Resilient Agriculture for Inclusive and Sustainable Ethiopian Food Systems

Baseline Report for Tigray Region 2023

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Resilient Agriculture for Inclusive and Sustainable Ethiopian Food Systems (RAISE FS)
Addis Ababa, December 2025

RAISE-FS is funded by the Embassy of the Kingdom of the Netherlands in Addis Ababa (grant number 4000004753).
RAISE-FS is a programme hosted by Stichting Wageningen Research Ethiopia

RAISE-FS working paper # 018

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RAISE-FS Resilient Agriculture for Inclusive and Sustainable Ethiopian Food Systems

Abate L., Schaap M., 2025. Resilient Agriculture for Inclusive and Sustainable Ethiopian Food Systems Baseline Report for Tigray Region 2023. Stichting Wageningen Research Ethiopia, Addis Ababa.
RAISE-FS SWRE-RAISE-FS-25-041

The RAISE-FS baseline survey in Tigray, conducted in 2023, aimed to establish key indicators for measuring project impacts and outcomes. Delayed due to security concerns, it gathered data on demographics, resources, food security, agricultural practices, gender roles, advisory services, and enabling environments.
Keywords: Baseline, food and nutrition security, production systems, RAISE-FS outcome indicators

This manual can be downloaded for free at: https://doi.org/10.18174/699727

RAISE-FS working paper #018

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Preface

The Resilient Agriculture for Inclusive and Sustainable Ethiopian Food Systems (RAISE-FS) is a four-year programme funded by the Dutch Embassy in Addis Ababa and hosted by Stichting Wageningen Research Ethiopia based in Addis Ababa, to bring about transformation in the Ethiopian food system. RAISE-FS will develop and implement a demand-driven and interdisciplinary approach to Research for Food System Transformation (R4FST) and as such contribute to the Government of Ethiopia's transformational agenda.

RAISE-FS adopts the food system approach as a Theory of Change (ToC), which helps in analysing the drivers and food system activities that contribute to the transformation of the food system by addressing leverage points, resulting in increased productivity, enhanced value chain performance, and improved human nutrition for food security while minimizing environmental impact and ensuring social inclusion.

The programme aims to leverage transformation in Ethiopian food systems, covering the spectrum from food-insecure households and regions, to better-off households that are food-secure and can realize production surpluses, towards commodity commercialization efforts that contribute to rural and urban consumption demands and export.

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List of abbreviations and acronyms

CAPI	Computer Assisted Personal Interview
CSA	Central Statistical Agency
DA	Development Agent
DE	Domain of Empowerment
FANTA	Food and Nutrition Technical Assistant
FHH	Female Headed Households
FI	Food Insecurity
FS	Food System
FCS	Food Consumption Score
GPI	Gender Parity Index
HFIAS	Household Food Insecurity Access Scale
KPI	Key Performance Indicator
MDD-W	Minimum Dietary Diversity for Women
MHH	Male Headed Household
MSc	Master of Science
NGO	Non-Governmental Organization
ODG	Open-source Data Kit
QDD	Quality Dietary Diversity
RAISE-FS	Resilient Agriculture for Inclusive and Sustainable Ethiopian Food Systems
SACCO	Saving and Credit Cooperation?
SNNPR	South Nations, Nationalities and Peoples Region
SWR	Stichting Wageningen Research
TLU	Tropical Livestock Unit
VSLA	Village saving and Lending Association
WFP	World Food Programme
WUR	Wageningen University & Research
WEAI	Women Empowerment in Agriculture Index

Summary

The baseline survey was designed to collect data from three different food systems, namely food insecure, high-potential food system, and commercial food system. The report is organized into different sections of outcome areas designed for the project, including demographic characteristics of households, which include age and family size distribution of households, marital status, education, and primary occupation of household heads and members. The average age of household heads was about 53 years and female headed households tend to be slightly older (47 years). Regarding the marital status of household heads, the majority of household heads (69% to 74%) in all food systems were married, while 10 to 15% of them were widowed.

The surveyed households have on average five members, with 42% to 60% of households having 4 to 6 members. Regarding educational status, most household heads don't read and write. The percentage is very high for female heads (about 73%) compared to male heads, which ranges from 31% to 60%.

Most farmers produce cereals mainly in the main season known as *Meher* with limited experience in good agricultural practices, which causes low yields. Farmers have very little experience with intercropping, relay cropping, agroforestry, and green manuring, better experience on crop rotation, even though most of them are rotating cereal crops with cereals. Very few proportions of farmers are rotating cereals with pulses, which is mostly recommended for soil fertility maintenance. Among all the plots covered during the survey, the majority were planted with a local variety of seeds, except maize and wheat which were mostly planted with improved varieties of seeds. The survey also indicates that the application of fertilizers is low.

Effective extension and advisory services for supporting farmers by development agents have the potential to improve agricultural productivity, net farm income, and food security. The data indicates frequency of extension agents' contact with farmers for their advice was low in the implementation areas, with slight differences among *woredas*. The proportion of farmers visited with low frequency was, on average, 43%, 47%, and 56% in commercial, high potential and food-insecure areas, respectively, and the result indicates that a large proportion of farmers are visited by DAs only once in more than a month.

The baseline survey indicates that decision-making of women on production and income generated from different sources was low compared to men, which contribute to low women's empowerment in agriculture. High workload and less access to finance were the main contributors to women's disempowerment in agriculture.

Most households rely on their own production to cover their food requirements. Households in food-insecure food system *woredas* also rely on purchase to satisfy their food requirements, with small proportions relying on food aid. On average, a household faced a food shortage for 3.5 months per year. While on average, household in food-insecure, high-potential and commercial areas didn't cover their annual food respectively for 4.4, 3.4, and 2.7 months in a year.

The data also indicate that food items consumed by household members were less than half as diverse as required for a healthy diet, although the dietary diversity varies among food system typologies, with statistically significant differences.

The survey results indicated that access to financial services was limited in all food systems. Most households that need a loan get and borrow from informal sources like friends, relatives, and informal lenders. Formal financial services like banks, micro finance, and village saving and lending associations, accessibility to female-headed households was very limited.

1. Introduction

Resilient Agriculture for Inclusive and Sustainable Ethiopian Food System (RAISE-FS) is a four-year program funded by The Netherlands Embassy in Addis Ababa and hosted by Stichting Wageningen Research Ethiopia (SWR Ethiopia) based in Addis Ababa, to bring about transformation in the Ethiopian food system. The RAISE-FS Theory of Change adopts the food system approach analysing the drivers and food system activities that contribute to the transformation of food system by addressing leverage points, resulting in increased productivity, enhanced value chain performance and improved human nutrition for improved food security while minimizing environmental impact ensuring social inclusion.

The programme specifically works to achieve five specific interrelated outcomes that can ensure demonstrated evidence to promote resilient, inclusive and sustainable food system in Ethiopia. The outcomes are;

- Social and economic empowerment of women and youth in food system increased
- Efficient and environmentally sustainable production increased
- Sector performance and value chains enhanced
- Availability of safe and nutritious foods increased
- Enabling environment for food system change enhanced

SWR Ethiopia collects data for objectively measuring its impacts and outcomes. Hence RAISE-FS needs to establish a baseline for key indicators of resilient, inclusive and sustainable food system in Ethiopia.

1.1. Objective of the baseline study

The general objective of the baseline survey is to collect reliable data that help to estimate the current value of the Key Performance Indicators (KPIs) identified for each of the project outcome areas. Namely, KPIs in relation to social and economic empowerment of women and youth, efficient and environmentally sustainable production, sector performance and value chains, availability and use of safe and nutritious foods, and associated enabling environment at the start of RAISE-FS project implementation.

Specific objectives of the baseline are:

- To estimate the value of the KPIs of the RAISE FS project as basis and reference point for tracking the RAISE-FS's progress; that is, to measure the degree and quality of change during an activity's implementation.
- To provide information to serve as a benchmark for all future activities for measuring RAISE-FS success.
- To generate additional information about the status, challenges and opportunities related with sustainable agricultural production, gender and social inclusion, availability and use of safe and nutritious food, performance of the target value chains, and enabling environment.

2. Methodology

2.1. Study area

The study area for the baseline study has been chosen in line with the RAISE FS implementation *woredas* and associated *kebeles*.

A sample of three *woredas* that were representing three different food system typologies: food insecure, high-potential and commercial have been selected from Tigray region. These are Enderta (food insecure), Tsa'eda Emba (high potential) and Raya Azebo (commercial).

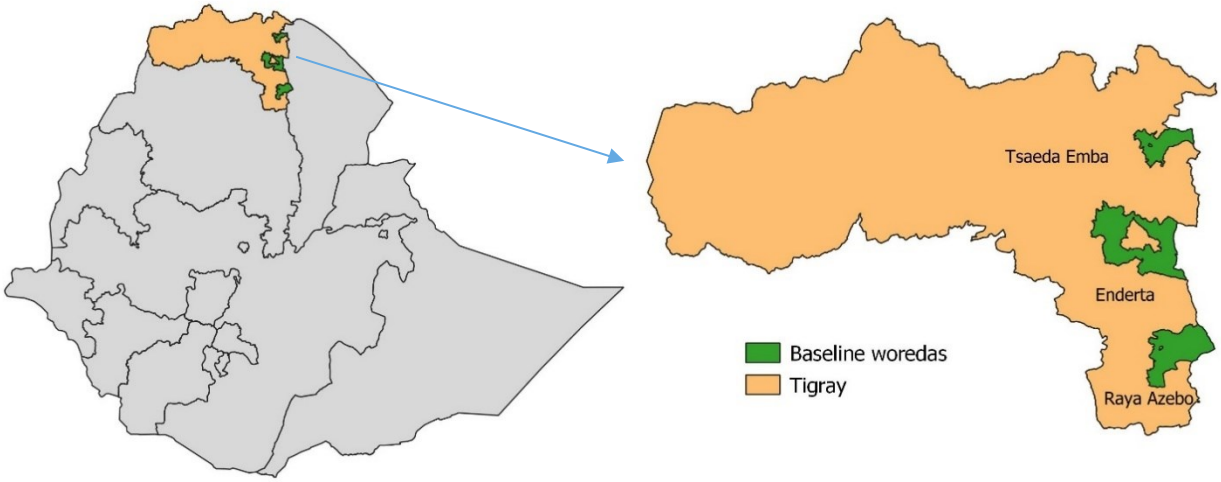


Figure 1: Selected woredas

2.2. Sampling design and data collection

A multistage sampling approach was followed to identify sample respondents using probability and non-probability sampling techniques. In the first stage, sample *kebeles* were selected from the RAISE FS intervention *woredas* in the region purposively and while in the second stage, sample households were selected randomly from the list of households prepared at *kebele* level.

A total of 6 *kebeles*, two from each *woredas* were selected. The minimum sample size for the survey was determined using the formula developed by Kothari (1990). Taking the number of households from the document compiled at *woreda* administration office, the survey was designed to sample a total of 311 respondents for interview (105 respondents from, 102 from Tsa'eda Emba, and 104 from Raya Azebo). To insure the inclusiveness of respondents, the survey was designed to categorise the respondents into female headed households (FHH), women in male headed household (WMHH), male headed households (MHH) and youth from any households were proportionally selected for the interview.

Table 1: Sample size per woreda

***Woreda* / food system**	***Kebele***	**Sampling**	**Household**	**Sampling**	**Data collected**	**Coverage**
	Total no. *Kebeles*	**Sampled *Kebeles***	**Total no. HHDs/ two *kebeles***	**HHDs sampled**		
Food insecure	24	2	5,368	105	106	101%
High potential	12	2	2,146	102	102	100%
Commercial	10	2	3,486	104	104	100%
		6		311	312	

2.3. Data collection

Development of the questionnaires
A Structured questionnaire for baseline data collection was designed for each area of outcomes by M&E staff and respective advisors from each area of outcomes. The survey questionnaire was designed into Computer Assisted Personal Interview (CAPI) mode by using KOBO toolbox which is part of open-source data kit (ODK) software.

Training of data collectors and supervisors
Prior to field data collection, all the field teams (data collectors, supervisors and coordinators) were trained on the basics of baseline survey and were extensively exposed to the questionnaires for this baseline survey. Two-day classroom training was given for the data collectors and supervisors on the detailed content of survey questionnaire, and how to ethically conduct the household survey. Then a one-day practical CAPI training on data collection was also given using tablets. This three-day training was followed by one day field exercise in the nearby target *kebele* that was identified for the survey. This helped data collectors and supervisors to internalize the questions and check preciseness (clarity) of the questions for the respondents, besides exercising the KOBO application using tablets.

Field data collection
Before actual field data collection was started, the tools were piloted by administering it to selected respondents. On the basis of the results obtained from the pilot, necessary modifications were made on the questionnaire. Six data collectors (2 for each *woreda*) with minimum MSc in related field of socio economic and agriculture were employed for data collection.

Field data collection was held in Tigray after similar survey was held in other three regions (Amhara, Oromia, and SNNP). It was conducted from 22 Nov 2023 to 05 Dec 2023 in all *woredas*. Supervisors took full charge of the administration of the questionnaires and the eventual product of data collection in the field. The supervisors guided and supported the enumerators and were there to help resolve minor field difficulties.

3. Data analysis, estimates for key indicators

3.1. Demographic characteristics

The demographic characteristics like the respondent's education level, average age, family size, marital status, and type of house the household lives in were analysed for each respondent type (FHH, MHH, WMHH, and Youth).

Household heads, women in male headed households and youth

The actual coverage of total sample size was 312 from the three *woredas* and six *kebeles* which was equal with the minimum sample size planned. The actual coverage of surveyed households shows that about 69.6% were male headed households and 30.4% were female headed households. Following the methodology for respondent selection, 22.1% were female heads of households (FHH), 37.5% were male heads of households (MHH), 16% were women in male headed household (WMHH) and 24.4% were youth. Overall, 50.3% were male respondents while the rest 49.7% were female respondents.

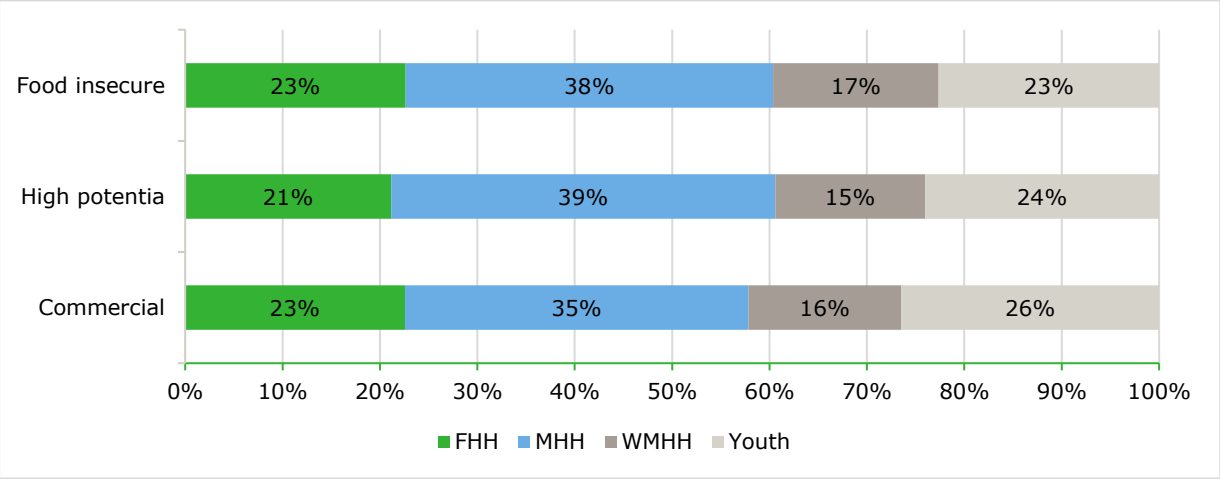


Figure 2: Respondents for baseline survey according to household headship situation

Education

Education has played a major role in making development a success in low-income countries (World Bank, 2015). Conventionally, benefits of education have often been investigated in terms of increased productivity, and numerous studies have focused on quantifying the contribution an individual's education has on the level of his or her wage. In addition, education not only brings private returns to the individual who hold them but also has positive externalities such as improving intra-family productivity and social cohesion (Dziechciarz-Duda and Król 2013*;* J. Owens, 2024 and the productivity of those with whom the individual's workforce interacts (Ranis et al., 2000). The baseline survey assessed the educational status of both household head and their spouses by asking the highest level of education completed. From Table 2, about 62% of household heads have not joined formal education, 30% of them completed primary school, 6.1% of them completed secondary school and only 1.6% graduated with diploma and above. Level of education differences also observed for household head between *woredas* separately for gender. Most household heads in the three *woredas* 51%, 47% and 67% of heads in Enderata, Tsa'eda Emba and Raya Azebo respectively didn't read and write. This percentage was high for female heads in all three *woredas*. Relatively more proportion of female heads (29%) in completed primary school but this proportion was high for male heads in Tsa'eda Emba.

A chi-square test (Table 2) at 5% level of significance for the difference show that there is strong evidence ($P<0.01$) that educational level of male heads is significantly different from female heads across all *woredas*.

Another chi-square test also analysed for the differences in level of education of male and female heads separately for each *woreda*. Educational level for male heads and female heads in Tsa'eda Emba was significant while the result shows that it is not significant for Enderta and Raya Azebo. The difference in education level household heads among *woredas* is significant (P-value=0.035) while the difference in level of education for female heads among *woredas* is not significant (P=0.249).

Table 2: Educational level of household head

Woreda	Household head	Can't read and write	Adult/religious education	Primary school	Secondary School	Diploma and above	Chi-square test for difference in education level
	sex	%	%	%	%	%	P-value
Enderta	Male	45.1	9.9	36.6	4.2	4.2	
	Female	64.7	0.0	29.4	5.9	0.0	
	Both	51.4	6.7	34.3	4.8	2.9	0.1362
Tsa'eda Emba	Male	36.6	11.3	42.3	9.9	0.0	
	Female	70.0	3.3	13.3	13.3	0.0	
	Both	46.5	8.9	33.7	10.9	0.0	0.007
Raya Azebo	Male	59.5	8.1	27.0	2.7	2.7	
	Female	86.2	0.0	10.3	3.4	0.0	
	Both	67.0	5.8	22.3	2.9	1.9	0.092
Overall	Male	47.2	9.7	35.2	5.6	2.3	
	Female	73.1	1.1	18.3	7.5	0.0	
	Both	55.0	7.1	30.1	6.1	1.6	0.000

Statistical tests using Chi-Square test:

*1.Level of education * woredas: Male-P=0.98, Female-P=0.176, Overall-P=0.035*

Educational level among woredas is significantly different with p value 0.035 at 5% level of significant

Age of the household heads

The average age of surveyed household heads was 51 years with the standard deviation of 13.22 and slight differences across *woredas* observed (Table 3). Similarly for all respondents, the average age was 42 years with standard deviation 16.02 which is smaller than household head since youth of age 18 to 35 also included as respondents. The average age distribution of male and female respondents across *woredas* were significantly different for Enderta and Raya Azebo but not for Tsa'eda Emba. Overall, the age distribution was significantly different for male and female heads across all *woredas*. Similarly, there is a significant difference of male and female respondent's age distribution (adults and youth) across *woredas* (P-value-<0.000).

Table 3: Average age (years), 95% t-test for difference of means for household head and respondent

Woreda		Household head				Respondents			
	Sex	N	Mean age	Standard Deviation	t-test Male vs Female	N	Mean age	Standard Deviation	t-test Male vs Female
Enderta	Male	71	51	11.42		53	44	15.58	
	Female	35	44	11.80		53	36	11.52	
	Both	106	49	11.87	0.010**	106	40	14.24	0.03**
Tsa'eda Emba	Male	72	56	14.45		51	47	19.39	
	Female	30	50	13.42		51	42	16.14	
	Both	102	54	14.31	0.076	102	44	17.91	0.190
Raya Azebo	Male	74	52	13.49		53	44	16.04	
	Female	30	47	10.84		51	36	14.25	
	Both	104	50	12.94	0.068	104	40	15.55	0.016**
Total	Male	217	53	13.31		157	45	17.00	
	Female	95	47	12.16		155	38	14.23	
	Both	312	51	13.22	0.000***	312	42	16.02	0.000***

Family size and marital status

Household family size has a direct relationship with food insecurity status (Olayemi, A. O., 2012). The survey results shows (Figure 3) that most households in Enderta, Tsa'eda Emba and Raya Azebo(46%, 42% and 60% respectively) have family size of four to six. The average and median value of family sizes for Enderta and Ta'eda Emba is six with standard deviation of 2.1 and 2.3 respectively while for Raya Azebo is five with standard deviation of 1.9. Female headed households have average family size of four while male headed households have average family size of six. The difference of average family size is statistically not significant across *woredas* (df=2, P=0.606). Similarly, sex of household head has an effect on the difference of average family size and statistically significant at 5% level of significance (t-test 7.713, df=310, P<0.0.001).

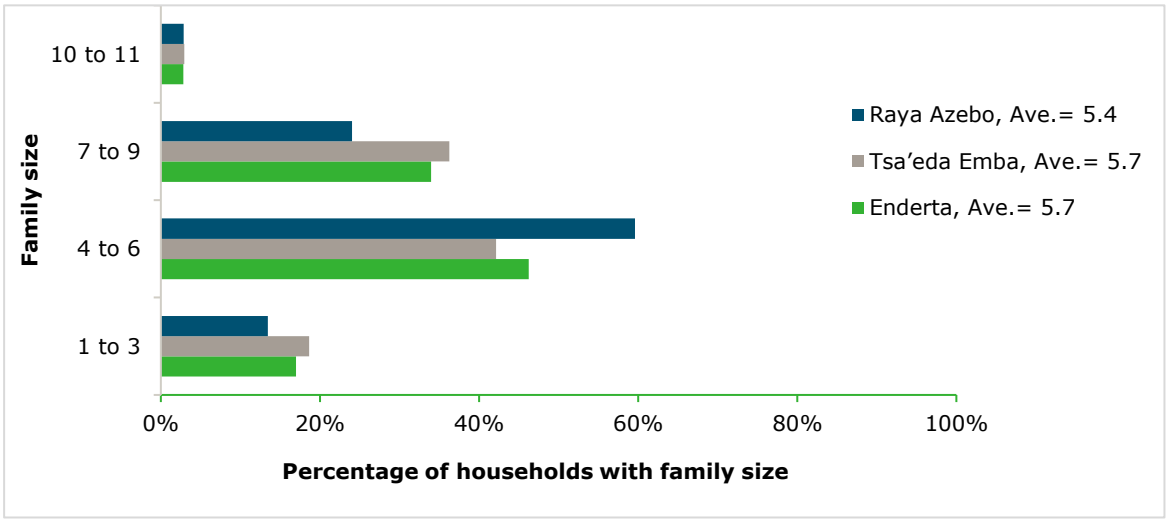


Figure 3: Family size of surveyed HHs

The baseline result also shows that the distribution of marital status for household head was similar with slight differences across the three food systems (Figure 4). Over 70% of surveyed household heads were married while less than 15% were widowed. A larger proportion of divorced household head was observed in Enderta. The difference of the distribution was also tested statistically and there is evidence that the marital status of household heads was not significantly different across *woredas* (P-value=0.917, Chi-square =2.032 and df=6).

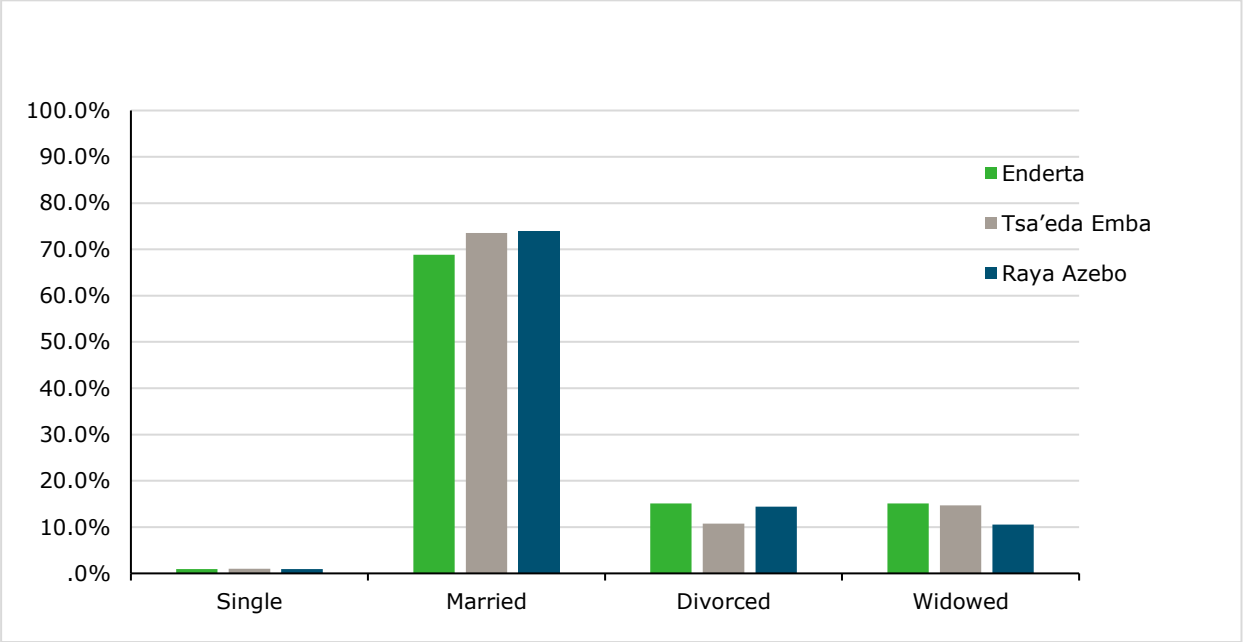


Figure 4: Marital status of household head

3.2. Resource ownership

Productive resources are essential to the livelihoods and food security of the households in rural areas. Household's resource ownership in the implementation area was analysed according to the type of house owned, number of livestock owned, along with land owned and rented in.

Dwelling

One of the assets of the surveyed households is their dwelling, the house in which they live. Most households (93%) owned the dwelling permanently while about 2.9% lived in a rented house. The rest households are living in other's house for free. The dwelling status of surveyed households are not significantly different across sex of household head for high-potential and commercial *woredas* while it is significantly different for male headed and female headed in food-insecure *woreda*(P-value=0.043) at 5% level of significance.

Table 4: Kind of dwelling in which household lives

Woredas	Sex of HH head	Private owned permanent	Free of rent	Rented	Chi-square test
		%	%	%	P-value
Enderta	Male	97.2	0.0	2.8	
	Female	88.6	8.6	2.9	
	Both	94.3	2.8	2.8	0.043**
Tsa'eda Emba	Male	93.1	6.9	0.0	
	Female	90.0	6.7	3.3	
	Both	92.2	6.9	1.0	0.298
Raya Azebo	Male	95.9	1.4	2.7	
	Female	86.7	3.3	10.0	
	Both	93.3	1.9	4.8	0.223
Overall	Male	95.4	2.8	1.8	
	Female	88.4	6.3	5.3	
	Both	93.3	3.8	2.9	0.075

The roof type of the dwelling is one indicator for household's wealth status. About 84% of the households lived in house of corrugated iron sheet roof while 14.7% lived in house of roof made of wood and mud. The distribution of roof cover type is not significantly different over male, and female headed households within *woredas* but there is strong evidence that the roof type is significantly different (*P-value=0.000*) across *woredas* separately for male headed and female headed households.

Table 5: Roof type of the main house

Woredas	Sex of HH head	Corrugated iron sheet	Thatch	Wood and mud	Chi-square test
		%	%	%	P-value
Enderta	Male	87.3	1.4	11.3	
	Female	88.6	0.0	11.4	
	Both	87.7	.9	11.3	0.780
Tsa'eda Emba	Male	72.2	0.0	27.8	
	Female	53.3	0.0	46.7	
	Both	66.7	0.0	33.3	0.065
Raya Azebo	Male	95.9	4.1	0.0	
	Female	100.0	0.0	0.0	
	Both	97.1	2.9	0.0	0.263
Overall	Male	85.3	1.8	12.9	
	Female	81.1	0.0	18.9	
	Both	84.0	1.3	14.7	0.171

*Roof cover*woreda, p-value=0.000 for both male and female headed households*

Land ownership

Figure 5 shows farmers in the *woreda*'s with food insecure food system typology owned larger land size of cultivated land compared to *woreda*'s with a high potential and commercial food system typology. The result also reflects that female headed households own smaller land sizes compared to male headed households in all *woredas* with average farm size 0.43 hectare and 0.77 hectare respectively. The calculated F-tests for comparing means also showed significant difference (*F=8.38, df=2, P-value=0.000*) in farm size among three food system typologies.

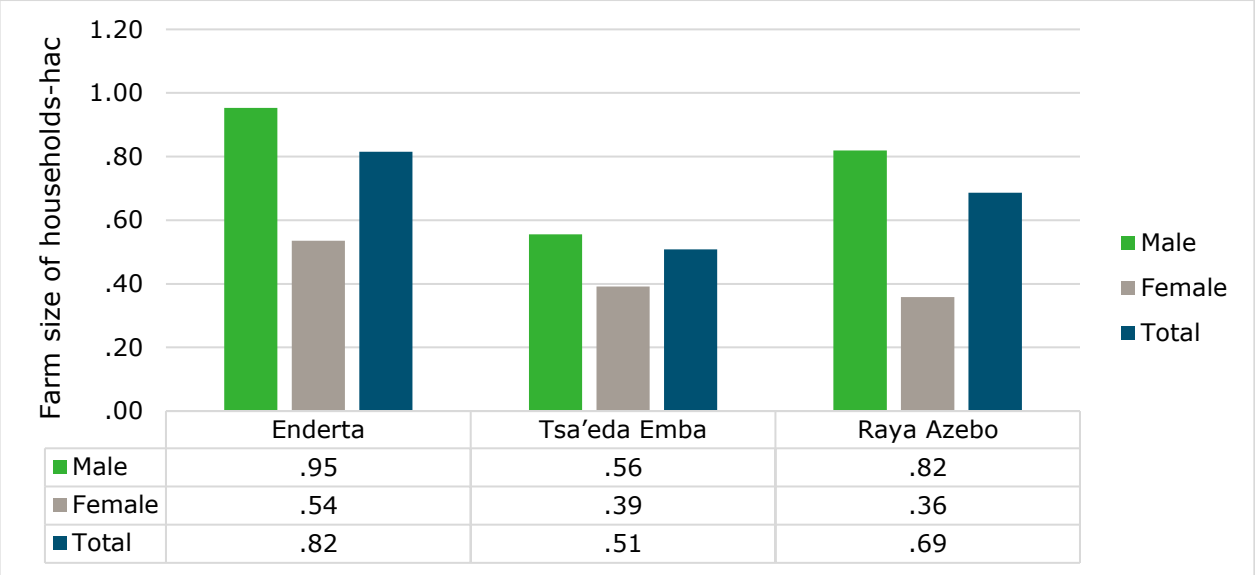


Figure 5: Average land holding of households (includes own cultivated, rented in/out, shared out)

Livestock

In Ethiopia, the agricultural sector is a corner stone of the economic and social life of the people. Livestock is an integral part of the agriculture and the contribution of live animals and their products to the agricultural economy accounts for 40%, excluding the values of draught power, manure and transport of people and products. Ethiopia has the largest livestock population in Africa, with 65 million cattle, 40 million sheep, 51 million goats, 8 million camels and 49 million chickens in 2020 (CSA, 2020).

Livestock is a major source of animal protein, power for crop cultivation, means of transportation, export commodities, manure for farmland and household energy, security in times of crop failure, and means of wealth accumulation. Livestock sector not only contributes to the agricultural GDP (45%) and the overall GDP (19%) but also plays a significant role in foreign exchange earnings, accounting for 16-19% (Statista, 2022).

The result of baseline shows (Table 6) more male headed household owned livestock compared to female headed households in all food system typologies. This implies that resources ownership is one of the sources for women disempowerment. Poultry was the most livestock owned by most households in food insecure *woreda* while cattle were owned by most people in high-potential and commercial *woredas*. Relatively higher proportion of male headed households own higher proportion of livestock compared to female headed households.

Table 6: Proportion of households' own livestock

Woredas	Cattle			Sheep/Goat			Donkey/Horse/Mule			Poultry		
	M	F	Both	M	F	Both	M	F	Both	M	F	Both
	%	%	%	%	%	%	%	%	%	%	%	%
Enderta	83	20	62	25	3	18	83	29	65	76	54	69
Tsa'eda Emba	88	70	83	61	33	53	72	37	62	68	50	63
Raya Azebo	80	40	68	27	13	23	34	13	28	45	43	44
Total	84	42	71	38	16	31	63	26	52	63	50	59

Tropical Livestock Units are livestock numbers converted to a common unit. An increased number of animals per adult available to support the household indicates improved food security and household resilience. The average, median and maximum number of animals reared per household presented as tropical livestock units (TLU) varied in relation with food systems and household head (Table 7). Generally, the result shows

that female headed households owned fewer animals than male headed. Farmers in high potential food systems owned a greater number of TLU compared to other food systems.

Table 7: Average number of TLU per region, FS typology and sex of household head

Woredas	Average			Median			Maximum			SD		
	M	F	T	M	F	T	M	F	T	M	F	T
Enderta	3.6	0.7	2.6	3.4	0.0	2.5	13.4	4.5	13.4	2.6	1.2	2.6
Tsa'eda Emba	4.0	1.7	3.3	4.0	1.6	3.2	9.7	5.9	9.7	2.3	1.4	2.3
Raya Azebo	4.1	1.1	3.2	3.5	0.1	2.5	24.0	5.1	24.0	4.0	1.4	3.7
Total	3.9	1.1	3.1	3.7	0.6	2.7	24.0	5.9	24.0	3.0	1.4	2.9

The variability of average number of TLUs shows that there was higher variability between male headed and female headed households for the three food systems (

Table 8). The difference of the average number of TLUs between food systems in Tigray was not significant (P=0.185) while it was significantly different between male headed and female headed households (P=0.000).

FS typology /Hh head	Mean	df	F	P-value, α=5%
Enderta	2.6			
Tsa'eda Emba	3.3			
Raya Azebo	3.2	2	1.699	0.185
Male	3.0			
Female	1.4	1	73.026	0.000**

Table 8: Average difference of TLU

Information Communication Technologies (ICT)

Information is a key component in improving smallholder agricultural production and linkages to remunerative markets, thus improve rural livelihoods, food security and national economies. Improvement of agricultural productivity will be realized when farmers are linked to market information. However, one major problem in many rural areas is that farmers and small entrepreneurs generally have no way of knowing the prices before they travel to the market due to poor communication facilities.

The dynamics of owning and using mobile for the intervention areas was assessed for all food systems. Less proportion of farmers in high potential owned and used mobile phones while more proportion of farmers owned and used mobile phone in food insecure *woreda* as it is adjacent to the regional town. Among those farmers who owned mobile phone, the proportion of farmers who owned smart phone that can support internet access is ranging from 12.7% in high potential to 35.5% in food insecure *woreda*.

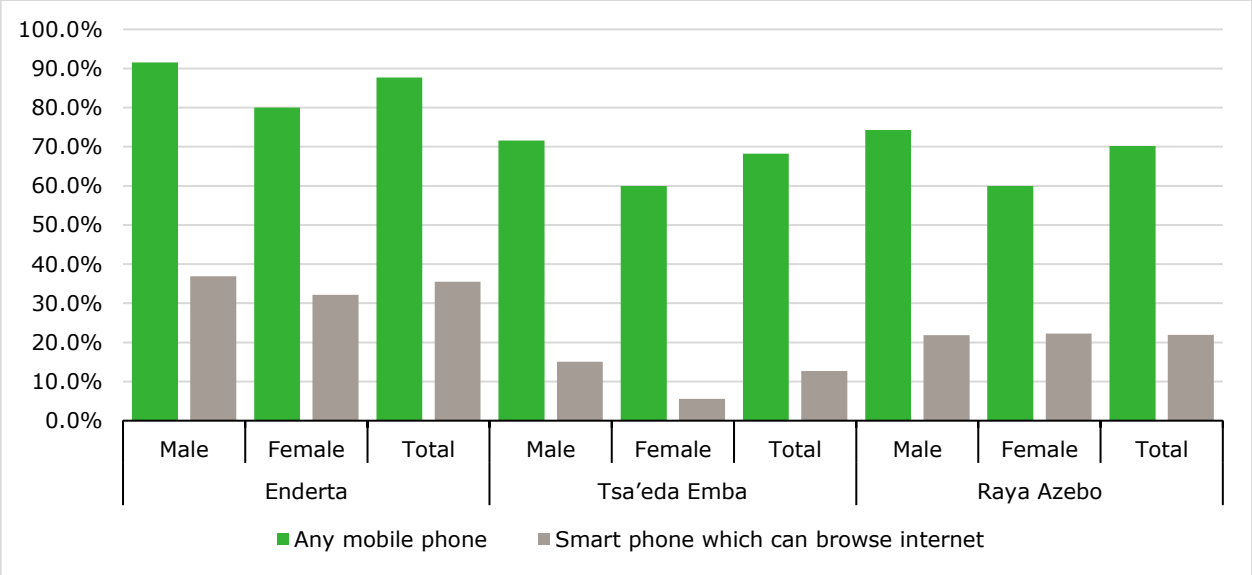


Figure 6: Proportion of households owned mobile phone

3.3. Main livelihood of households

Livelihood strategies in the survey area are a combination of activities that people undertake to survive and fulfil their livelihood requirements. The main livelihood basis of the households surveyed is crop production, livestock production and off-farm activities. Off-farm activity in this study is defined as those activities which help the household to receive cash money from agricultural wage employment, non-agricultural wage employment or self-employment and remittances.

Results of the survey indicate (Table 9 and Table 10) that crop production is the first livelihood option for 84% of the households while it is the second source of livelihood for only 4% of households. Similarly, Livestock production is the first livelihood activity for 1.3% and second livelihood for 52% of the households surveyed. Off-farm activity is the first livelihood option for only 14.3% of the households surveyed and second source of livelihood for 17% of households

Generally, source of livelihood is similar in all food systems with slightly non-significant change in proportions. Relatively high proportion of Female headed households (40% in Enderta, 13% in Tsa'eda Emba and 33% in Raya Azebo) were found to be engaged on non-agriculture or off-farm activities as their primary source of livelihood. Overall larger proportion of surveyed households in food insecure *woreda* used non/off farm activities as their primary source of livelihood.

Table 9: Primary sources of livelihood

Woreda	Sex of Household Head								
	Male			Female			Total		
	Crop farming (%)	Livestock (%)	Non/Off-farm activities (%)	Crop farming (%)	Livestock (%)	Non/Off-farm activities (%)	Crop farming (%)	Livestock (%)	Non/Off-farm activities (%)
Enderta	93	0	4	60	0	40	82	0	18
Tsa'eda Emba	92	3	3	83	3	13	89	3	8
Raya Azebo	88	1	1	67	0	33	82	1	17
Total	91	1.4	8	70	1.1	30	84	1.3	14.3

Table 10: Secondary source of livelihood

Woreda	Sex of Household Head											
	Male				Female				Total			
	Crop (%)	Livestock (%)	Non/ Off-farm (%)	No 2ndary source (%)	Crop (%)	Livestock (%)	Non/ Off-farm (%)	No 2ndary source (%)	Crop (%)	Livestock (%)	Non/ Off-farm (%)	No 2ndary source (%)
Enderta	3	55	27	15	17	17	40	26	8	42	31	19
Tsa'eda Emba	1	58	9	31	3	40	10	47	2	53	10	36
Raya Azebo	1	76	7	16	3	27	13	57	2	62	9	28
Total	2	63	14	21	8	27	22	42	4	52	17	27

4. Outcome area and indicators

4.1. Social and economic empowerment of women and youth

OUTCOME 1.1: Increased Women's and Youth's Decision-Making in Agriculture
OUTCOME 1.2: Increased Income for Women & Youth in the Food System

Women empowerment and closing the gender gap should take priority not only to improve the lives and quality of living for these women but would also positively impact the agricultural output and the general state of their economy. Furthermore, this could also create more stability for the children growing up in rural communities. With the knowledge that mothers gain, this knowledge can then be passed down to their children and the rise in income can be invested in the children's future. (FEED the FUTURE, 2013)

Women play a vital role in advancing agricultural development and food security. They participate in all aspects of rural life in paid and unpaid employment, trade, and marketing, as well as tend to crop and animals, collect water and wood for fuel, and care for family members. But women face many constraints in the multiple activities they pursue that limit their contributions and productivity; relative to men, women tend to own less land, have limited ability to hire labour, and have impeded access to credit, extension, and other training services. The main cause of this persistent gap is established traditional gender roles which continue to negatively impact women across Africa. (https://borgenproject.org/empowering-women-in-agriculture/)

Women empowerment in agriculture was measured by the Women empowerment in agriculture index (WEAI). It was developed by researchers to track the change in women's empowerment levels that occurs as a direct or indirect result of interventions under the project. WEAI is composed of two sub-indexes which measure the five domains of empowerment in agriculture, 5DE and gender parity in empowerment within the household (GPI) (Malapit,H, et.al 2020). The 5DE considered are:

Production: This dimension concerns decisions over agricultural production and refers to sole or joint decision making over food and cash-crop farming, livestock, and fisheries as well as autonomy in agricultural production.

Resources: This dimension concerns ownership, access to, and decision-making power over productive resources such as land, livestock, agricultural equipment, consumer durables, and credit.

Income: This dimension concerns sole or joint control over the use of income and expenditures.

Leadership: This dimension concerns leadership in the community, here measured by membership in economic or social groups and comfort in speaking in public.

Time: This dimension concerns the allocation of time to productive and domestic tasks and satisfaction with the available time for leisure activities.

Empowerment

To measure the empowerment of women in agriculture we use the individual level computed five domains of women empowerment (5DE). The index further identifies the domains in which women are disempowered. This helps to identify empowerment indicators that contribute substantially to the degree of disempowerment. The domains that contribute the most to the disempowerment of women are then chosen as empowerment indicators. Once these domains are selected, a continuous measure of empowerment is developed for the selected indicators.

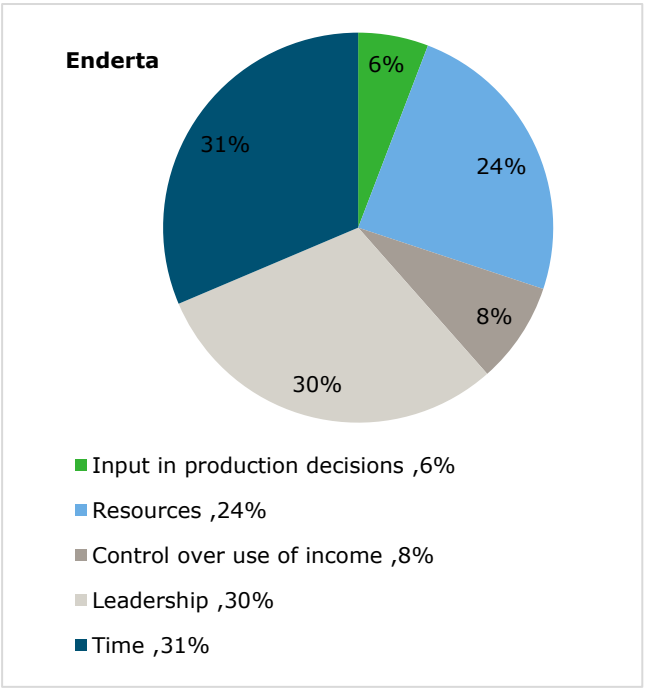
Table 11: The five domains of empowerment in the Women's Empowerment in Agriculture Index

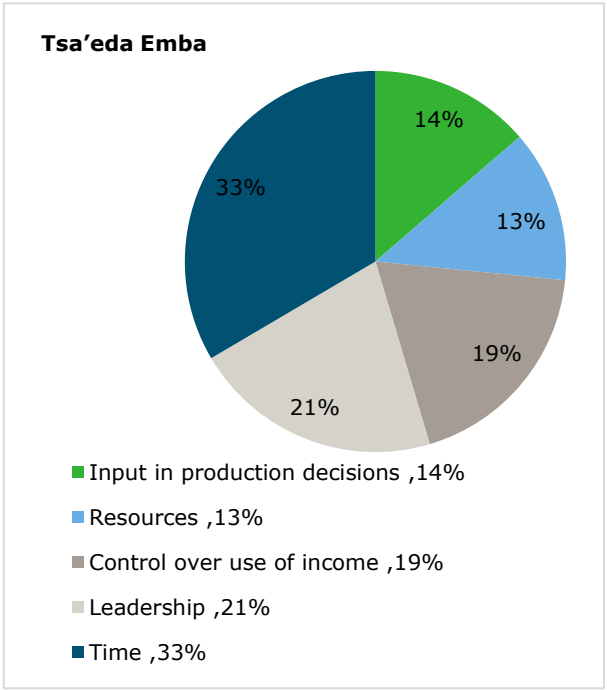
Domain (each weighted 1/5 of 5DE sub-index	Indicator	Definition of indicator	Weight
Production	Input in productive decisions	Sole or joint decision making over food and cash-crop farming, livestock, and fisheries	1/5
Resources	Ownership of assets	Sole or joint ownership and decisions of major household assets	2/15
	Access to and decisions on credit	Access to and participation in decision making concerning credit	1/15
Income	Control over use of income	Sole or joint control over income and expenditures	1/5
Leadership	Group member	Whether the respondent is an active member in at least one economic or social group, for example, agricultural marketing, credit, water users' groups.	1/10
	Speaking in public	Whether the respondent is comfortable speaking in public concerning various issues, such as intervening in a family dispute, ensuring proper payment of wages for public work programs, and so on.	1/10
Time	Workload	Allocation of time to productive and domestic tasks	1/10
	Leisure	Satisfaction with the available time for leisure activities	1/10

The 5DE for study areas shows that 18 % of women are empowered. Among the 76.5 %of women who are not yet empowered, on average, they have inadequate achievements in 31.6 %of indicators in the domains and still adequate achievements in 72.5 %of indicators in the domains. Thus, the women's disempowerment index (M0) is 76.5 %× 31.6 %= 0.241 and 5DE is 1 – 0.241 = 0.759.

Similarly, 11.8 %of youth are empowered. Among the 88.2 %of youth who are not yet empowered, on average, the inadequacy score among these youth is also 48.8 percent. So, the youth disempowerment index (M0) is 88.2 %×48.8 %=0.4298 and youth 5DE is 1 – 0.4298= 0.5702

Figure 7, from the results of the survey, the domain that contributes the most to the disempowerment of women is Time (31 to 33 percent) followed by leadership (21 to 30 percent) in all three *woredas*. Resource ownership is also the third level contribution for women disempowerment in Enderta and Raya Azebo (24% and 21% respectively) while control over the use of income is the third factor for women disempowerment in Tsa'eda Emba.





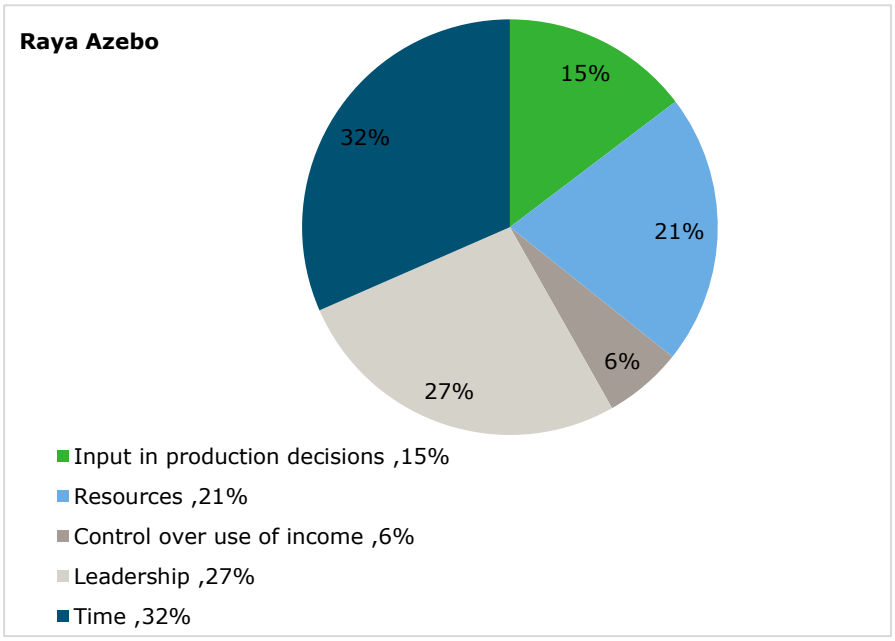


Figure 7: Contribution of each of the 5 domains to disempowerment of women

Figure 8, shows that indicators of domains that contribute most to women's disempowerment in the study areas are "weak leadership" from sub-indicator of "difficulty in speaking to influence the community" and "less leisure time" that results in high workload (18% and 17% respectively). Access to and decision on credit (16%) has high contribution for women disempowerment.

Similarly, indicators of domains that contribute most to youth disempowerment in the study areas are weak decisions on control over use of income (22 percent), have less inputs on production decisions (18 percent), weak leadership and influence in the community (13 %and 12 %respectively).

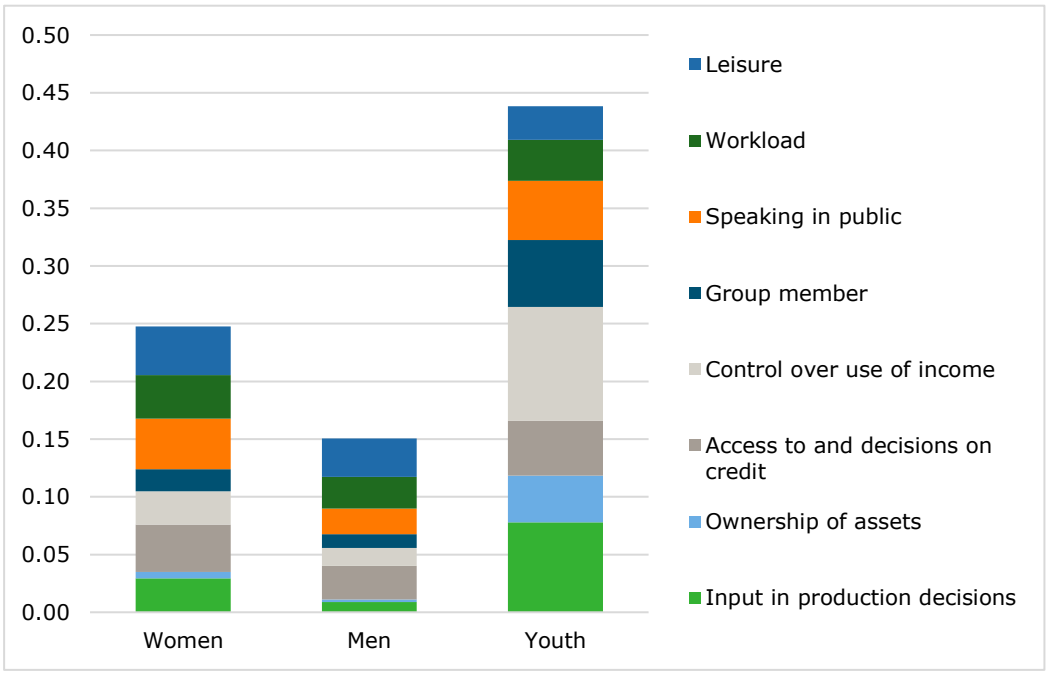


Figure 8: Contribution to disempowerment for women, men and youth

Women's, men's and youth workload

The survey assessed the workload of respondents by asking the total time spent in paid and unpaid activities, including domestic chores and caring for children and the elderly within 24 hours (1 day) before the interview day during the rainy season when the survey was conducted. A respondent achieves adequacy (acceptable workload hours per day) for the workload indicator if she/he works less than 10.5 hours per day. Respondent who worked more than 10.5 hours per day do not achieve adequacy for the workload indicator.

The workload for domestic works was found to be far higher for women than men and youth while workload for agricultural activities was higher for men than women and youth (Table 12). Leisure time was better for men than women which clearly shows that women have more workload compared to men and youth and contributes more for women disempowerment. The average number of working hours for women, men and youth were also tested for their equality separately for income generating activities (agricultural and non-farm activities), domestic activities and leisure time activities.

The average working hour for income generating activities and leisure time was higher for women The difference in average working hours for income generating, domestic and leisure time activities are statistically not significant difference for women and men.

Table 12: Average time (in hours) allocated to activities

Activities		Women	Men	Young
Agricultural activities	Farming	2.2	5.5	3.6
Non-farm activities	Work as employed/wage work	0.2	0.4	0.0
	Own business work	1.0	0.4	1.8
	Weaving / sewing / textile care	0.1	0.0	0.0
Domestic works	School (also homework)	0.0	0.0	0.3
	Shopping / getting service (incl. health services)	0.4	0.5	0.6
	Food preparation/Cooking	2.2	0.2	0.9
	Domestic work (incl. Cleaning, fetching water and fuel)	1.5	0.2	0.8
	Caring for others (children, elderly, sick)	1.2	0.3	0.4
Average time spent on income generating and domestic activities		**8.6**	**7.5**	**8.5**
Leisure activities	Sleeping and resting	11.4	10.7	11.3
	Eating and drinking	2.4	2.3	2.4
	Personal care	0.3	0.6	0.6
	Traveling and Commuting	0.4	0.4	0.8
	Watching TV/movies/listening to radio	0.2	0.4	0.2
	Exercising	0.0	0.0	0.0
	Community/Social activities	1.6	1.5	0.5
	Religious activities	0.6	1.1	0.3
Total time spent on leisure activities		**16.9**	**17.1**	**16.1**

4.2. Efficient and environmentally sustainable production

Outcome 2.1: Sustainable agricultural practices increased
Outcome 2.2: Improved functioning of input (incl. seed) supply chains
Outcome 2.3: Strategic planning for agricultural development improved

Conventional farming and monocropping systems in addition to depletion of the natural resource, causes land degradation (Hammond,J,et.al., 2017). Intercropping can be defined as a multiple cropping system that two or more crops are planted in a field during a growing season. Intercropping is a way to increase diversity in an agricultural ecosystem. Ecological balance, more efficient utilization of resources, increase the quantity and quality of products and reduction of damage by pests, diseases and weeds will increases with use of intercropping systems. Row-intercropping, mixed- intercropping, strip-intercropping and relay intercropping are most important types of intercropping (Sayed R., 2011).

Agronomic practices on which baseline data collection from households held were intercropping, relay cropping, crop rotation, agroforestry and green manuring. As shown in Table 13, most of farmers from Enderta have experiences of crop rotation and relay cropping compared to other farmers. Farmers from Raya Azebo have good practices of intercropping and agroforestry. The difference of experiences in agronomic practices among farmers across food systems across *woredas* was analysed using chi-square test and the result shows that except for green manuring and intercropping, other practices (crop rotation, relay cropping and agroforestry) were significantly different (P-value ranging from 0.000 to 0.036) between food systems in the region.

Table 13: Agronomic practices being employed/done/applied by respondent farmers

Woreda	Intercropping		Crop rotation		Relay cropping		Agroforestry		Green manuring	
	%	P-value	%	P-value	%	P-value	%	P-value	%	P-value
Enderta	2.8		82.1		11.3		7.5		0.9	
Tsa'eda Emba	1.0		68.3		0.0		1.0		1.9	
Raya Azebo	3.8		68.3		0.0		8.7		1.0	
Total	2.5	0.408	72.9	0.034*	3.8	0.000**	5.7	0.036*	1.3	0.771

**-evidence for statistically significant at 5% level*

Crop rotation is one of the improved farming practices that most farmers have experience. It was highly practiced by farmers from food insecure *woredas*. Farmers from Raya Azebo and Enderta have higher experience of agroforestry. For most agronomic practices female farmers still have less experience than men farmers on good agricultural practices.

Meher season production and use of improved varieties, fertilizer and pesticides

The two crop seasons in Ethiopia are the *Meher* and *Belg* seasons. Meher is the main crop season. It encompasses crops harvested between *Meskerem* (September) and *Yeaktit* (February). Crops harvested between *Megabi*t (March) and *Nehase* (August) are considered part of the Belg cropping season. The *Meher* crop produces 90-95 % of the nation's total cereals output, and the *Belg* harvest provides the remaining 5-10 %of cereal output (CSA, 2021).

The results of the baseline survey in Table 144 show that limited crops were produced in food-insecure and high-potential *woredas*. Low percentage of households in high potential areas have used improved varieties for wheat production. Larger proportion of farmers from high-potential *woreda* has experience of using chemical fertilizer and organic fertilizer for cereal production compared to others other *woredas*. The result also indicate that nutrition-dense crops were not widely produced except grass pea and chickpea in food insecure and commercial *woredas* respectively while sorghum was the major crop for commercial area farmers.

Table 14: Major crops produce during meher season

Woreda	Crop	HHs growing	*HHs used Improved variety*	HHs used Chemical fertilizer	HHs used Manure/ compost	*HHs used pesticide*	*Average productivity (Qt/ha)*	*Produce sold market*
		%	%	%	%	%		%
Enderata	Bread wheat	75%	61.3	60.0	17.5	60.0	7	3
	Teff	50%	18.9	49.1	11.3	64.2	6	2
	Sorghum	36%	0.0	31.6	10.5	18.4	8	1
	Food Barley	25%	0.0	44.4	11.1	48.1	8	1
	Grass peas	10%	0.0	0.0	0.0	9.1	8	12
Tsa'eda Emba	Bread wheat	77%	13.8	67.5	71.3	11.3	11	1
	Food Barley	50%	9.6	46.2	84.6	5.8	11	5
	Maize	11%	0.0	45.5	54.5	27.3	17	0
	Potatoes	11%	81.8	90.9	81.8	72.7	84	89
	Teff	11%	0.0	72.7	36.4	27.3	11	0
Raya Azebo	Sorghum	72%	6.7	8.0	12.0	60.0	10	19
	Teff	45%	27.7	10.6	6.4	42.6	4	14
	Chick-peas	11%	9.1	0.0	9.1	54.5	5	11

Irrigation

The survey results in figure 9 show that limited households in implementation *kebeles* have access to water for irrigation. Relatively high proportion of farmers in high potential *woredas* have access to water to produce crops using irrigation. In all *woredas* female headed farmers have low access to irrigation.

Vegetables like potato, onion, green peppers and head cabbage were the major crop produced by irrigation in high potential areas while commercial crops like *chat*, *Rhamnus Prinoide* (*Gesho)* and coffee were the major crops produced with irrigation in commercial *woredas*. Similarly, Tomato, head cabbage, peppers, and carrot were vegetables produced by farmer in food insecure *woreda*. Female headed farmers have less experience of producing crops by irrigation compared to male headed in most *woredas*. More number of female heads in Raya Azebo have experience in irrigation compared to female heads in other *woredas*.

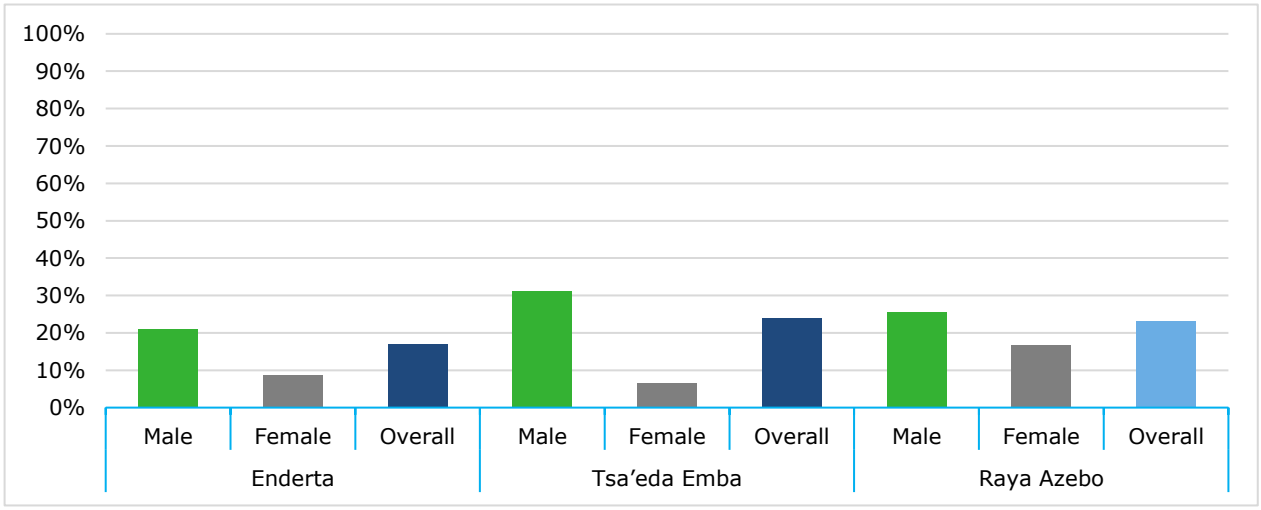


Figure 9: Percentage of households producing crops under irrigation

Home garden

The most fundamental benefit of home gardens is their direct contributions to household food and nutrition security by increasing availability, accessibility, and utilization of nutrient dense food products. Additionally, households can have better access to a diversity of vegetables and fruits that lead to an overall increase in dietary intake and boost the bioavailability and absorption of essential nutrients through home gardening (*Agric & Food Secur*ity., 2013).

Production of home garden also depend on the accessibility of water, seed, land, and knowledge. The survey result (Table 15) shows that experience of farmers for home garden production was very low. Farmers in food insecure areas have better experience on home garden production compared to others. Most farmers have experience of producing vegetables on large field which was far from home. Female headed households have less experience compared to male headed households.

Table 15: Percentage of households who had a home garden in the last 12 months

Woreda	Male		Female		Total	
	n	%	n	%	n	%
Enderta	6	8.5	3	8.6	9	8.5
Tsa'eda Emba	1	1.4	0	0.0	1	1.0
Raya Azebo	3	4.1	1	3.3	4	3.8

Challenges for home gardens

Figure 10 shows four important challenges for home gardening: high costs of inputs (seed fertilizers, pesticides, etc); time required in terms of planting, weeding, harvesting; effort of fetching water and labour to prepare seed beds, planting, weeding, harvesting. These all were mentioned as additional burden by surveyed farmers. Access to water and labour are the main challenges due to high migration of the youth to towns. High cost of inputs was also mentioned as the main challenges for farmers in Enderta followed by land scarcity and poor access to fertilizer while poor soil fertility and pests are among the major challenges identified in the high-potential *woreda*.

Access to irrigation, labour and time saving technologies, labour sharing arrangements were mentioned by most farmers as a copping mechanism for the burden they faced. In addition to these, few farmers indicated that the support of home garden inputs (water can, cultivator/dibber) encouraged them to produce more and incur interest to continue with the activities of home garden.

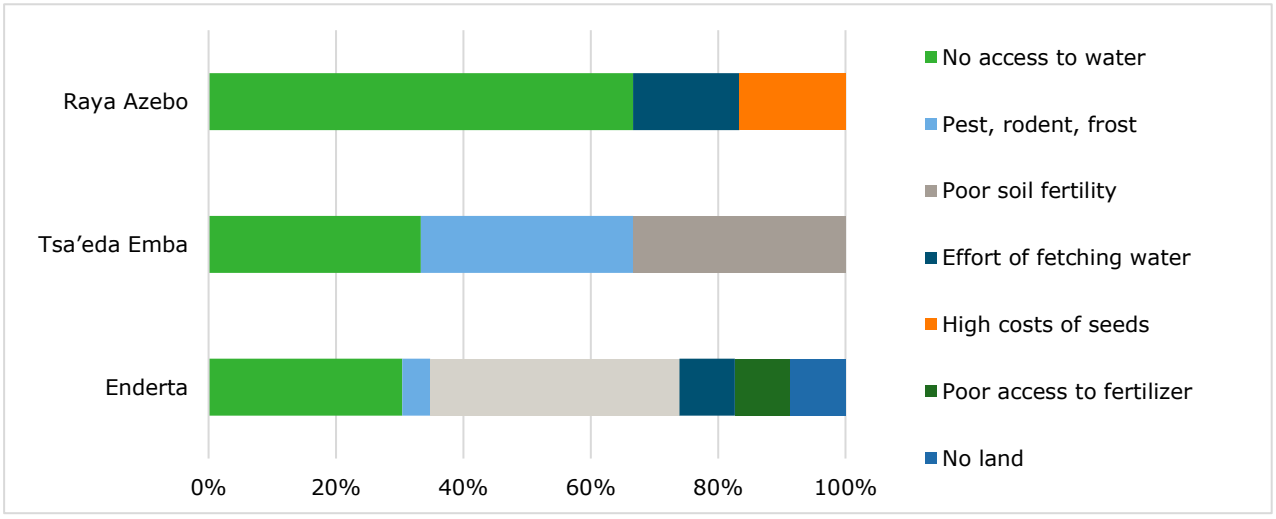


Figure 10: Challenges in home gardening

Agricultural extension

Agricultural extension is the primary mechanism to disseminate innovations that enhances agricultural production. The evaluation of various studies showed that agricultural extension contributes to improving farming, improving commercialization, educating farmers, conserving natural resources, promoting new technologies, promoting sustainable agricultural practices, and disseminating information across various settings. The extension system in Ethiopia has great potential to help farmers throughout the country with development agents (DAs).

The survey result (Table 16) shows that relatively high proportion of male headed farmers had contact or were visited by agricultural development agents (DAs) in food insecure and commercial *woredas*; yet, in the high-potential *woreda* about equal proportion of male and female headed households had access to agricultural extension service. Extension services were better in high potential *woredas* while very low in food insecure and commercial *woredas* (Table 16).

The proportion of visited female headed households was slightly lower than male headed households but statistically the difference is not significant. Farmers in high potential areas were more visited by development agents followed by those in the food insecure *woreda* (56.7%, 36.8% respectively). The difference in percentage of farmers who were visited by the DAs for male headed and female headed farmers was statistically significant for the food-insecure *woreda*. Overall, access to extension services showed statistically significant difference in the three *woredas*.

Table 16: Percent of farmers visited by development agents for the main season

Woreda	**Male**	**Female**	**Overall**	**Chi-square test for the difference- Male VS Female**	**Chi-square test for the difference- between *woredas***
	%	**%**	**%**	**P-Value**	**P-Value**
Enderta	43.7	22.9	36.8	0.0370**	
Tsa'eda Emba	56.8	56.7	56.7	0.9930	
Raya Azebo	36.5	26.7	33.7	0.3370	
Total	45.7	34.7	42.4	0.0720*	0.0100**

***-significant at 5%, *-significant at 10%*

Effective extension and advisory services for supporting farmers by development agents have the potential to improve agricultural productivity, net farm income and food security. Farmers were asked on the number of visits made by the various development agents and the type of messages they passed over and the number of visits were categorized as high (at least once within less than 2 weeks in cropping season), medium (within 2 to 4 weeks in cropping season) and low (within more than a month in cropping season).

Table 17 shows the frequency at which development agents were visiting farmers. It is quite clear that the frequency of extension agents in contact with farmers was low in the implementation areas with slight differences among *woredas*. The proportion of farmers under low frequency of visiting ranges from 43% to 56% indicating that large proportion of farmers are visited by DAs only once in more than a month.

Table 17: Frequency of farmers visited by DAs for the main cropping season

Woreda	**Male HH head**			**Female HH head**			**Overall**			**Ch-square test, Male VS Female P-value**
	High	**Medium**	**Low**	**High**	**Medium**	**Low**	**High**	**Medium**	**Low**	
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	
Enderta	16	29	55	0	38	63	13	31	56	0.471
Tsa'eda Emba	21	33	45	29	18	53	24	29	47	0.470
Raya Azebo	26	30	44	13	50	38	23	34	43	0.521
Total	21	31	48	18	30	52	20	31	49	0.921

Chi-square test among woredas (P-value) =0.648

4.3. Sector performance and value chains enhanced

Outcome 3.1 Access to finance enhanced (inclusive to youth and women)

Outcome 3.2 Market linkages created and access to market information improved

Access to finance and type of financial institutions

Access to credit can open economic opportunities for women and youth which can help reduce poverty because they strengthen the ability of people to grow assets and smooth out their consumption, which, in turn, can help protect against unexpected financial shocks (Dunford, 2012). Financial inclusion connotes all initiatives that make formal financial services accessible and affordable, primarily to low-income people.

The baseline survey collected data on the accessibility of financial institutions available in the survey areas by asking whether any member from the household borrowed either cash, in-kind or cash and in-kind from different sources. Table 18 shows most of the household members were able to get and borrowed in cash and/in kind from friends and relatives except households in food insecure that obtained credit from NGOs. This implies that different formal financial institutions were not accessible for farmers to borrow finance. Relatively more household members in the Enderta *woreda* were able to get loan from formal lenders (bank/financial institution) compared to others. Group based micro-finance including VSLAs/ SACCOs were more accessible by household members from the high- potential *woreda*.

Table 18: Percent of households that accessed loan from different sources

Woreda	Non-governmental organization (NGO)	Formal lender (bank /financial institution)	Informal lender	Friends or relatives	Group based micro-finance including VSLAs/ SACCOs	Informal credit/ savings groups (e.g tontines, etc.)	Access credit from any source	Chi-square test P-value
	%	%	%	%	%	%	%	
Enderta	34.9	16.0	0.0	16.0	0.0	1.9	45.3	
Tsa'eda Emba	14.4	13.5	27.9	39.4	17.3	1.9	64.4	
Raya Azebo	1.0	5.8	1.9	14.4	1.0	1.0	20.2	
Overall	16.9	11.8	9.9	23.2	6.1	1.6	43.3	0.000**

Table 18 also shows formal sources (non-governmental organization, bank/financial institution) and Group based micro-finance or lending including VSLAs/ SACCOs were less accessible than informal lending sources (Informal lender, Friends or relatives, and Informal credit/ savings groups (e.g merry-go-rounds (*Ekub*), funeral societies, etc.). The accessibility of financial services is significantly different *(P-value 0.000)* for the overall sample.

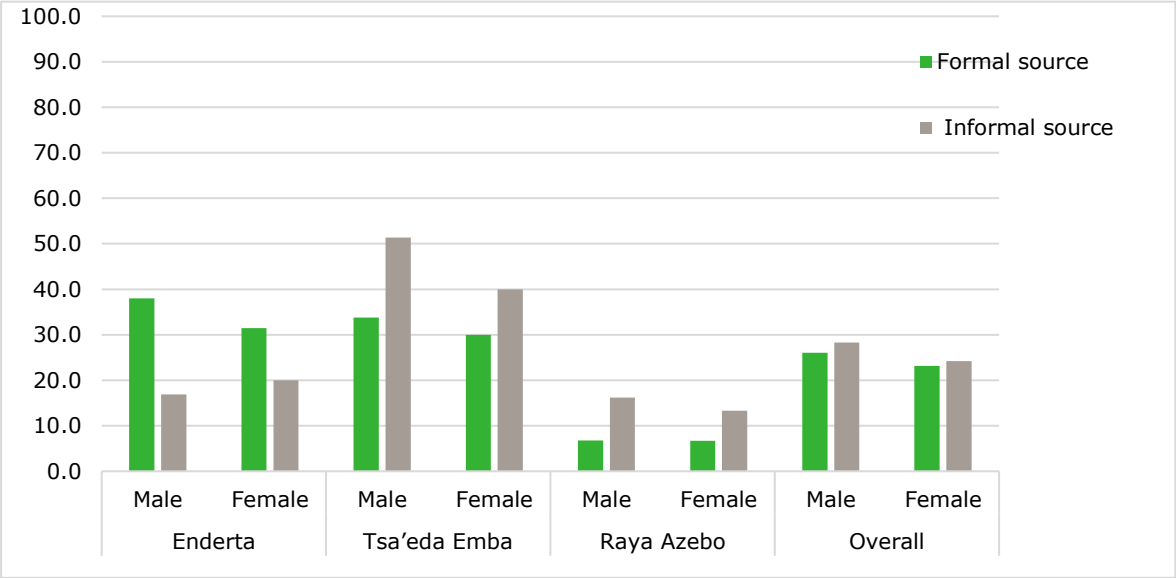


Figure 11: Access of credit from formal sources and informal sources

Figure 11 shows low proportion of household members from female headed households in all food systems have access to borrow from formal sources compared to household members from male headed households. Overall, about 26% and 23% of household members from male headed and female headed households respectively were able to get credit from formal source. Household members in the Raya Azebo were the least in accessing credit from formal sources.

The accessibility of formal sources for male headed members of households and female headed members of households also tested statistically for its difference. It was not significantly different for male headed and female headed households in all three *woredas* (P-value ranges from 0.328 to 0.676 for formal sources and from 0.203 to 0.485 for informal sources) at 5% level of significance. Similarly, the accessibility of formal credit sources and informal credit sources among *woredas* are statistically different (P-value 0.000**) at 5% level of significance.

Access to market information

The provision of basic market information is a service that aims to increase the efficiency of agricultural markets and contribute towards overcoming issues of market failure due to asymmetric access to basic market information. According to Shepherd (1997), public dissemination of prevailing market prices and conditions is one of the formats whereby farming households obtain market information. Public provision of market information aims to reduce asymmetry of information in the marketplace. The data obtained from the baseline showed that about 70%, 78% and 79% farming households from food insecure, high potential and commercial areas respectively had access to market information before taking their produce to market which they obtain through a variety of sources. Relatively higher proportion of female headed households have access to market information than male headed households in both high potential and commercial *woredas*.

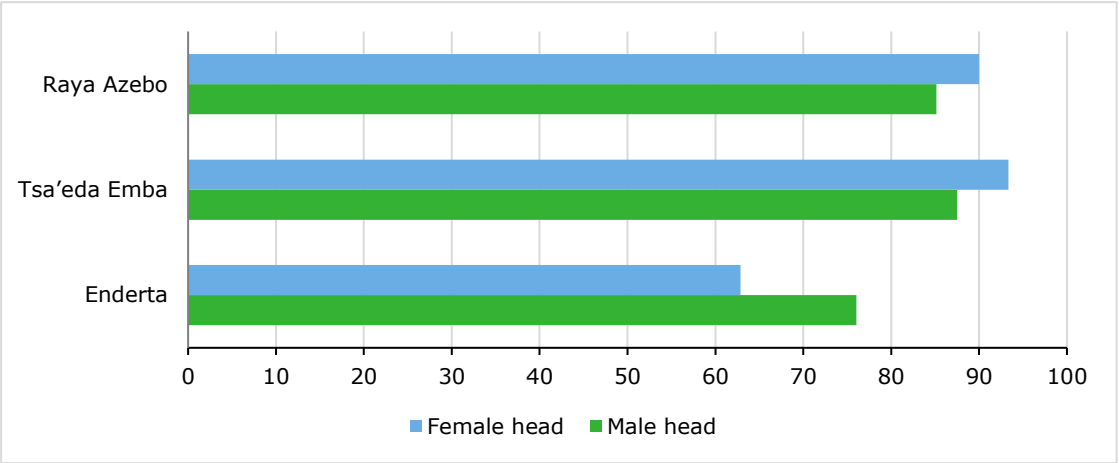


Figure 12: Percentage of respondents who have access to market information

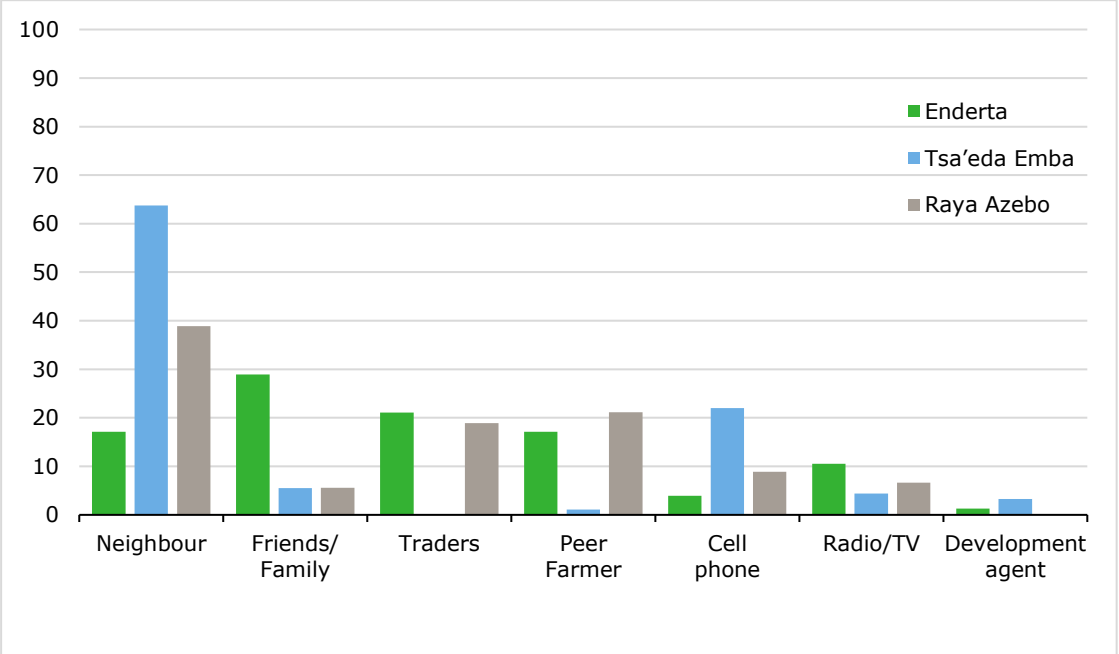


Figure 13: Source of market information

Figure 13 shows that most farming households from all food systems access market information from their neighbours and or friends and family. Larger proportion of farmers in food insecure areas access market information from Radio/TV due to adjacent to regional capital. Larger proportion of farmers in Tseada Emba *woreda* used cell phone for accessing market information but generally very small proportions of farmers obtain market information from these sources.

4.4. Availability of safe and nutritious foods

Outcome 3.1 Increased availability of nutrient-dense food
Outcome 3.2 Increased utilization of safe and nutrient-dense foods
Outcome 3.3 Develop and/or strengthen national food safety system

Sources of food consumption

Figure 14 reports the main sources of foods consumed by the household in the last 12 months preceding the survey days which was either from own production, purchased, obtained from gift/transfer or food aid. The proportion of households that reported 'own production' as the main source of food consumption was highly higher than other sources of food reported. Less proportion of female headed households were able to cover their annual food consumption from their own production in all *woredas*. The differences in source of household food for male and female headed households were statistically significant for Enderta, Tsa'eda Emba, and Raya Azebo (P-value 0.005, 0.016, and 0.011 respectively). Sample households from the high-potential *woreda* were able to cover their food from their own production for a greater number of months in the year compared to the food-insecure and commercial *woredas*. As expected, food aid was observed in the food-insecure and high-potential *woredas* in the region. The difference in main source of food between food system typologies was statistically tested and the result shows that there was strong evidence that the difference in main source of food in the last 12 months before interview date was significant at 5% level (chi-square P-value 0.020). Among all food system typologies, purchasing food from the market either from their saved money or selling livestock was found to be the second important source for covering their food for their family.

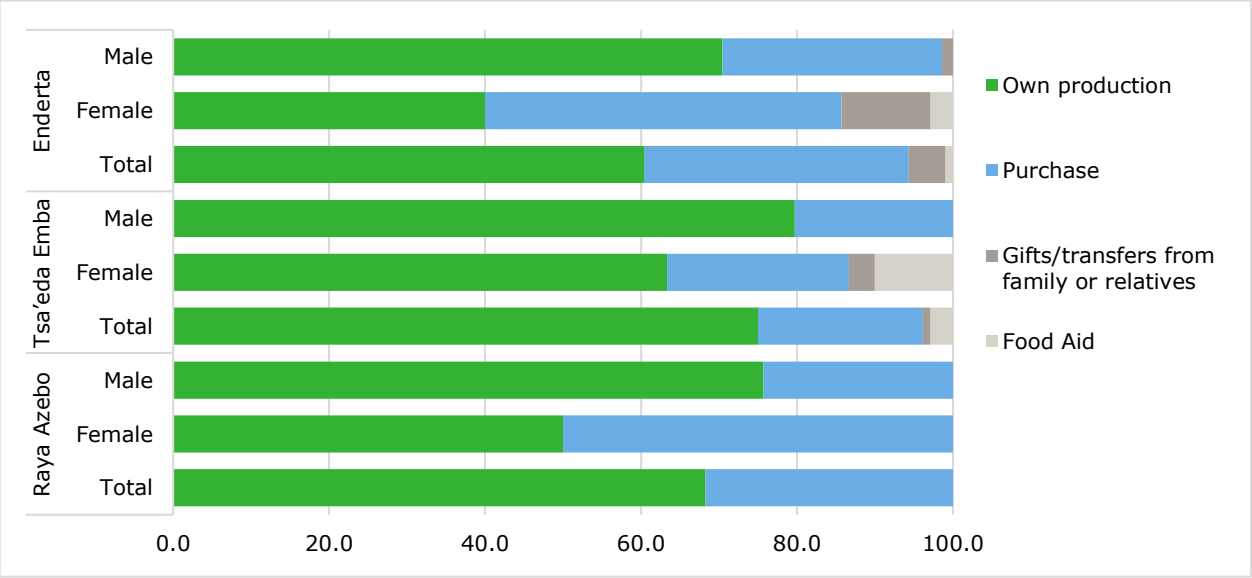


Figure 14: Source of food consumption for 12 months before study time in Amhara

Months with food gap

Food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 2022). It can be measured using a subjective indicator called food gap (ibid). The number of months that the household was not able to satisfy their food needs in the last 12 months preceding the survey date was assessed by asking "Is there a time of year when there was less food/food shortage compared to other times?"

The results as presented in Table 19 revealed that most of the households in the food-insecure *woreda* faced food shortage compared to the high-potential and commercial *woredas*. High proportion of female headed households faced food shortage compared to male headed households in high potential and

commercial *woredas*. But, in the food-insecure *woreda*, more male headed household faced food shortage compared to female headed as most female heads participated on side bussinesses to covere their food demands.

The difference in food insecurity level between female headed and male headed households within food system typologies between *woredas* were tested using chi square test.The result reveals that the difference in food insecurity level within *woredas* for male headed and female headed households was not significant at 5% level. But there is strong evidence that the difference of food security level between food system typologies was statistically significant at 5% level with P-value 0.000.

Table 19: Percent of households faced food shortage

Woreda	Male head	Female head	Overall	Chi-square test for difference of facing food shortage.	
				Between Male, female Head	Between FS typologies
	%	%	%	p-value	p-value
Enderta	94.4	91.4	93.4	0.682	
Tsa'eda Emba	63.5	73.3	66.3	0.370	
Raya Azebo	54.1	66.7	57.7	0.278	
Total	70.3	77.9	72.6	0.215	0.000**

***-significant at 5% level, * significant at 10% level*

As shown in Table 20 most of the households (56%) from the food- insecure *woreda* faced food gap for 4 to 6 months (average 4.4 months) in a year. Overall, high proportion of female headed households faced food shortage for a greater number of months. Female headed households in the food-insecure, the high-potential and the commercial *woredas* faced food shortage on average for 4.8, 4.2, and 3.8 months, respectively while male headed households faced on average for 4.2, 3.1, and 2.3 months, respectively.

Table 20: Percentage of households faced food gap in the last 12 months

Woreda	Male headed HH				Female headed HH				Overall			
	# Of Months with Food gap				# Of Months with Food gap				# Of Months with Food gap			
	0	<=3	4 to 6	>6	0	<=3	4 to 6	>6	0	<=3	4 to 6	>6
Enderta	5.6	29.6	53.5	11.3	8.6	17.1	60.0	14.3	6.6	25.5	55.7	12.3
Tsa'eda Emba	36.5	20.3	32.4	10.8	26.7	13.3	36.7	23.3	33.7	18.3	33.7	14.4
Raya Azebo	45.9	25.7	21.6	6.8	33.3	13.3	40.0	13.3	42.3	22.1	26.9	8.7
Total	29.7	25.1	35.6	9.6	22.1	14.7	46.3	16.8	27.4	22.0	38.9	11.8

Critical months for food shortage

Figure 15 indicates that, most of the households from Enderta and Raya Azebo faced food shortage from Aug to Oct with critical month being September while most farmers from Tsa'eda Emba faced food shortage from July to September with critical month being August. About 91% of households in Enderta and 49% of households in Raya Azebo faced food shortage in September while 60% of households from Tse'ada amba faced food shortage in the month of August.

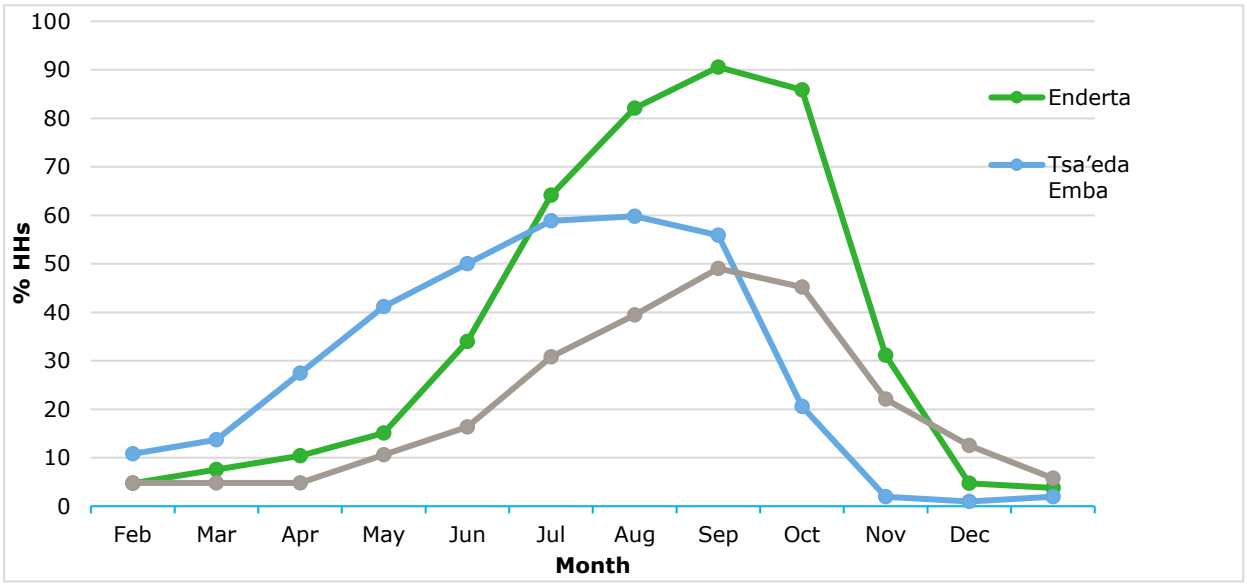


Figure 15: Months with food gap of surveyed woredas in a year

Dietary diversity - food consumption score

The dietary diversity & food frequency approach aims to estimate whether the household manages to access items from the basic food groups in their habitual diet. Number of days of consumption out of the reference last 7 days (week) is intended to track potential regularities in the consumption habit (FAO 2010).

The food consumption score is calculated to assess the food consumption behaviour of surveyed households within 7 days of before interview day based on eight categories of food groups. These food groups include cereals and tubers, pulses, vegetables and leaves, fruits, Meat/Fish, Milk and Dairy, Sugar and sugarcane (as well as Oil, fat and butter. Based on the guideline for measuring household and individual dietary diversity produced (FAO 2010), the total calculated FCS from 0-21 is poor food consumption behaviour, 21.5-35 is borderline food consumption and FCS>35 is acceptable food consumption behaviour.

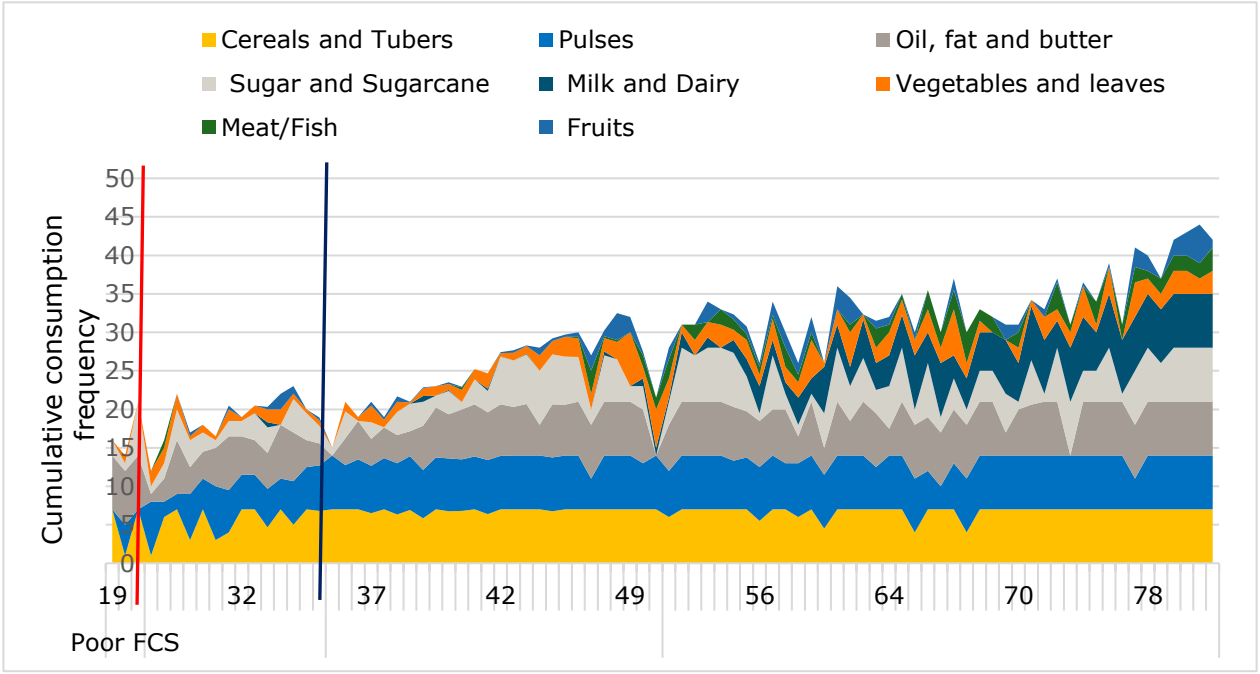


Figure 16: Food consumption frequency of different food crops

A disaggregation of the households by FCS presented in Figure 16 show that cereals and pulses were consumed 6 to 7 days in a week for all *woredas* with average number of days about 7 days. Consumption of Vegetables and fruits were very limited in all *woredas* with average 1 to 2 days per week. Consumption of fruits within a week observed only in Tsa'eda Emba. Dairy products were more consumed in Raya Azebo and Tse'ada Emba with average number of days 1 to 2 per week but dairy products observed in their meal for the food-insecure *woreda*. Sugar, oil, fat and butter consumption practiced for 4 to 6 days per week in all *woredas*.

The food consumption score of surveyed households were also analysed and categorized as poor, borderline and acceptable food consumption behaviour. The result shows that poor food consumption behaviour was observed in the food-insecure *woreda* and in the commercial *woreda* with higher percentage of female headed households (Figure 17). About 60% households in all *woredas* had acceptable food consumption score. The result also shows that only about 4% of the households in the food-insecure areas and 7% of female headed households in the commercial area had poor food consumption behaviour.

The differences of FCS also statistically tested, and it is significant (P-value 0.032) among female headed and male headed for commercial area while not Significant for male and female headed households in the food-insecure and the high-potential *woredas* (P-value 0.547, 0.510 respectively) at 5% level of significance. The difference of food consumption score among food system typologies were significant (P-value 0.024).

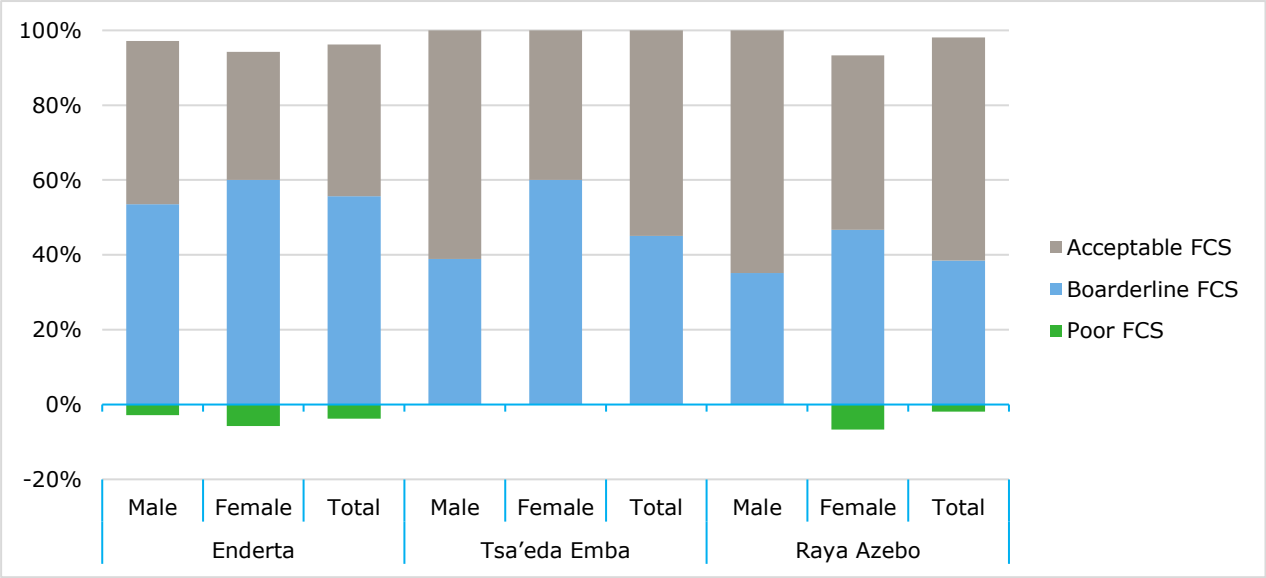


Figure 17: Percent of households under each Food Consumption Score of Amhara woreda

Dietary diversity - Individual Quality Dietary Diversity (QDD)

The Individual Quality Dietary Diversity (QDDS) was measured on men and women by asking them about their individual food consumption in the 24 hours prior to the interview. The questions were based on 10 food group categories: grain, white roots and tubers, and plantains; pulses (beans, peas and lentils); nuts and seeds; dairy; meat, poultry and fish; eggs; dark green leafy vegetables; other vitamin a-rich vegetables and fruits; other vegetables; and other fruits.

There were significant differences in dietary diversity scores between food system typologies. As shown in Table 21, among all respondents, few proportions of individuals fulfil the minimum diversified food items (>=5 FG). About 2.8%, 7.8%, and 9.6% of individuals consumed at least five food groups or more within a day. Respondents from Raya Azebo, which is commercial food system, consumed better number of food groups with an average of 3.1 food groups compared to other food system typologies. The least number of diversified food groups with average 2.4 was observed in food insecure areas.

There were also differences in the proportion of women under reproductive age who achieved minimum dietary diversity (MDD-W). Women under reproductive age from Raya Azebo had the highest proportion of

people meeting the minimum diet diversity (13.2%). The average number of food groups consumed by reproductive women age groups was found to be 3.2.

The average number of food groups consumed by respondents in each *woreda* was slightly different and statistically tested for their significant difference. The mean difference test among food system typologies shows that, there is strong evidence that the difference was significant at 5% level of significance (P-value 0.000). Similarly, as indicated in Table 21, the difference was significant among for men, women and women under reproductive age (age 15 to 49) in different food system typologies with p-value 0.008, 0.002, and 0.004, respectively.

Table 21: Dietary diversity of surveyed respondents (Minimum of 5 food items)

Dietary Diversity score		Enderta	Tsa'eda Emba	Raya Azebo	Total	F-test Between *woredas*. F(df), P-value
Overall	n	106	102	104	312	
	%	2.8%	7.8%	9.6%	6.7%	
	ave	2.4	2.9	3.1	2.8	9.561(2), 0.000**
Men	n	53	51	53	157	
	%	3.8%	13.7%	9.4%	8.9%	
	ave	2.5	3.1	3.1	2.9	4.992(2), 0.008**
Women	n	53	51	51	155	
	%	1.9%	2.0%	9.8%	4.5%	
	ave	2.4	2.6	3.1	2.7	6.395(2), 0.002**
Women (15–49)	n	46	35	38	119	
	%	2.2%	2.9%	13.2%	5.9%	
	ave	2.5	2.7	3.2	2.8	5.780(2), 0.004**

n-number of respondents, ave-average number of food items/groups, %-%of individuals consumed at least 5 food items/group per day

As shown in Table 22, the number of food groups (FGs) consumed within 24 hours preceding the survey date varied from *woreda* to *woreda*. Most individuals in Raya Azebo and Tsa'eda Emba, more than 60% and 50% respectively, consumed at least three food groups while 27% of individuals from Enderta consumed a minimum of 3 FGs. The difference in proportion of respondents who consumed either five, four or three food groups across food system typologies was statistically tested using chi-square test. The result showed that there is significant difference in proportion of respondents consumed at least 3 FGs across food system typologies (P-value=0.000) while the difference of the proportion of respondents who consumed at least 5FGs across food system typologies was not significant (P-value =0.126)

Table 22: Proportion of respondents consumed at least 5/4/3 food items

Respondent	Food groups	Enderta	Tsa'eda Emba	Raya Azebo
		%	%	%
Overall	>=5 FG	2.8	7.8	9.6
	>=4 FG	13.2	23.5	26.9
	>=3 FG	27.4	51.0	63.5
Men	>=5 FG	3.8	13.7	9.4
	>=4 FG	17.0	31.4	28.3
	>=3 FG	26.4	56.9	66.0
Women	>=5 FG	1.9	2.0	9.8
	>=4 FG	9.4	15.7	25.5
	>=3 FG	28.3	45.1	60.8
Women (15 - 49)	>=5 FG	2.2	2.9	13.2
	>=4 FG	10.9	14.3	28.9
	>=3 FG	32.6	51.4	65.8

In all *woredas* (Figure 18), starchy staple foods, Pulses (beans, peas and lentils), were the most frequently reported foods groups consumed by most people. Dark green leafy vegetables were consumed by limited people, but other vegetables were more consumed with good consumption patterns in high potential area. Dairy products were consumed by most individuals in Raya Azebo.

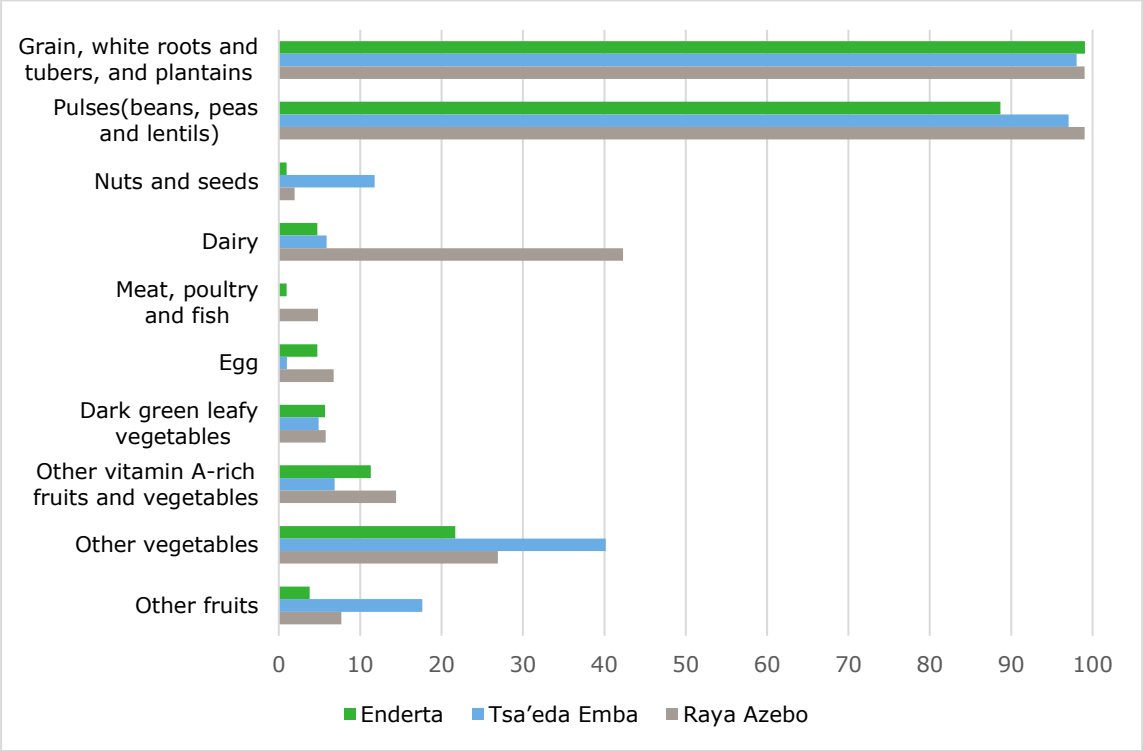


Figure 18: Percentage of people consumed each food groups within a day

Household Food Insecurity Access Scale (HFIAS)

Food security is defined as a state in which "all people at all times have both physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life" (USAID, 1992). Food insecurity (FI) is defined as the limited or uncertain availability of nutritionally adequate and innocuous foods or the limited or uncertain capacity for acquiring adequate foods by socially acceptable means (Salvador et. al, 2015).

Figure 19 depicts a conceptual framework about the onset and process of household food insecurity

It is known that the household food insecurity can be measured in different way depending on the purpose of the study. This study employed commonly known measure of food security status tools known as Household Food Insecurity Access Scale (HFIAS). The tool consists of nine occurrence questions and nine frequencies of occurrence questions. The HFIAS occurrence questions ask whether or not a specific condition associated with the experience of food insecurity ever occurred during the previous 4 weeks (30 days).

A food secure household experiences were none of the food insecurity conditions, or just experiences worry, but rarely.

A mildly food insecure household worries about not having enough food sometimes or often, and/or is unable to eat preferred foods, and/or eats a more monotonous diet than desired and/or some foods considered undesirable, but only rarely. But it does not cut back on quantity nor experience any of three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating).

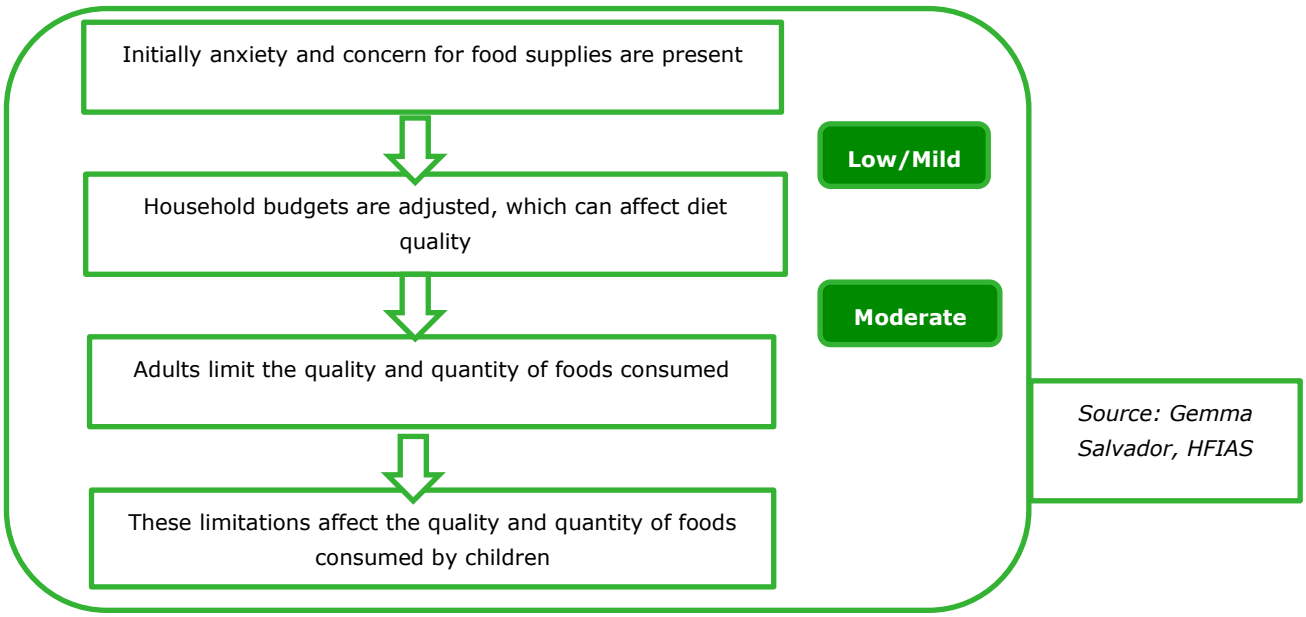


Figure 19: Onset and process of household food insecurity
Source: Salvador, et al, 2015

A moderately food insecure household sacrifices quality more frequently by eating a monotonous diet or undesirable foods sometimes or often, and/or has started to cut back on quantity by reducing the size of meals or number of meals, rarely or sometimes. But it does not experience any of the three most severe conditions.

A severely food insecure household has graduated to cutting back on meal size or number of meals often, and/or experiences any of the three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating), even as infrequently as rarely. In other words, any household that experiences one of these three conditions even once in the last four weeks (30 days) is considered severely food insecure (USAID, 1992).

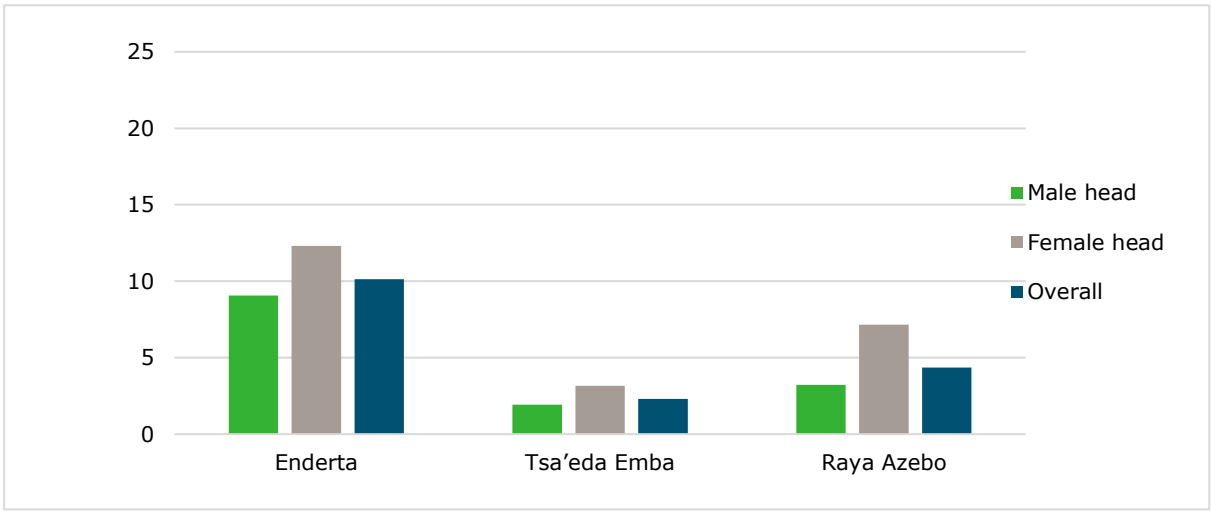


Figure 20: Average household food insecurity access score

The survey result (Figure 20) showed that the average HFIAS was high in the food-insecure *woreda* ranging from 9 to 12 for male headed and female headed households, respectively. The score was also relatively high for the commercial *woreda* compared to the high-potential area where the lowest HFIAS was observed.

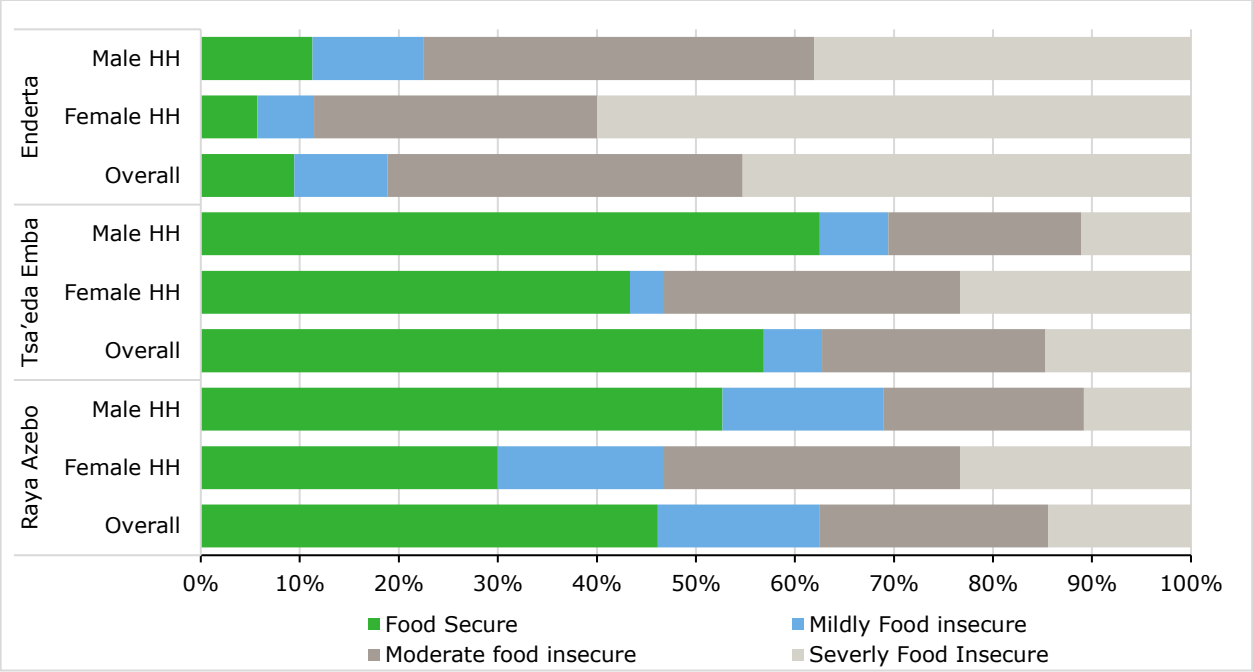


Figure 21: Percentage of households with food insecurity level

The results presented in figure 21 among food system typologies, high percentage of households (45%) in the food-insecure *woreda* had experienced a severe food insecurity. Higher proportion of female headed households from food insecure, high potential and commercial *woredas* (respectively 86.8%, 53.3%, and 53.3%) were categorised under moderate to severe food insecurity. Generally female headed households were more food insecure than male headed households in all food systems. A small proportion of sever food insecure households was observed in high potential area. The difference in food insecurity access scale between *woredas* was tested and found significant (P-value =0.000). The difference was also tested for male headed and female headed households within each food system and the result shows that it was not significantly different for each *woredas* with P-value 0.187, 0.169, and 0.134 respectively for the food-insecure, the high-potential and the commercial areas.

Conclusions

The survey provided an in-depth overview of the baseline information and data through which key project indicators were established.

The study utilized the five domains of empowerment, which is one part of WEAI, to demonstrate degrees of empowerment and degree of WEAI's indicator contribution for women and youth disempowerment. Among the five domains of empowerment (5DE), women were empowered with 75.9% of WEAI's indicators and still disempowered with 24.1%. Similarly, youth were empowered with only 57% of indicators while disempowered with 43% of WEAI's indicators.

Time use counts the largest share (32%) for women's disempowerment with 15% of high workload and 17% less leisure time. Leadership (25%) is the second stage for its contribution of women's disempowerment with 18% facing difficulties of speaking in public and 8% lack of group membership. Access to finance and decisions on credit had high contribution (16%) for women disempowerment among indicators for resource domain. Hence efforts should be made towards improving women's workload, increase women involvement in economic activities to enhancing leadership, and improving access to finance.

Similarly for youth empowerment, weak leadership and influence in the community is the major contributor for youth disempowerment (25%) with 13% lack of group membership and 12% difficulties of speaking in public. Lack of inputs for decisions on control over use of income and lack of resources also high contribution for youth disempowerment (22%).

An indicator of dietary diversity is particularly designed to capture the quality dietary diversity (QDDs) of individuals that used as a proxy for household QDDs. There were minimal differences in dietary diversity scores between food system typologies and between male and female in the implementation area. Few women, less than 10% achieved the recommended minimum dietary diversity in all *woredas*. In general, the dietary diversity was very low in all food systems. Respectively in Enderta, Tsa'eda Emba and Raya Azebo, the average number of food items were 2.4, 2.9, and 3.1. Overall, about 27%, 51% and 64% of individuals from food insecure, high potential and commercial areas consumed at least three food items.

Access to finance for rural households were limited in the implementation area specially for women and youth. Informal lending sources like friends/ relatives, informal credit/saving groups like merry-go-rounds, funeral societies were more accessible than formal sources like bank/financial institution, micro-finance including VSLAs/ SACCOs. In all food systems, female headed households have less access to finance compared to male headed households. Improving access to finance for women and youth needs to be one of the areas of intervention to improve livelihood.

Experience of farmers on agronomic practices like intercropping, relay cropping, crop rotation, agroforestry and green manuring was assessed the survey. Most farmers had less experience on intercropping, relay cropping, agroforestry and green manuring. High percentage of farmers (73%) had experience on crop rotation even though more farmers rotated their crops with similar category of crops like cereal with cereal which is not recommended as good agricultural practice. This method of crop rotation has no input for increasing crop productivity and the survey results also shown that productivity of most crops was very low. Female headed farmers have less experience on those good agricultural practices. These low experience of improved farming practices leads farmers to low productivity. Relay cropping, agroforestry and green manuring were less practiced by farmers.

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Resilient Agriculture for Inclusive and Sustainable Ethiopian Food Systems (RAISE FS)

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Resilient Agriculture for Inclusive and Sustainable Ethiopian Food Systems (RAISE-FS) is a four-year program funded by the Dutch Embassy in Addis Ababa and hosted by Stichting Wageningen Research Ethiopia based in Addis Ababa, to bring about transformation in the Ethiopian food system. RAISE-FS will develop and implement a demand-driven and interdisciplinary approach to Research for Food System Transformation (R4FST) and as such contribute to the Government of Ethiopia's transformational agenda.