Table 12 Fixed effect estimation result of cereal crop price increase on multidimensional poverty and its dimension

Variable	Deprivation score	FS_and_Nutri Deprivation	Education Deprivation	Standard_livg Deprivation	RL_and_re Deprivatio	Risk Deprivation
Log_Cereal_price	0.1344 (0.0194)***	0.4412 (0.1177) ***	0.0189 (0.0099)	0.0181 (0.0049) ***	0.0022 (0.0051)	0.0947 (0.0144)***
_cons	0.1993 (0.0350)***	(0.3056) (0.2075)	0.0016 (0.0225)	0.1019 (0.0083) ***	0.1186 (0.0094) ***	-0.0159 (0.0234)
R-square (within)	0.59	0.52	0.094	0.42	0.58	0.37
Observation	754	754	754	754	754	754

Numbers of HH	377	377	377	377	377	377
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Note: other variable are control, Robust Standard error (adjusted for clustering on the HH level) are reported in parenthesis beneath the estimated coefficient, significance level are as follows: *** p<.01; ** p<.05; * p<.1. Source Author survey result, 2024-2026.

This result confirms that rising the price of cereal crop price does not merely increase the overall poverty status of the individual household rather they reduce food security and nutritional status through reducing meal quantities and frequency of the household. Notable impacts are expected on food insecurity and nutrition dimensional deprivation because of such cereal crop are largely associated with the vital importance of daily diets, low substitution between such cereals and other food groups, and the fact that high cereal prices crowd out expenditure on other nutritious foods [31]. Moreover, the rise in the prices of such cereal crop could likely deplete the purchasing power of the poorest by 20% [17]. Households may adjust by cutting down consumption of other foods (including fruits and vegetables, animal source foods, etc) and shifting to low quality and low nutrient foods. On the other hand, when we see their effect on rural livelihood and resource dimension it shows statistically insignificant. This implies that while increasing price of cereal crops immediately hurt consumption, nutrition, and material wellbeing. They does not immediately alter rural livelihood and household resource like house, land and basic asset.

Gendered effect: - As shown in the table there is significant difference between male and female headed household in multidimensional poverty threshold, severely multidimensional poverty threshold and overall deprivation Score. The interaction coefficient tells that holding other variable constant, when cereal price are raised by 10% probability of falling to at least multidimensional poverty, severely multidimensional poverty and overall deprivation scores of female headed household are penalized by additional 0.82, 1.66 percentage point and 0.0073 unit respectively as compared to their counter parts. The total impacts of cereal price inflation on female-headed household increased to 2.76 percentage point for probability of falling to official multidimensional poverty, 4.5 percentage point for probability of live in destitution category of poverty and 0.017 unit deprivation score.

Table 13 Fixed effect result of cereal price rise impacts on different threshold of MP poverty by Gender (Interaction model)

Variable	At leas Vulnerable	At least MP	At least MP	Deprivation Score
Log_Cereal_price*	0.005 (0.114)	0.194 (0.023)***	0.283 (0.0514)***	0.097 (0.024)***
Log_Cereal_price*	0.214 (0.136)	0.082 (0.034)**	0.166 (0.082)**	0.073 (0.034)**
Female Headed				
Female total effect	0.219 -0.431 (0.154)	0.276 0.431 (0.0035)***	0.449 0.268 (0.026)***	0.170 0.396 (0.0109)***
_cons				
R-squared (Within	0.354	0.35	0.173	0.169
Observation	754	754	754	754
Numbers of HH	377	377	377	377

Note: other variable are control, Robust Standard error (adjusted for clustering on the HH level) are reported in parenthesis beneath the estimated coefficient, significance level are as follows: *** p<.01; ** p<.05; * p<.1. Source Author survey result, 2026

This asymmetric difference confirm surgical price of local cereal crop does not hit both groups of people equally rather they influence female-headed household unequally. This notable difference are expected and stated by different scholars. According to according to world bank and FAO as cited by Habtezion, [80], Of 141 countries, 103 (25 of 35 in Africa) have legal differences between men and women that may hinder women's economic opportunities, including access to credit and extension service. Women receive only 5 percent of agricultural extension services worldwide. Moreover, the share of female smallholders who can access credit is 5 to 10 percentage points lower than that of male smallholders [80]. This is partly attributable to the fact that women often do not have the necessary collateral. Consequently, women often possess lower resources to cope with grain inflation and may experience multiple poverty deprivation during periods of welfare crisis.

The result come from the key informant interview and focus group discussion also confirm this structural gender disparity. One key informant interviewee who works at woreda agricultural office, he says that, women's are

reluctance in use of credit and purchased agricultural inputs like fertilizer, pesticide and improved variety for improving their productivity. Additionally, he says that rather than using the above mechanism to increase their yield and alleviate their economic stress they ask aid and begging as a strategy to withstand from their economic shock. After gaining the data from our KII, we also ask the FGD participants why they are unwillingness to access credit and use fertilizer. The participant says that we want to use fertilizer and add our crop yield but their cost is much higher, even more than the value of our crop we produced. The same is true for credit access, we want to access credit but we have no collateral, we limited resource to repay the credit. Finally, participant noted that due to the above-mentioned reason they are unwilling to use the above intervention mechanism rather they prefer to endure hardship.

The finding is consistent with Kumar & Quisumbing [29], the finding found that female headed household are more likely vulnerable to food price rise and are more likely to have experienced a food price shocks in 2007-2008. Because they are resource poor and have, large food gap compared to male headed. Our result also in line with Mottaleb & Erenstein [71], this study demonstrates that, in general, commodity price hikes more adversely affect female-headed households.

4. Conclusion and recommendation

Multidimensional poverty remains one of the biggest challenges facing Ethiopia, its incidence and intensity are very high in the countries. An overlapping of different shocks exacerbates this critical issue. In the past, vulnerability to poverty in Ethiopia was largely associated with bad weather and natural disasters. Recently, however, inflation seems to have become another important factor making people more vulnerable to poverty. This study investigates gendered impacts of cereal crop price rise on household multidimensional poverty especially by focusing on non-monetary poverty in vulnerable area of Ayina Bugna woreda. The result shows that rate of increased in price of cereal crops was calculated for each household and the average price increase in such crop is 48% and 57% for male and female headed household respectively between 2024 and 2026. Furthermore, study also shows that multidimensional poverty in 2026 was much more worsen as compared to 2024 and their prevalence is much higher in female headed household in both survey round as compared to male headed household. This finding are troubling across our recent country policy. Considering that our home grown economic reform strategy was prepared to reduce the prevalence of poverty via private led growth strategy, while our ten years development plan also focused on modernizing agricultural sector and social safety net, our finding shows a gap between “what policy says” and ground reality. It is highly doubtful Ethiopia will attain its poverty reduction plan until 2030. The impact of cereal crop price rise on poverty could depend on various factors such as the source of income of the community, the ability of consumers to substitute other less expensive food items, the coping strategies available to households, the relative magnitude of the rise in prices of the various consumption goods and production inputs, the proportion of the net food buyers in the community and policy responses by governments to such rises in prices.

Using multi-threshold-fixed effect model the result found that multidimensional poverty significantly affected by several factors including high costs of major staple of cereal crops, being net buyer's status of food, local transport shortage, disrupted market linkage, ownership of oxen, experiencing household production shock, higher price of fertilizer input, and blocked bank service plus their own bank account. These factors are increase the probability of household crossing to each threshold of poverty. On the other hand, TLU, access to aid and credit can contribute to reduce multidimensional poverty.

The result revealed that our main explanatory variable cereal price measured by log price has a positive and significant relationship with poverty status and overall deprivation. The result indicates that when cereal price raised by 10% the overall deprivation score of household increased by 0.0134 units. Moreover the probability of household crossing to official multidimensional poverty and severely multidimensional poverty increased by 2.4 and 3.7 percentage point respectively. Additionally increasing the price of such crops also hit female-headed household more as compared to male-headed household. This result confirms that rising the price of cereal crop price does not merely increase the overall poverty status of the individual household rather they reduce the food security and nutritional status through reducing meal quantities and frequency of the household. Occurrence of production shock through drought and conflict, rapidly rising price of fertilizer, restricted transport movement and blocked bank service also contributed to the observed rising levels of inflation in the study area.

Based on the above finding we recommend as follows; a rapid increase in agricultural inputs like fertilizer and pesticide could have a direct effect on cereal crop inflation and productivity reduction. So, the government should

give priority attention to those essential agricultural inputs. Rapidly increasing and expanding distribution channel like cooperatives and peasant association that the farmers get fertilizer input in affordable cost with right delivery time. As vulnerable area, the government also subsidizing all food prices, in order for female and poor to afford adequate food. Emphasis should be given to ensure that the smallholder farmers intend to increase cereal production. Farmers should be provided with quality seeds of modern or high yielding varieties, credit, stable and accessible source of fertilizers, and irrigation. Finally, it is important to track updated poverty and price data over time especially in conflict and drought-affected area like Ayina Bugna this enabling timely interventions and targeted resource allocation to the most vulnerable populations.

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Author Contributions

All author are participated in design of the study. Semane Melku Tesfe: conceptualization, drafting, formulation and analysis. Zemen Ayalew Ayele: conceptual guidance, revision, ethical control and approve. Mengistie Mossie Birhanu: review and supervision. All authors have read and approved the final version of the manuscript.

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Data availability

The data of this paper work are available from the corresponding author upon request.

Declarations

Clinical Trial Number

Not applicable.

Ethical approval and consent to participate

The need for ethics approval was waived by the Institutional Review Board of Bahir Dar University due to the study's reliance on fully anonymized socio-economic survey data and the non-invasive nature of data collection involving no medical or sensitive psychological interventions. All methods and procedures employed in this study were carried out in accordance with the Belmont Report and the relevant institutional guidelines and regulations of Bahir Dar University. Informed consent was obtained from all sample before the interview. The participant were informed that this study was purely for academic purpose only and their participation was voluntary. Additionally, we assured that the participant have full right to withdraw from the study at any time if the feel inconvenience.

AI Statement

When we write our manuscript the author used “<https://gemini.google.com>” for editing purpose only in order to improve the quality of the paper.

Consent to publish

Not Applicable

Competing interest

The author declare no competing interest

5. Reference

1. Okou, C., J.A. Spray, and M.F.D. Unsal, *Staple food prices in Sub-Saharan Africa: an empirical assessment*. 2022: International Monetary Fund.
2. Unsal, D., et al., *Food (in) security in SSA under COVID-19: A Macro Perspective*. IMF Research Department Special Series on COVID-19, 2020.
3. Ivanic, M., W.J. Martin, and H. Zaman, *Estimating the short-run poverty impacts of the 2010-11 surge in food prices*. World Bank Policy Research Working Paper, 2011(5633).

4. Ouko, K.O. and M.O. Odiwuor, *Contributing factors to the looming food crisis in sub-Saharan Africa: Opportunities for policy insight*. Cogent Social Sciences, 2023. 9(1): p. 2173716.
5. Odongo, M.T., et al., *Climate change and inflation in Eastern and Southern Africa*. Sustainability, 2022. 14(22): p. 14764.
6. UNDP and OPHI, *Global Multidimensional Poverty Index 2024: poverty amid conflict*. 2024.
7. ASARECA, A.f.S.A.R.i.E.a.C.A. *About Ethiopia*. 2026.
8. PDC and FDRE, *Ten-Year Development Plan: An African Beacon of Prosperity (2020/21–2029/30) (Popular Version)*. 2021, Federal Democratic Republic of Ethiopia Planning and Development Commission: Addis Ababa, Ethiopia.
9. UNDP and OPHI, *Global multidimensional poverty index 2025—overlapping hardships: poverty and climate hazards*. 2025.
10. FEWS NET, *Ethiopia Food Security Outlook Update December 2023 - May 2024: Drought-induced crop failure leads to Emergency in conflict-affected north*. 2024, Famine Early Warning Systems Network.
11. FEWS NET, *Weather shocks and tensions in the north sustain high food assistance needs*. 2025: Ethiopia.
12. Mawutor, J.K.M., et al., *Inflation and energy poverty: threshold effect of governance quality in Africa*. Journal of Economic Studies, 2024. 51(1): p. 222-237.
13. Cattaneo, A., et al., *Ensuring affordability of diets in the face of shocks*. Food Policy, 2023. 117.
14. Kuma, B. and G. Gata, *Factors affecting food price inflation in Ethiopia: An autoregressive distributed lag approach*. Journal of Agriculture and Food Research, 2023. 12: p. 100548.
15. ESS, *Monthly news inflation report on november 2023* 2023, Ethiopia Statistical Service.
16. Lord, S., *Higher food prices and poverty*. Nature Food, 2023. 4(8): p. 640-641.
17. Magrini, E., J. Balié, and C. Morales-Opazo, *Cereal price shocks and volatility in sub-Saharan Africa: what really matters for farmers' welfare?* Agricultural Economics, 2017. 48(6): p. 719-729.
18. Minten, B. and P.A. Dorosh, *Rising cereal prices in Ethiopia: An assessment and possible contributing factors*. Vol. 73. 2019: Intl Food Policy Res Inst.
19. Brenton, P. and M. Nyawo, *Cereal prices and child undernutrition in Ethiopia*. The Journal of Development Studies, 2021. 57(12): p. 2045-2062.
20. Levin, J., *Poverty impact of rising maize prices in Kenya*. 2010, Working Paper.
21. Ivanic, M., W. Martin, and T. World Bank. Development Research Group. Agriculture and Rural Development, *Short- and long-run impacts of food price changes on poverty*. Policy research working paper 7011. 2014, Washington, D.C.: World Bank.
22. Martin, W. and N. Minot, *Poverty impacts of food price increases in Ethiopia*. Washington, DC: International Food Policy Research Institute. 2023.
23. Minot, N. and W. Martin, *Poverty impacts of food price increases in Burkina Faso*. Washington, DC: International Food Policy Research Institute. 2023.
24. Okou, C., J. Spray, and F. Unsal, *Staple Food Prices in Sub-Saharan Africa: An Empirical Assessment*. IMF Working Papers. 2022, Washington, D.C: International Monetary Fund.
25. Gelaw, F. and M. Sileshi, *Impact of grain price hikes on poverty in rural Ethiopia*. African Journal of Agricultural and Resource Economics, 2013. 8(2): p. 69-89.
26. Abdullah, M. and R. Kalim, *Impact of global food price escalation on poverty in South Asian countries*. The Pakistan Development Review, 2016: p. 543-559.
27. Alem, Y., *The impact of food price inflation on consumer welfare in urban Ethiopia: A quadratic almost ideal demand system approach*. Economic Studies Department of Economics School of Business, Economics and Law University of Gothenburg, 2011. 54.
28. Fahuuruddin, F., et al., *Impact of food price increases on poverty in Indonesia: empirical evidence from cross-sectional data*. Journal of Asian Business and Economic Studies, 2023. 30(2): p. 126-142.
29. Kumar, N. and A.R. Quisumbing, *Gendered impacts of the 2007–2008 food price crisis: Evidence using panel data from rural Ethiopia*. Food Policy, 2013. 38: p. 11-22.
30. Laborde, D., C. Lakatos, and W.J. Martin, *Poverty impact of food price shocks and policies*. World Bank Policy Research Working Paper, 2019(8724).
31. Rudolf, R., *The impact of maize price shocks on household food security: Panel evidence from Tanzania*. Food Policy, 2019. 85: p. 40-54.
32. Mukasa, A.N., *Food Price Shocks-Induced Poverty Traps: Analysis Using a Panel Dataset from Uganda*. 2015, FERDI Policy Brief.
33. Wang, Y. and M. Çakır, *Welfare impacts of increasing teff prices on Ethiopian consumers*. Agricultural economics, 2021. 52(2): p. 195-213.

34. Headey, D.D. and W.J. Martin, *The impact of food prices on poverty and food security*. Annual review of resource economics, 2016. 8(1): p. 329-351.
35. Jose Ramon G. Albert, R.D.A., and Jana Flor V. Vizmanos, *National Accounts and Household Survey Estimates of Household Expenditures: Why Do They Differ and Why Should We Be Concerned?* 2017.
36. Hasell, J., et al. *Poverty*. Our World in Data 2022.
37. ECHO. *Ethiopia - Drought and Conflict (DG ECHO, DG ECHO Partners, Ethiopian Red Cross Society) (ECHO Daily Flash of 30 December 2024)*. DG ECHO 2024.
38. Bihon, A., *Ayena Bugna Affected Community Support: Joint project between Woldia University and the Amhara Association in Seattle*, W.U.A.A.i. Seattle, Editor. 2025.
39. WDU, *Combined Report on the Impact of Drought and Health/Nutrition Crisis in Waghimra and North Wollo Zones*. 2025, Woldia University, Technology Transfer and Community Service Directorate: Woldia, Ethiopia.
40. WHO. *WHO delivers critical support to Bugna Woreda and surroundings amid humanitarian needs*. 2025.
41. BoA, *Woreda agriculture office*. 2024.
42. ESS, *Projection of Population Size by Sex, Region, Zone and Wereda*. 2023.
43. Asfaw, T.T., *Echoes of Hunger: Unraveling the Story of Famine in Lasta awraḡḡa, 1960s–1980s*. Aethiopica, 2025. 28: p. 134-161.
44. Tadesse, M., *The humane costs of the 1970s and 1980s famines in North Wollo, Ethiopia*. Cogent Arts & Humanities, 2023. 10(2): p. 2286066.
45. Dessalegn, R., *Famine and Survival strategies: a case study from Northeast Ethiopia*. 1991.
46. Chih-Pei, H. and Y.-Y. Chang, *John W. Creswell, research design: Qualitative, quantitative, and mixed methods approaches*. 2017.
47. Bealu, T., G. Endrias, and A. Tadesse, *actors Affecting Economic Efficiency in Maize Production: The Case of Boricha Woreda in Sidama Zone, Southern Ethiopia*. 2014, Ethiopian Economics Association (EEA).
48. Assoma, A.A., *Adaptation and change in Enset ecology and farming among the kore of southwestern Ethiopia*. 2017: Washington State University.
49. Dramane Bako, *A Guide to Sampling*. 50x2030 Technical Note Series. 2021: Food and Agriculture Organization of the United Nations (FAO) and The World Bank.
50. Godana, A., B. Kuma, and T. Leza, *Gender-based perceptions of multidimensional rural poverty: evidence from Wolaita Zone, Southern Ethiopia*. Discover Sustainability, 2026. 7.
51. Yamane, T., *Statistics: An introductory analysis*. 1967.
52. Alkire, S. and M.E. Santos, *Acute multidimensional poverty: A new index for developing countries*. 2010.
53. FAO and OPHI, *Measuring rural poverty with a multidimensional approach: The Rural Multidimensional Poverty Index*. Vol. 19. 2022: FAO.
54. Gidelew, G.E., B.A. Alemu, and K.E. Kassie, *The impact of cluster farming on multidimensional poverty reduction: evidence from Northwestern Ethiopia*. Discover Sustainability, 2025. 6(1): p. 1103.
55. UNDP and OPHI, *Technical note. Multidimensional Poverty Index*. 2024a, UNDP and OPHI.
56. Garner, T.I., D.S. Johnson, and M.F. Kokoski, *An experimental consumer price index for the poor*. Monthly Lab. Rev., 1996. 119: p. 32.
57. Moulton, B.R., *Bias in the consumer price index: what is the evidence?* Journal of Economic perspectives, 1996. 10(4): p. 159-177.
58. Deaton, A. and S. Zaidi, *Guidelines for constructing consumption aggregates for welfare analysis*. Vol. 135. 2002: World Bank Publications.
59. Klick, J. and A. Stockburger, *Experimental CPI for lower and higher income households*. 2021.
60. Ha, T., *Heterogeneous Effect of Cost-Of-Living Crisis: Evidence From South Korea*. Asian-Pacific Economic Literature, 2026. 40(1): p. 16-28.
61. Matz, J.A.a.K., Matthias and Abegaz, Getachew Ahmed, *The short-term impact of price shocks on food security---Evidence from urban and rural Ethiopia*. Food security, 2015.
62. Dessus, S., S. Herrera, and R. De Hoyos, *The impact of food inflation on urban poverty and its monetary cost: some back-of-the-envelope calculations*. Agricultural Economics, 2008. 39: p. 417-429.
63. Kedir, A.M. and A. McKay, *Chronic poverty in urban Ethiopia: Panel data evidence*. International Planning Studies, 2005. 10(1): p. 49-67.
64. Oscar, T., *Panel data analysis fixed and random effects using Stata*. Data and statistical services, 2007. 3: p. 1-40.
65. Baetschmann, G., K.E. Staub, and R. Winkelmann, *Consistent estimation of the fixed effects ordered logit model*. Journal of the Royal Statistical Society Series A: Statistics in Society, 2015. 178(3): p. 685-703.

66. Lancaster, T., *The incidental parameter problem since 1948*. Journal of econometrics, 2000. 95(2): p. 391-413.
67. Ai, C. and E.C. Norton, *Interaction terms in logit and probit models*. Economics letters, 2003. 80(1): p. 123-129.
68. Karaca-Mandic, P., E.C. Norton, and B. Dowd, *Interaction terms in nonlinear models*. Health services research, 2012. 47(1pt1): p. 255-274.
69. Wu, B., et al., *Multidimensional relative poverty alleviation of the targeted microcredit in rural China: a gendered perspective*. China Agricultural Economic Review, 2024. 16(3): p. 468-488.
70. Birhanu, F.Z., A.S. Tsehay, and D.A. Bimerew, *The effects of commercialization of cereal crops on multidimensional poverty and vulnerability to multidimensional poverty among farm households in Ethiopia*. Development Studies Research, 2021. 8(1): p. 378-395.
71. Mottaleb, K.A. and O. Erenstein. *Do market shocks generate gender-differentiated impacts? Policy implications from a quasi-natural experiment in Bangladesh*. in *Women's Studies International Forum*. 2019. Elsevier.
72. Minten, B. and S. Kyle, *The effect of distance and road quality on food collection, marketing margins, and traders' wages: evidence from the former Zaire*. Journal of Development Economics, 1999. 60(2): p. 467-495.
73. APA news, *Ethiopia: Famine hits Amhara Amid Security crisis*, in *Africa Press Agency*. 2024.
74. Rashid, S., *Staple Food Prices in Ethiopia*, F.S.C.W. Paper, Editor. 2010.
75. CSA, *Ethiopia Demographic and Health Survey*. 2006, Central Statistical Agency and ORC Macro: Addis Ababa, Ethiopia and Calverton, Maryland, USA.
76. Alkire, S., J.M. Roche, and A. Vaz, *Changes over time in multidimensional poverty: Methodology and results for 34 countries*. World Development, 2017. 94: p. 232-249.
77. Onyeneke, R.U., et al., *Exploring the impacts of climate change, institutional quality, and conflicts on food security in Africa*. Frontiers in Sustainable Food Systems, 2026. 10: p. 1740395.
78. Hausman, J.A., *Specification tests in econometrics*. Econometrica: Journal of the econometric society, 1978: p. 1251-1271.
79. Caracciolo, F., et al., *Distributional effects of maize price increases in Malawi*. Journal of Development Studies, 2014. 50(2): p. 258-275.
80. Habtezion, S., *Gender, agriculture and food security*. 2012, United Nations Development Programme (UNDP): New York.