6

FOOD SECURITY CONDITION OF SMALLHOLDING FARMERS IN KILTE AWELALO

Globally, the figures of undernourishment has shown a significant decline where currently there are about 795 million people who are undernourished. For developing nations as a whole, the total share of undernourished people in the total population has declined from 23.3% in 1990-92 to 12.9% in 2013-14. A pronounced decline in number of undernourished was perceived majorly from developing nations despite the significant population growth (FAO, 2015). Africa in general showed a slow progress towards achieving international hunger targets as the region is highly influenced by natural disasters and conflicts. The continent continues to be the region with the highest prevalence of undernourishment with an average of one in four people out of a billion are estimated to be undernourished.

The Sub-Saharan Africa has the highest prevalence of undernourishment though there has been seen a betterment in the last two decades. Undernourishment has declined from 32.7% to 24.8% in 2014. The five countries in Africa with the highest undernourishment are Ethiopia, Tanzania, Nigeria, Kenya and finally Uganda (Birara E., 2015). Ethiopia is frequently affected by food deficits where on average 5 million people require food aid each year. Additional to this, due to El-Niño impact, the number of population who are in need of direct food aid has increased to 15 million (Federal Democratic Republic of Ethiopia, 2015). Since the 1980s, the country was able to enhance grain productivity by 70% yet in parallel the total population grew from 40 to 99.1 million and will further increase by 31 million in the coming 15 years (CSA, 2014). Coupled with

this, low land fertility and environmental degradation, disease epidemic and other factors led to a high variability in the agricultural productivity, predominantly in the smallholding farmers. FAO (2015) affirmed that economic growth is a key success factor for reducing hunger which basically focuses on the livelihoods of the poor and thus improving the productivity and income generating activities of smallholder farmers is a key to its progress.

Ethiopian economy basically depend on agriculture and the sector contributes the lion share of the Gross Domestic Product (GDP) and foreign currency earnings of the country through sale of agricultural outputs abroad. Furthermore, the sector is creating employment opportunities to the majority of the country's population and presently about 85% of the total population depend on agriculture to sustain their basic livelihood. Consequently, as the sector had been backbone of the Ethiopian economy for centuries in the past, still continues to be the leading at present and it is believed to remain the determinant sector to play a leading role in bringing an overall sustainable economic growth to the country (CSA, 2013). Moreover, food security has been given an enormous emphasis by the Government of Ethiopia and various strategies and programs were implemented in this regard. Yet, the country's overall figure regarding food security trend has been very low though remarkable progress was made by different governmental and nongovernmental stakeholders.

This part of the study explains the background characteristics of the surveyed sample household heads and their food security condition by assessing their food intake behavior by different measurement techniques. It presents results of descriptive analysis of the study by using data gathered from 370 respondents. The descriptive analysis is done to portray the general characteristics and nature of the socio-economic conditions and to analyze food security status of smallholder farmers. To assess food security conditions of the smallholding farmers, the study

employed Food Consumption Score (FCS), Months of Adequate Household Food Provisioning (MAHFP) and Body Mass Index (BMI) as proxy measures. In concomitant to this, various independent variables are also incorporated accordingly to their significance echelon on food security condition in the study areas.

6.1 Socioeconomic Background of Household Heads

The general background of household heads presents data on sex distribution, age, educational background, household size and households' religion. The main aim is to assess how these characteristics of households influence food security and livelihood.

Table 6.1 Sex and Age distribution of household heads

Age range (in years)	Sex		
	Male	**Female**	**Total**
26-34	13	2	15 (4.1%)
35-44	116	16	132 (35.7%)
45-54	37	10	47 (12.7%)
55 and above	147	29	176 (47.6%)
Total	313 (84.6%)	57 (15.4%)	370

Source: Survey result, 2015

The respondents were composed of both female and male headed households where the majority are male headed households. The population statistics from the *Woreda* administration also reveals that from total of 28,588 household heads, 30% (8578) are female headed households, whereas the remaining majority are male headed households (Bureau of Planning & Finance Tigray Region, 2015). Furthermore, numerous studies have revealed that the gender of a household head has a huge impact on the livelihood strategies and food security condition of household members, where female headed households in Ethiopia are often more food insecure than male headed households. The main reason behind is preparation of land with oxen-drawn plough by

norm in Ethiopia is a job mostly engaging men due to cultural and religious taboos. In a small-scale agriculture, majority of the job demands more physical force and in case of the study areas, the socio-cultural attitude towards female farmers/cultivators do not encourage women to engage in various agricultural works and economic activities. With this regard, households headed by female are more likely to have less chance of being food (Eva L., 2008).

Even though, there are few female headed households owning their own oxen and fertile land, the ploughing is expected to be done by a male family member, neighbors or relatives. In cases if either are absent or there are no male family members or the male family member is unable to plough due to various reasons or no relatives who can do the work for free or voluntarily, the female headed household is forced to go into a detrimental sharecropping arrangements where they have to capitulate up to 50% of the yield. This taboo which prohibits women from ploughing their land with their own oxen is dictated by supreme religious beliefs mainly (Eva L., 2008). With this in mind, in coming sections, this argument is going to be substantiated with further analysis in specific to the study areas.

In addition to this, the study revealed that majority of the household heads are in the age group of '55 and above' followed by middle age group of '35-44'. Many studies have revealed that in the middle age category, people seek opportunities and make decisions which involve risk (Tinsaye T., 2013). The older the age, the higher risk aversion leading to a lesser participation in opportunities which may possibly bring a chance to enhance livelihood options and food security condition of their family members. In addition to this, the older the household heads, the lessened chance of learning and adapting towards new technologies as compared to the younger ones with a better perception and response level.

Table 6.2 Age and Education level of household heads

Education Level	Age distribution				Total (%)
	26-34	35-44	45-54	55 & above	
Illiterate	0	43	25	141	209 (56.5%)
Read and write	0	0	2	14	16 (4.3%)
Less than 8th level	13	80	14	21	128 (34.6%)
9-12 Level	2	9	6	0	17 (4.6%)
Total (%)	15 (4.1%)	132 (35.7%)	47 (12.6%)	176 (47.6%)	370 (100.0)

Source: Survey result, 2015

As can be seen from table 6.2, household heads in the age group of '55 and above' are the ones with a very low educational attainment. No household head in this age group was found to have education level of more than primary education. It is also found that about 56.5% of the total sample household heads had no formal education which is a higher rate as compared to the region's 29% of no formal education (WFP, 2009).

Figure 6.1 Age and education level of household heads
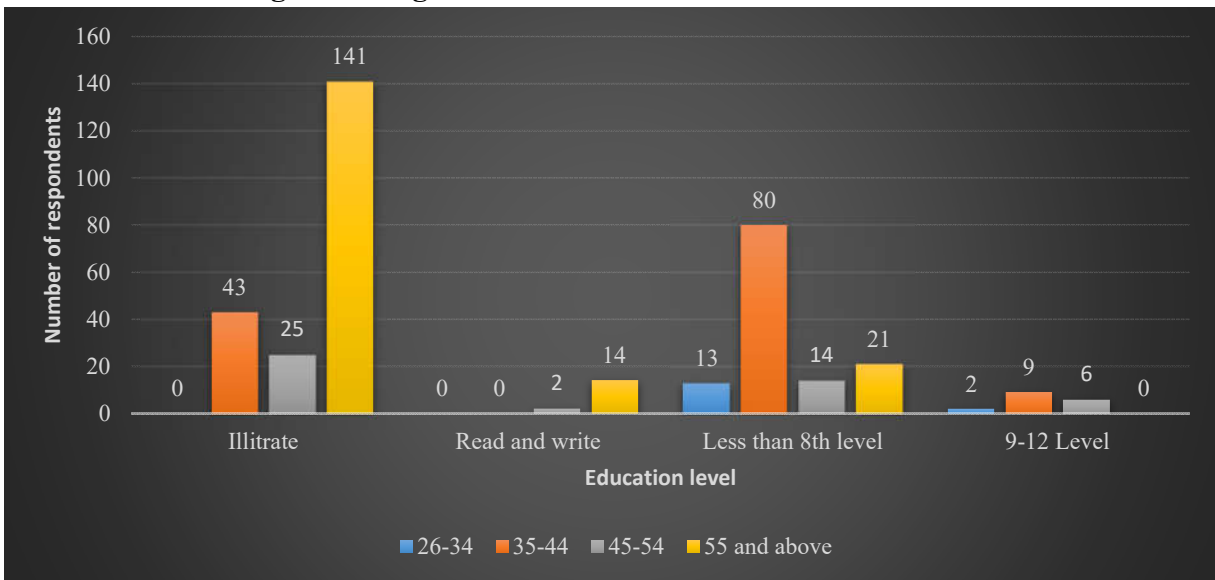
Source: Survey result, 2015

In contrast, all household heads in the age group of '26-34' who are generally deemed to be economically productive age group have a formal education and a relatively better literacy level

as compared to other age groups. This is also mainly attributed due to the Government of Ethiopia's effort with its GTP (Growth and Transformation Plan) primary education objective of expanding access to quality 'primary education for all' (Reaching a 100% access to primary education) by the end of 2015 (GTP, 2010).

Table 6.3 Marital status and Sex of household heads

No.	Marital Status	Sex		Total (%)
		Male	Female	
1	Married	304	0	304 (82.2%)
2	Divorced	17	25	42 (11.3%)
3	Widow	0	19	19 (5.1%)
4	Single	0	5	5 (1.4%)
	Total	321	49	370

Source: Survey result, 2015

Regarding the marital status, majority of the household heads are married and from this majority, all were headed by male members of the households. Majority of women in the study areas are underprivileged to work outside their home and to be leaders of their house mainly due to the socio-cultural attitude of the society towards women. Only women who are either divorced, widowed or single are the ones who are somehow able to manage to work in agriculture field and other similar activities against the socio-cultural impediments for survival. In addition to this, the survey on divorce rate appears to be quite relatively higher (11.3%) which was also a similar finding to WFP's Vulnerability assessment and mapping in Tigray region revealing divorced population is about 17% (WFP, 2009).

Table 6.4 Religion

No.	Religion of the Respondents	Frequency	Percent
1	Orthodox Christian	368	99.5
2	Muslim	2	0.5
	Total	370	100.0

Source: Survey result, 2015

With regard to households' religion distribution, the study found that about 99.5% of the households are Orthodox Christian religion followers whereas the remaining were Muslims. In similar findings also, the Ethiopian Rural Socioeconomic Survey revealed that in Tigray region 97.0% are followers of Orthodox Christian religion followed by 2.9% Muslims (CSA[3], 2013).

6.2 Food Security Condition

Kilte Awelalo with its undulating topography has a total area of 101,757.63 ha, out of which only 21,620 (21.24%) is a cultivable land with poor fertility (Bureau of Planning & Finance Tigray Region, 2015). Cultivable land is one crucial input for farmers which has the capability to plunk as a decisive factor for food security condition especially in case of smallholding farmers. Though the *Woreda* is fully a "*Woyna Dega"*[4] climatic condition which is somehow conducive for crop production, yet the erratic rainfall situation is a big limitation for the farmers. As mentioned by the Food Security and Early Warning Coordinator of the *Woreda*, the *Woreda* has been confronting frequent droughts with frequency of two to three years of appearance. In addition to this, shortage of cultivable land with an average distribution of 0.63ha per households coupled with its low productivity mainly due to frequent plowing for a very long and consecutive time have been huge

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[4] Woyna Dega is a local term used to connote Subtropical climate zone according to elevation. The tree climatic zones according to elevation are Kolla or Sub tropical (below 1830m elevation), Woyna Dega or Subtropical (1830-2440m) and Dega or cool zone (above 2440m). Accessed from http://www.ethiopiantreasures.co.uk/pages/climate.htm on October 20, 2016 at 12:15 a.m.

deterring factors in the efforts made to enhance the food security condition of smallholding farmers.

The derivation causes of food insecurity at household level are quite complex as the causes are combinations of both natural and human made with dynamic processes and idiosyncratic underlying factors. All these make food security assessment easier when said than done in practice. A most common and direct indicator of food security is to determine with calorie intake of household members, and various studies made in this vicinity has been conducted with this measurement index. Yet, the disadvantages have been subject under contrary discussions between scholars especially the matter of the cut-offs where they are claimed not be sensitive enough in distribution. As in most instances, undernourishment levels are highly underestimated in cases where the highly deprived may be subjected for a further food deficiency which is not shown in the index. There are various limitations for the diverse food security measurement indexes. Even so, for this study, three indices were incorporated, namely, Food Consumption Score, Months of Adequate Household Food Provisioning and Body Mass Index.

Figure 6.2 Farmland ownership and number of types of crop production
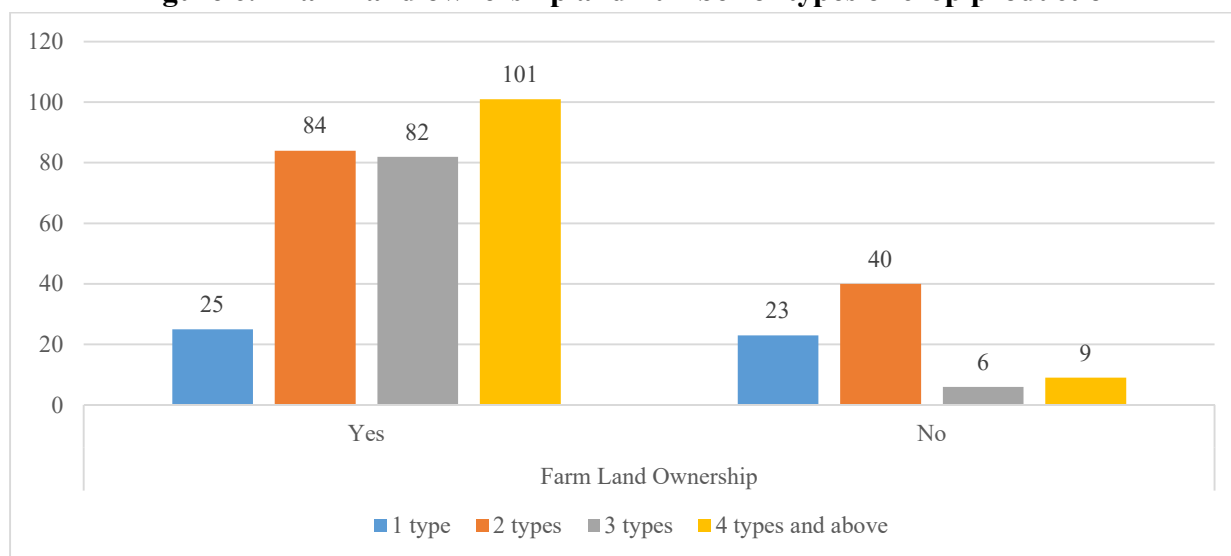
Source: Survey result, 2015

With regard to the number of crop varieties production, majority of the respondents (33.5%) in the study areas produce two varieties of crops in a given year out of which 67.7% of them own farmland. From farmers who are producing more than four varieties of crops, 91% of them own their own land. In similar lines, from farmers who do not own a cultivable farm land, majority produce on average 1-2 types of crops. This clearly shows the importance of owning a farmland in the number of crop varieties production in the study areas.

The major types of crops that farmers grow in the study areas include in descending order wheat, *Teff*, and finally sorghum produced by 73.9%, 73.9%, and 20.7% of the households respectively. In addition to this, maize is also produced by 5.4% of the total sample households. *Teff* is one of the staple food crops which is the main ingredient for preparing the staple food which is locally known as "*Injera*". It is a common food for majority of Ethiopians. However, during the survey, it was noticed that the cost of preparing "*Injera*" fully made of *Teff* is relatively higher and difficult for many smallholding farmers to afford. Concomitantly, respondents revealed that producing sorghum is really crucial for substituting some share of the preparation of "*Injera*" by sorghum. Other similar studies also added that majority of households in Tigray region produce main staple crops like *Teff*, maize, sorghum, wheat and barley in descending order (Sara A., 2010). In similar lines Girmay T. (2006) also stated that the major crops which are produced in the region are sorghum, barely, *Teff*, millet, wheat and maize accounting for 26%, 16%, 12%, 11%, 9% and 7% respectively. Moreover, Ethiopia is the first largest producer of wheat in Sub Saharan Africa where wheat is a vital and another staple food crop in the country. In general, wheat in the country is ranking fifth in area and production after *Teff*, maize, barley and sorghum and fourth in productivity. Yet, the productivity of wheat has remained very low as compared to the relative

potential of its production mainly due to access to improved production technologies and their adoption strategies by the farming community (Girmay T, 2006).

In addition to this, production of cash crops have a high potential for enhancing income sources and food security of households through a better consumption of nutritionally adequate foods. The major cash crops produced in the study areas include onion by 14.8% of households, tomato by 11%, potato by 9.1% and finally other fruits and vegetables by 6.5% of the households. Majority of the respondents revealed that they don't produce these cash crops due to shortage of capital to obtain various inputs like irrigation system, improved seeds and etc. In addition to this, shortage of fertile cultivable land and the intensive time consuming hard work which is requisite for the production were also additional challenges. Moreover, during the survey it was noticed that dry season fruits and vegetables cultivation was limited mainly due access to irrigation from micro dams. Sara A. (2010) also asserted that after the introduction of water harvesting irrigation system (shallow well and deep water irrigation) at household level, the dry season horticultural crop production was found to be a common practice.

6.2.1 Current food consumption

In the survey, households were enquired to recall varieties of food items consumed by their household members within the seven days prior to the survey date through calculating the number of days that the food varieties were consumed. Using ACF-International analytical method of food consumption score, the food varieties consumed were grouped into ten food groups;

1. Cereals (Teff, Maize, Sorghum, Millet, Rice or others)

2. Roots and tubers (Potatoes, Cassava, Sweet Potatoes or others)

3. Nuts, Pulses or Legumes (Peas, Beans, Chick peas or others)

4. Vegetables and leaves

5. Fruits

6. Meat, Offal, Poultry (Beef, goat, veal, fish, eggs or similar sea foods)

7. Milk or Diary products (Milk, Cheese, Yogurt or other)

8. Sugar, honey or other sugar products

9. Fats or oil (Butter) and finally

10. Condiments (tea, coffee, spices) or other miscellaneous foods

Food consumption score (FCS) is an indicator of household dietary adequacy mainly by focusing on macronutrients and energy. During the survey, precautions were taken by the researcher by taking into account of festivals, fasting times, meals taken outside and other similar times which may possibly distort the data. Moreover, during the grouping of food varieties, local food varieties were taken into consideration and were incorporated. Accordingly, with the given weights by their nutritional density (See Annexure 2) from the above food group varieties, the following food consumption pattern was calculated combining information on dietary diversity and dietary frequency for the three study areas.

Figure 6.3 Food consumption frequencies among varieties of food groups
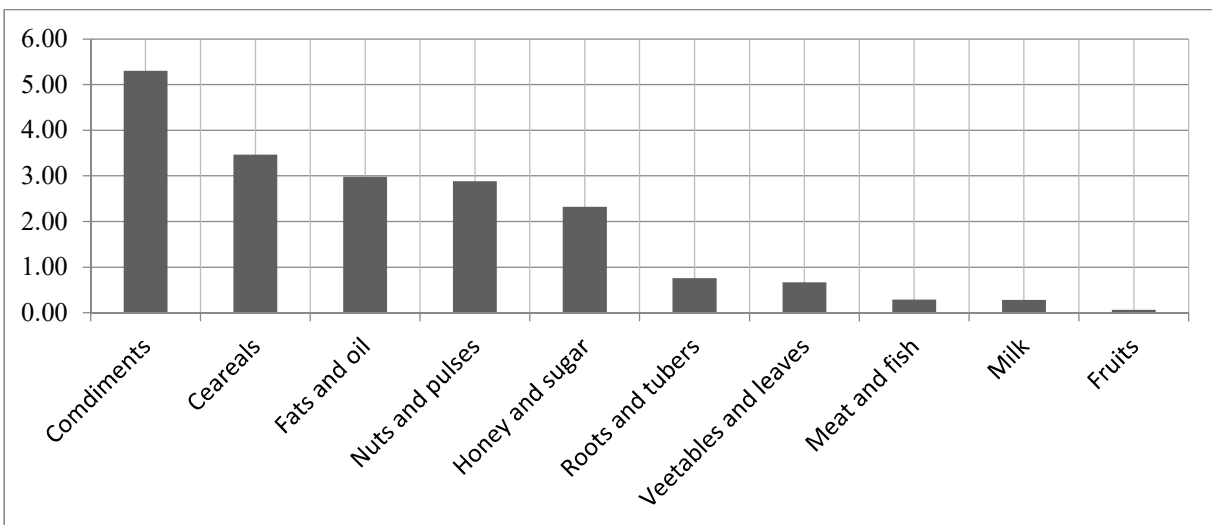
Source: Survey result, 2015

As can be seen from the figure above, using a 7 day recall period, the information collected on the variety and frequency of various food groups' consumption; high protein and high micronutrient carrier food groups' consumption was found to be relatively lower as compared to other food groups. It was also that the diets were not sufficiently nutritious enough. Similar study made in the region revealed that households with a poor consumption, eating the equivalent of cereals and oil on daily basis and sugar three times a week are considered to have a minimum consumption (WFP, 2009). Similarly, this study has depicted the proportion of households with their respective food consumption score as follows.

Table 6.5 Household Food consumption score

Food consumption Score	Study areas			Total	Percentage
	Ayenalem	Genfel	T.A. Sanded		
Poor food consumption	75	57	42	174	47.02
Borderline food consumption	73	64	49	186	50.27
Acceptable food consumption	3	2	5	10	2.7
Total	151	123	96	370	99.99

Source: Survey result, 2015

From the survey, it was found that there is no significant difference in the consumption pattern between the three study areas. Moreover, households with acceptable food consumption accounted only 2% of the total sample population. It was found that households with borderline food consumption take the largest share followed by poor food consumption accounting for 47%.. In addition to this, majority about 40.8% of the total sample households stated that their production yield has decreased comparing the yield from year 2005E.C. to 2006 E.C., whereas 27.5% of them revealed that their production yield has increased and the remaining stated that it was a similar yield. A similar study made in Tigray region by employing Food Consumption Score revealed that

14.5% of the total households in Tigray region had poor food consumption with maximum in Adigrat region (35%) and Zalambesa (15%) (WFP, 2009).

In addition, the study has assessed households' proportion among different wealth groups and their food consumption pattern by using a participatory approach. Hereby, the study employed a technique by ACF (2011), where households were inquired about their perception and justification on the classificatory reason for wealth holding differences among smallholding farmers in the study areas. Basically this is done for the identification of wealth distribution ranking; Poor, Medium and Rich and the reason behind. This is done with a rationale that local people have a better understanding of the socio-economic class differences and the reasons behind it. Accordingly, a criteria that distinguishes 'rich' from 'medium' and 'poor' was identified by providing choices among farm land size holding, livestock holding, number of children and monthly income. Consequently, an end result where nearly all revealed that land holding size as the major reason behind putting households in the wealth distribution ranking of poor, medium and rich. Accordingly, households were then classified with their wealth distribution ranking and 'Rich' accounted for 8.1%, 'medium' 33.2% and 'poor' accounted for 58.6% of the total sample population.

With regard to the food consumption pattern of the smallholding farmers, the study employed information collected on the basis of a seven days recall period as stated above, on variety and frequency of different food groups to compute the weighted food consumption score. During computation, weights were assigned on the nutritional density of each food group and concomitantly cut off points were set up to enable a benchmark for success. Accordingly, households were then classified as either having a "Poor", "Borderline" or "Acceptable" food consumption based on the analysis of the collected data. At household level, studies have revealed

that dietary frequency and diversity are good proxy indicators of food security and the use of food consumption score will also allow to compare diversity and quality across a population (WFP, 2009).

**Figure 6.4 Food consumption score across different wealth groups**
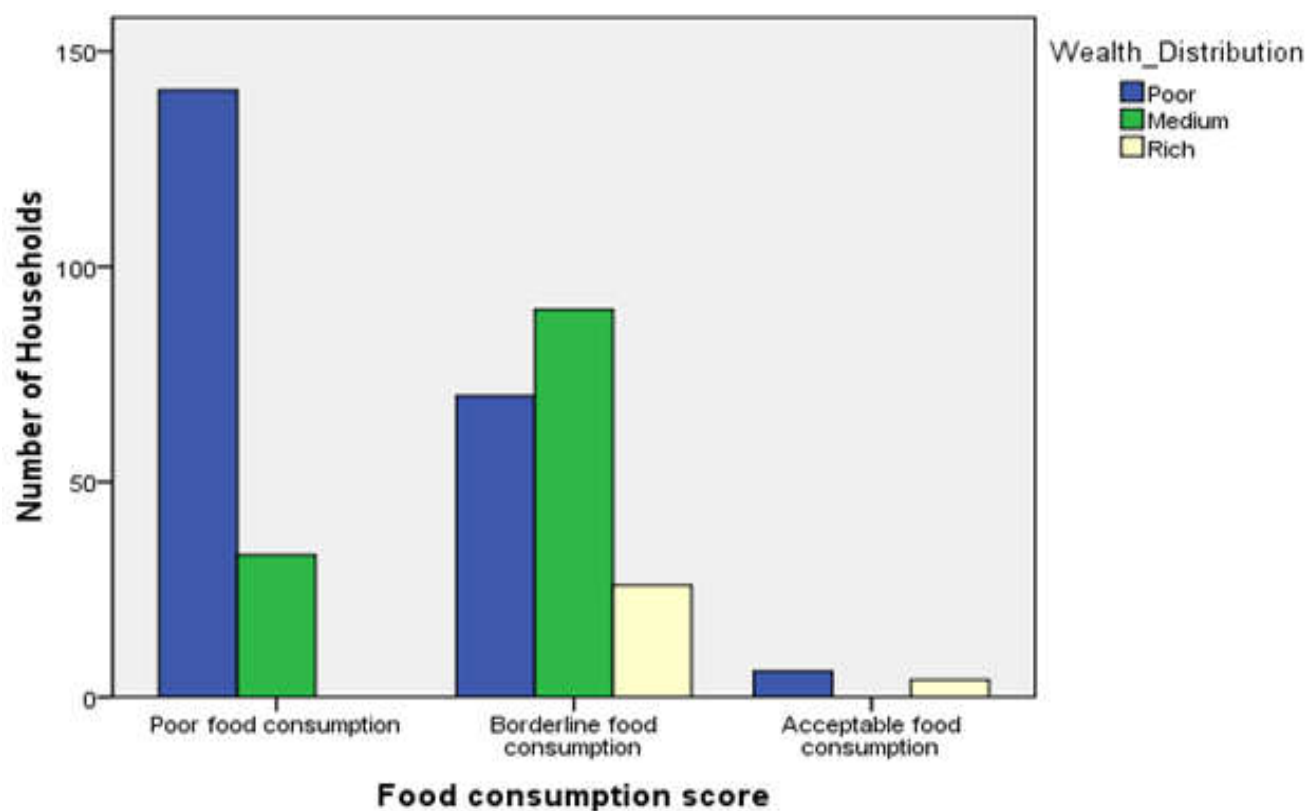
Source: Survey result, 2015

As can be seen from the above figure 6.4, the total share of households belonging in the wealth group of 'poor' are the highest in number and are the ones with the poorest food consumption whereas, there are no rich wealth ranking with poor food consumption score. However, there are few number of households in the poor wealth ranking with borderline food consumption and acceptable food consumption. Here, the main rationale behind this lies upon two possible reasons; first is the wealth ranking was not done on the basis of direct income and income

sources, it was computed through the land distribution and the second reason is the fact that limited number of households who are landless are the major participants in non/off-farm activities which has a direct impact on their food consumption pattern.

Figure 6.5 Food consumption pattern and production yield
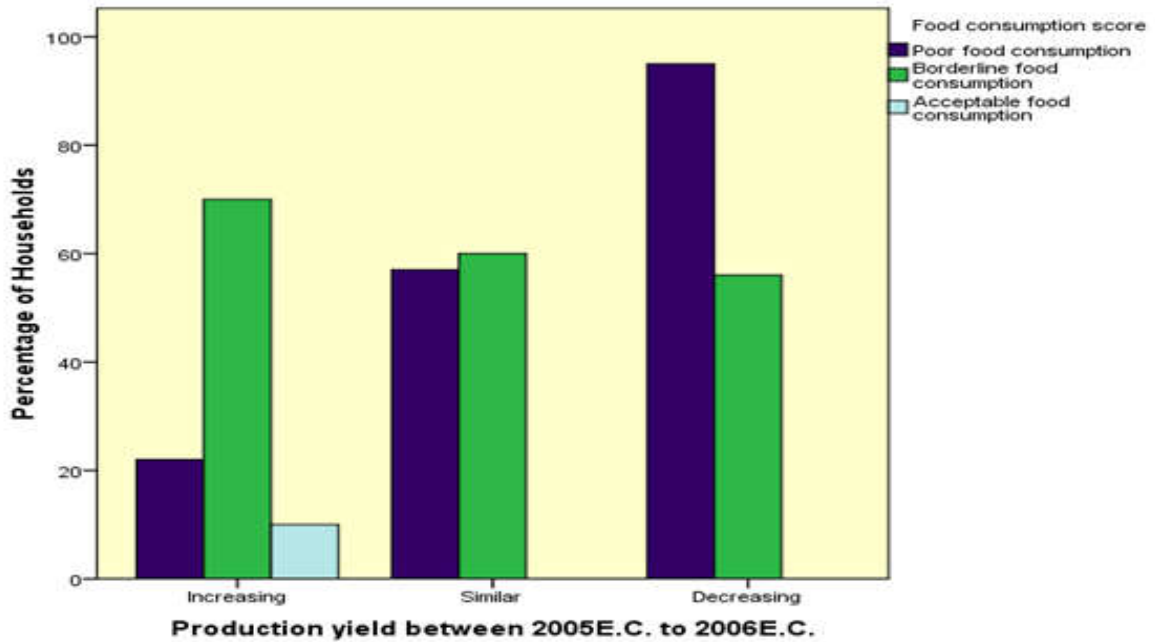
Source: Survey result, 2015

From figure 6.5, it can be seen that households whose production yield increased from the year 2005 E.C.[5] to 2006 E.C. had a better food consumption score position, whereas households with less production yield between 2005-06E.C. were found to be the majorities with a poor food consumption pattern. This clearly shows the significance of production yield in the food consumption pattern of the smallholding farmers in the study areas.

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[5] E.C. (Ethiopian calendar): The Ethiopian calendar is the major calendar used in Ethiopia and also works as the liturgical year for belonging to the Orthodox Tewahedo Churches, Coptic Orthodox Church of Alexandria and Eastern Catholic Churches. A seven to eight years gap exists between the Gregorian and Ethiopian calendars.

Table 6.6 Households' Food consumption pattern

	Food consumption score			Total
	Poor food consumption	**Borderline food consumption**	**Acceptable food consumption**	
Male Headed households	134	169	10	313
Female Headed households	40	17	0	57
Total	174	186	10	370

Source: Survey result, 2015

From the above table, it can be seen that no female headed household was having an 'acceptable food consumption', where majority were found to be under 'poor food consumption'. Similar studies also revealed that female headed households were more food insecure as compared to the male headed households (WFP, 2009).

Moreover, regarding marital status and food consumption score, it was noticed that except married ones, the rest were not having an acceptable food consumption. It was also noticed that the lesser the household size the better food consumption score. Tsegay G., (2009) revealed that the proportion of food insecure households among the female headed households is 49% which is higher than the proportion of food insecure households among the male headed households which is about 39% in the rural parts of Tigray. He also revealed that the male headed households are more likely to be in better food security position than the female headed households (Tsegay G., 2009).

Table 6.7 Food consumption score in the midst of uncertainty and anxiety of food supply

	Food consumption score			Total
	Poor food consumption	**Borderline food consumption**	**Acceptable food consumption**	
Households experiencing food shortages before the next harvest	159	147	0	306
Households who are not experiencing food shortages before the next harvest	15	39	10	64
Anxiety (Fear of running out of food before reaching next harvest season)	165	155	0	320
No Anxiety (Fear of running out of food before reaching next harvest season)	9	31	10	50

Source: Survey result, 2015

Regarding households running out of food before reaching the next harvesting season and the anxiety or fear of running out of food before reaching next harvest season, there was no significant difference among them statistically from the survey. However, about 3.7% (14) of households who are not running out of food before reaching the next harvest season have the fear of running out of food (anxiety). Grippingly, no household having an acceptable food consumption was found to be neither experiencing running out of food nor feeling a fear of running out of food before reaching the next harvest season. Similarly, households who are experiencing food shortage and who have the fear of running out of food before reaching the next harvest season, were found to be majorities in the 'poor food consumption score'. In similar lines, the frequency of running out of food within a yearly count, about 45.4% of the households stated running out of food in their household happens often, while for 38.2% households occurring sometimes and for the

remaining16.4% happening rarely. In addition to this, there is a significant relationship between the frequency of running out of food and food consumption score.

The other proxy index employed in the study to assess the food availability condition of smallholder farmers is the count number of months with an adequate food availability in households in a given year. For this Months of Adequate Household Food Provisioning (MAHFP) is employed as an index, and it is computed as the number of months that households were able to address vulnerability in a way that can ensure food availability above a minimum level of 9 months in a year . With this index, households who are in the group below the poverty threshold have less than nine months of adequate food supply to their household. The remaining three months, households are assumed to cope up by employing various coping mechanisms through decreasing consumption, selling of productive assets, migration, asking for credit, informal supports and others (ACF, 2011). To accomplish this, a precaution was taken for a better accuracy of recall by households and thus the information was collected during months where households were assumed to have insufficient food supplies; i.e. just before harvesting time.

Table 6.8 Food consumption score and Months of Adequate Household Food Provisioning

| | | Food consumption score | | | |
		Poor food consumption	Borderline food consumption	Acceptable food consumption	Total
MAHFP	**2 months**	6	0	0	6
	3 months	15	0	0	15
	4 months	57	1	0	58
	5 months	63	0	0	63
	6 months	6	29	0	35
	7 months	11	27	0	38
	8 months	6	59	0	65
	9 months	10	36	6	52
	12 months	0	34	4	38
Total		174	186	10	370

Source: Survey result, 2015

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Accordingly, from the survey households who were facing insufficiency in food supplies less than total of 9 months accounted for 75.6% of the total sample population. The average MAHFP in the study areas is 6.8 months, and as can be seen from the above table nearly all the households who have less than six months of adequate food supply are the majorities with a very poor food consumption pattern. Majority of households with an average of 6 to 8 months of MAHFP have a borderline food consumption pattern. Similarly, households with 9 months and above are the only ones with an acceptable food consumption pattern. Captivatingly, the survey reveals a momentous positive relation between food consumption score and months of adequate household food provisioning among the different wealth groups. Referring to Annexure 3, it presents an evidence with the perception and justification of land holding size as a basis behind the wealth holding differences among smallholder farmers in the study areas and its relationship with food availability and food consumption pattern of households.

Keeping other factors constant, as households' wealth accumulation increases, they have a high tendency of moving towards to a higher protein and more nutritious food types. Similarly, referring at Annexure 3, poor households were found to be the majorities with a very poor food consumption score and a relatively lower MAHFP whereas, no rich household was found to have either a poor food consumption score or MAHFP of less than nine months. Similarly, households with poor food consumption pattern and MAHFP of less than the average (6.8 months) accounted for 32.4% of the total sample population. Similar to this, there was no significant difference in MAHFP between male and female headed households. A similar study made in Tigray revealed that poor food consumption is more prevalent in the remote areas and about 17% of the rural households are having poor food consumption (CSA, 2014).

Table 6.9 Body Mass Index of adult member of households

BMI	Freq.	Percent
Severe thinness	117	10.8
Moderate thinness	86	7.9
Mild thinness	152	13.9
Normal range	716	65.9
Pre-Obese	16	1.5
Total	1087	100.0

Source: Survey result, 2015

Moreover, to assess the nutritional quality and extent of energy deficiency, the study employed body mass index as a proxy measure for food utilization. This is the only measure of weight which is incorporated in this study and the height and weight measure of all adults was measured and used to calculate their BMI. In line with this, the study has not incorporated child body mass index measurement as it requires a further elaborated analysis of nutrition with specific analysis of food consumption patterns of children. Accordingly, it was found that majority of the respondents were in normal range of body mass index. Though, the survey result on BMI is having a positive range, the number of respondents who are underweight and in sever thinness was not negligible. The proportion of respondents who are underweight was found to be 32.6%. Moreover, the study tried to compare BMI distribution between adult women and men and it was found that there is no significant difference where both were having similar patterns with the result depicted in the above table.

Furthermore, the study has prepared an index which can merge the three food security measurement components calculated above to arrive at a conclusion in the food security status of the smallholding farmers in the study areas. As a result, for merging the three measurement indices used to measure food security status of smallholding farmers; (namely Food Consumption Score,

Months of Adequate Food Provisioning and finally Body Mass Index) and to arrive at a concluding point of measurement, the study based on the basic index formation of Human Development Index (HDI). The three indices were treated and calculated after defining their minimum and maximum values as follows;

$$\text{Dimesion Index} = \frac{\text{Actual value} \quad \text{Minimum value}}{\text{Maximum value} \quad \text{Minimum value}}$$

After computing the dimension index of the three indices, principal component analysis was employed to produce an estimated and approximate weights of the three coefficient parameters of the indices. The principal component analysis is used in such a way where the values of the three indices are expressed as functions of possible causes in the quest to find the most important ones. Computing the weights of the given indices avoids the conjecture choice of giving equal weights, which was a similar critics put on the earlier HDI computation. After the application of the computed weights, cutoff points were set up to enable analysis in the food security trends and to provide a benchmark for success. Subsequently, the food security status of each household was computed and the values were set accordingly in the table 6.10 below.

6.10 Food security status of households

No.	HH Food Security status	Freq.	Percent
1	Food Secure	44	11.89
2	Transitory food insecure	206	55.68
3	Chronically food insecure	120	32.43
	Total	370	100.00

Source: Survey result, 2015

The study found that from the total 370 households, only 44 (11.89%) were food secure whereas the rest majority fall in the 'transitory food insecurity' group followed by 'chronically food insecure'. Beyond half of the sampled households were transitorily food insecure, though this is regarded as a short term shock, yet these group are also highly vulnerable to any upcoming shocks which can in turn drive households to chronic food insecurity. Furthermore, about one third of the total sample respondents were chronically food insecure and taking the incidence of the El-Niño extreme weather impact around the end of 2015, there is no doubt that the number of households in the chronically food insecure group would increase. Another similar study in Tigray region revealed that 42% of sample households in the rural parts of the region were food insecure whereas the remaining 58% were food secure (Tsegay G., 2009).

The main factors affecting decision making of various intervention programs that can impact livelihoods of farming households were top down approaches which are lacking flexibility and not putting enough recognition to farmers as key actors in the decision making process in Tigray regional state (Berhane H., 2009). Similarly, as the main purpose of this study is to identify the food security status of farming households, solely depending on the above statistical figures might end the study far beyond the reality on grounds and was assumed that it will not give enough recognition to the perception of the farmers. Therefore, in line with the above computation, households were inquired about their perception towards their relative food security status in order to compare the fitness of the index calculated in local and reality terms.

Table 6.11 Households' perception on their food security status

No.	HH Food Security status	Freq.	Percent
1	Food secure	48	12.97
2	Transitorily food insecure	183	49.46
3	Chronically food insecure	139	37.57
	Total	370	100.00

Source: Survey result, 2015

As can be seen from the table 6.11 above, only 48 (12.97%) of the total sample households revealed that they are food secure, the rest majority are transitorily food insecure followed by chronically food insecure. This result further supports the finding in the previous table 6.10 where the developed index has a similar figure with that of the relative food security perceptions of households. Here, it should be noted that the chronically food insecure households figure is not small to ignore where more than one third of the sampled population are in need of direct food aid and allied supports. The longer the period of time for rendering aids and supports, the higher intensified and devastative impacts.

Moreover, it was found that from the total income of the smallholding farmers in the three study areas, on average they spend 53.78% of the income on food purchase. Another study made by USAID in collaboration with Government of Ethiopia (MOARD) in Kilte Awelalo revealed that the area is characterized by unreliable rainfall and dry climatic condition and this has made the *Woreda* to suffer from chronic food shortages. This on the other hand is more aggravated by the very infertile soils which has in general forced the poor smallholding farmers who roughly cultivate (less than 0.25 ha) to purchase 50% of their annual food needs. Majority of farmers in the area are in need of a direct food aid and other supplementary supports (USAID, 2014). .

Conclusion

This study has tried to present results of various statistical analysis using data gathered from 370 households socio-economic condition, food consumption pattern, household food supply and access and finally food utilization to assess food security condition in the study areas. Accordingly, respondents were composed of both male and female headed households with majority of male headed households. It was noticed that due to the high demand of more physical force and the socio-cultural attitude towards female farmers, it does not encourage women to engage in various agricultural works. It was also found that majority of the household heads were in the old age group and were having a relatively lower educational attainment.

Moreover, the study found that more than half of the household heads were not having any formal education. Nonetheless, the economically productive age group of 21-34 were having a relatively better literacy level as compared to other age groups. Another major finding was farm land ownership was having a great significance in the number of crop varieties production, where households owning farmland were having a higher number of crop varieties production, keeping other factors constant. In addition to this, the major types of crops in descending order are wheat, *Teff*, and finally sorghum.

Regarding food consumption patterns of smallholding farmers in the study areas, households with acceptable food consumption were very limited in number whereas the largest share was seen in the borderline food consumption and finally followed by poor food consumption. It was also found that the number of households with poor food consumption was as high as half of the total sample population. In concomitant to this, majority of the households revealed that their production yield has decreased as compared to the previous years.

Furthermore, farmland size was found to be a major classificatory reason basis for the wealth holding differences among the smallholding farmers. Basing on this, majority were belonging in the wealth group of poor and are the ones with the poorest food consumption while there were no rich wealth ranking with poor food consumption score. Similarly, it was found that households whose production yield increased from the previous year are the ones with better food consumption pattern. In addition, it was found that female headed households were having a reduced amount of food consumption as compared to male headed households. Similarly, there was no household with an acceptable food consumption who is either experiencing of shortage of food or having a fear of running out of food before reaching the next harvest season.

Months of Adequate Household Food Provisioning (MAHFP) assessment revealed a high food insufficiency among the smallholding farmers with less number of months of adequate food supply. In addition, there was a significant relationship between food consumption score and MAHFP where households' with higher number of months of adequate food supply were the ones with an acceptable food consumption pattern. In similar lines, the BMI assessment of adult members of the sample population revealed that majority of the respondents having a normal range of BMI. However, the number of population who are underweight was not negligible. Finally, the three indices were combined in order to classify households food security condition and it was found that more than one third of the total sampled population are chronically food insecure, about half of the population were transitory food insecure and the rest small number of households were food secure.