Journal of Agricultural Research Advances
ISSN: 2582-7227

Research Article
Open Access

Assessment of household food security and its determinants in Ethiopia

Hailu MK
Ethiopia Institute of Agricultural Research, Addis Ababa, Ethiopia

Corresponding author: mekonnen.hailu2002@gmail.com

Received on: 18/07/2022 Accepted on: 20/12/2022 Published on: 25/12/2022

ABSTRACT

Aim: The main objective of the study was to analyze rural households' food security status and its determinants in Minjar Shenkora *woreda* of Central Ethiopia.

Materials and Methods: Data were collected from 240 randomly selected rural farm households. The study employed both descriptive statistics and a binary logistic regression model to estimate the status and determinants of households' food security, respectively.

Results: The results showed that the mean dietary energy available for food secured households were 2,860.6 Kilo calorie per day while 1,891.7 Kilo calorie per day for the insecure group.The binary logit model results showed that education level, farm size, livestock ownership, cooperatives membership, off- farm income and credit access have positive and significant effects on household food security. While household size has a negative and significant effect on household food security.

Conclusion: It was concluded that interventions should target at improving rural financial services and off-farm activities that increase households' income and focusing on those most significant variables when attempting to enhance household food security.

Keywords: Determinant; Ethiopia; food security; logistic model; rural.

How to cite this article: Hailu MK (2022). Assessment of household food security and its determinants in Ethiopia. J. Agri. Res. Adv., 04(03): 20-26.

Introduction

Food security is among the major issues addressed in the international development agendas, including the sustainable development goals (SDGs). It is world's greatest challenge to secure physical, social, and economic access to sufficient, safe, and nutritious food for all people at all times for an active and healthy life, in an environmentally sustainable manner (Burchi et al., 2011; FAO, 1996). This demonstrates its equal importance for both developed and developing countries. The vast majority of people who are food insecure live in developing countries such as Asia, Africa, Latin America and the Caribbean (FAO, IFAD, UNICEF, WFP and WHO, 2021). However, great strides have been made in the reduction of poverty and food insecurity. Yet, the number of food insecure people has been steadily rising, owing primarily to a rise in moderate food insecurity.

Globally, more than 2.37 million people are currently facing moderate and severe food insecurity. Of the 2.37 billion people, half (1.2 billion) are found in Asia, one-third (799 million) in Africa, and 11% (267 million) in Latin America and the Caribbean (FAO, IFAD, UNICEF, WFP and WHO, 2021).

Ethiopia is among African countries repeatedly mentioned in connection with the food insecurity problem. The daily calorie consumption in Ethiopia is below 2100 kcal/person/day (Kahsay and Mulugeta, 2014). Ensuring food security for today's population and generations to come is one of the greatest challenges in Ethiopia. Although there have been efforts to achieve food security at the household level, nearly 25% of the population still lives below the nationally defined poverty line (USAID, 2019). About 20.5% of households (this directly translates into 26 million people) estimated to be food insecure (CSA and WFP, 2019). More than 20 million rural Ethiopians are now dependent on permanent welfare transfer programs (Diriba, 2018). According to the Global Food Security Index, Ethiopia ranked 108 (GFSI,

2021) and 173 in the Human Development Index (UNDP, 2021).

Several studies have found that Ethiopians have experienced prolonged periods of food insecurity, which can be attributed to a variety of factors (Aidoo et al., 2013; Bashir et al., 2012; Bogale and Shimelis, 2009; Tolossa, 2005). For the majority of the people, these factors have hindered their "physical, social, and economic access to sufficient, safe, and nutritious food necessary to meet dietary needs and food preferences for leading an active and healthy life." According to Tolossa (2005) provides five detailed account of the causes of food insecurity by classifying them into biophysical shocks or stresses, lack of access to livelihood assets, constraints to livestock, access-related constraints such as lack of opportunities, start-up capital, knowledge and skills, and inappropriate land right arrangements. Furthermore, in Ethiopia, various determinants of household food insecurity have been identified (Bogale and Shimelis, 2009; Mulugeta, 2009; Haile et al., 2005; Shiferaw et al., 2003). In light of this, the purpose of this paper is to identify the factors that contribute to household food security in Central Ethiopia. The study offers insight into the nature of food security and its determinants, allowing researchers and policymakers interested in future research and policy implementation to use the model to address food insecurity at the household level.

Materials and Methods

Description of study area

The survey was conducted in Minjar Shenkora *woreda* of Amhara Regional State and Ada'a*woreda* of Oromia Regional State of Ethiopia. MinjarShenkora is one of the *woredas* in the North Shewa Zone of Amhara Regional State of Central Ethiopia. The administrative center of the *woreda* is Arerti. It is located farther to the southern part of North Shewa Zone, and located at about 135 km southeast of the Capital city, Addis Ababa. The *woreda* is composed of a total of 30 *kebeles*, 27 rural *kebeles*, and the rest urban *kebeles*. *Tef*, wheat, sorghum, and maize are among the cereal crops and chickpea and lentil among pulses grown in the *woreda*. Ada'a is one of the *woredas* in East Shewa Zone of Oromia Regional State of Central Ethiopia. The *woreda* administrative town is Bishoftu, which is located 45 km away east of Addis Ababa. Ada'a *woreda* is a mixed farming, crop production, and livestock production area. Crops grown in the *woreda* are *tef*, wheat, barley, maize sorghum, chick pea, ground nut, root crops, and vegetables.

Data source and sampling procedures

The data for this study were obtained from both quantitative and qualitative sources. Quantitative data were collected through a household survey while qualitative data were collected through key informant interviews and focus group discussions. A multistage sampling procedure was employed to draw sample households in the study areas. In the first stage, two *woredas*, Minjar Shenkora and Ada'a *woreda* were selected based on their *tef* production potential. In the second stage, four kebeles from high and low producing areas were randomly selected. In the third stage, representative households from each sample *kebeles* were determined by using a formula suggested by Yamane (1967). This simplified formula required sample size at 95% confidence level, degree of variability = 0.5, and level of precision = 5%. Finally, based on proportionate random sampling, 240 households were selected on the lottery method from the list obtained from respective *kebeles*.

Method of data analysis

The study used descriptive statistics (frequency, percentage, mean, standard deviation) and

Descriptive statistics (frequency, percentage, mean, standard deviation) on various indicators of food security and their determinants including socio-demographics, resource endowments, institutional services, and markets were computed. Moreover, inferential statistics (such as t-test, and Chi-square test) were used to estimate the food security status in the study areas. The Household Food Balance Model (HFBM) was also used.

The food security status, dependent variable for the logit analysis was dichotomous in nature (food secure and food insecure), among various models binary logistic regression model was used as the estimated probabilities lies between logical limit of 1 and 0 (Gujarati, 2009). The food security status is a binary outcome variable that takes a value of Y=1 if the household is food secure, 0 otherwise. The binary logit model was used to determine the factors influencing of different explanatory variables on food security situation. The functional form of logit model can be specified as follows where P_i donates the probability of household food secure that is $Y_i = 1$

and $\exp^{(Zi)}$ stands for the irrational number to the power of Z_i (Gujarati, 2003). The model can be written as:

$$P_i = E(Y = \frac{1}{X_i}) = \frac{1}{1+e^{-(\beta 0+\beta 1X1)}} \ldots (1)$$

For the case of explanation, equation (1) is written as;

$$P_i = \frac{1}{1+e^{-Zi}} \ldots\ldots\ldots\ldots\ldots (2)$$

The probability that a given household farmer is decided to food secure properly is expressed as by equation (2), while the probability of food insecure is expressed by equation (3)

$$P_i = \frac{1}{1+e^{Zi}} \ldots\ldots\ldots\ldots\ldots (3)$$

Variable definition and measurement

Definitions and measurements of the outcome and explanatory variables were observed (Table 1). The selection of variables used in this study is based on previous studies

Table 1: Definition and measurement of variables used in the analysis

Variables	Definition and Measurement
SEX	1= if the household head is male and 0 otherwise
AGE	Age of the household head in years
EDUCATION	1= if the household head is literate and 0 otherwise
HH_SIZE	Household size in Adult equivalent
FARM_SIZE	Farm size in hectare
FARM_EXP	Farm experience in years
LIVESTOCK	Livestock ownership in TLU
OFF_FARM	1= if household engaged in off farm activities and 0 otherwise
CREDIT	1= if the household access credit and 0 otherwise
COOPERATIVES	1= if the household member of cooperative and 0 otherwise
CONTACTS	Frequency of DA contacts with farmers
TRAINING	1= if the household access to training and 0 otherwise
DIS_MARKET	Distance to the nearest market in kilometer

Results and Discussion

Food availability and dietary energy supply of sample households

A total of 597,603.3 Kcal/ADE/day with the mean of 2,491.2 Kcal/ADE/day was available for all sample households from all sources (Table 2).The mean dietary energy available for food secured households was 2,860.6 Kcal/ADE/day, while 1,891.7 Kcal/ADE/day for the insecure group. It showed that the mean of dietary energy supply for food secure households was larger than that of food insecure groups. Their mean difference between the two groups was statistically significant at ($p<0.01$). The observation of the range (min= 1,023.8 Kcal/ADE/day and max= 7,547.7 Kcal/ADE/day) implies that there was a great variation among the farming households so that looking into the conditions of each households was essential.

Descriptive results of hypothesized variables

It was presented a summary of the explanatory variables used in econometric estimation and tests if systematic associations between socio-demographic characteristics and the food security status of the farm households (Table 3). The results showed that the food secure and insecure households have a significant difference in most of the explanatory variables. For example, the mean household size of food secure households (4.1 ADE) was smaller than that of food insecure households (5.0 ADE) showing that their mean difference was statistically significant between the groups at ($p<0.01$). Likewise, the mean livestock possession for food secure households (6.2 TLU) was larger than that of food insecure households (4.9 TLU). Their mean difference in livestock ownership between the two groups was statistically significant at ($p<0.01$).

Moreover, the dummy variables demonstrate that among 90% of households headed by male, 57% of them were food secured whereas about 33% of food insecure groups. Their mean difference was statistically significant between the groups at ($p<0.01$). Similarly, results indicated that 64% of households had no access formal education. Out of this, about 24% of food secured households while 40% of food insecure groups showing that their mean difference was statistically significant between the groups at ($p<0.01$). Besides, among 70.4% of households who are member to agricultural cooperatives, about 48% belongs to food secure and 23% indicated to food insecure. Their mean difference was statistically significant between the groups at $p<0.01$.

Determinants of household food security

It showed the results of a logistic regression study that showed the association between household food security and its determinants (Table 4). Out of 13 hypothesized variables, 7 were statistically most significant at less than ($p<0.1$) level of significance. Among these, education level, household size in adult equivalent, membership in agricultural cooperatives, livestock ownership and engaged

in off farm activities were mostly significant at ($p<0.01$). Though, it does not mean any influence on food security of remaining determinant variables.

Household food security and education are inextricably linked because, especially in subsistence farming, literate farm household heads outperform illiterate counterparts in a variety of ways, yet the importance of indigenous knowledge in achieving food security should not be overlooked (Tolossa, 2005). Our result is in line with this study because it showed that education of household head influenced household food security positively (B = 0.290) and significant at ($p<0.01$). The odds ratio in favor of the probability of being food secure increased by a factor of 0.914 with one year increase in the level of education. This indicates that households headed by relatively better educated were more likely to be food secure than those headed by less educated or illiterate ones. This goes in line with some previous studies which showed statistically significant and positive relationship between level of household head education and the probability of being food secure (Mohammed et al., 2021; Dawit and Zeray, 2017; Guyuand Muluneh, 2016; Bashir et al., 2012).

The effect of household size on food security was negative (B = -0.712) and statistically most significant at ($p<0.01$). By keeping other factors constant, the odds ratio in favor of being food secure decreased by a factor of 3.491 with an increase in the household size by one member. This indicated that households with larger household size are more likely to be food insecure than their counterparts. The negative association could be due to an increase in the number of family dependency ratio. This means that households having many children and old age groups may lack sufficient manpower, which eventually results in overdependence on limited household resources. It is consistent with several previous research findings (Fekede et al., 2016; Funmilola and Patricia, 2014; Aidoo et al., 2013).

Livestock is a source of income through the sale of livestock and livestock products, as well as a source of supplementary food. Furthermore, livestock can be used as a coping strategy in the event of crop failure or other disasters. Households with greater livestock holdings are shown to be more food secure than those without. Our results also confirmed that the effect of livestock holdings on household food security was positive and statistically most significant at ($p<0.01$). The odds ratio (B = 0.149) in favor of being food secure was increased by a factor of 1.161 with an increase in livestock ownership by one TLU. This goes in line with most previous studies including (Mohammed et al., 2021; Gebre, 2012).

Farm households who are members in agricultural cooperatives can easily access credit, agricultural inputs, information, and stable market outlets. This implies that households who are members in agricultural cooperatives are shown to be more food secure than those who are not. Results indicated that the effects of membership in agricultural cooperatives on household food security was positive and statistically most significant at ($p<0.01$). The odds ratio (B = 0.230) in favor of being food secure was increased by a factor of 0.794 with an increase in membership in agricultural cooperatives.

Off-farm activities are important activities through which rural households get additional income to supplement their livelihoods. Households who engaged in off-farm activities are less risk-averse than farmers without sources of off-farm income. Our result showed that the effect of off-farm income on household food security was positive and statistically most significant at ($p<0.01$). The odds ratio (B = 0.438) in favor of being food secure was increased by a factor of 1.039 with an increase in off-farm income by one Ethiopian Birr (ETB).

Table 2: Sample households' dietary energy supply (Kcal/ADE/Day)

Households	Minimum	Maximum	Mean	SD	Sum	Chi-square
Food insecure (n= 89)	1,023.8	2,098.5	1,891.7	272.3	172,140.6	24.387***
Food secure (n= 151)	2,104.7	7,547.7	2,860.6	860.2	423,372.5	
Pooled (N= 240)	**1,023.8**	**7,547.7**	**2,491.2**	**839.7**	**597,603.3**	

Source: Own calculation based on field survey

Note: *, **, and *** denotes significance level at 10%, 5%, and 1%; NS= not significant

Table 3: Summary statistics of explanatory variables by food security status

Variables	Food insecure (n= 89)	Food secure (n= 151)	Pooled (N= 240)	Mean Differencez
Continuous Variables				t-test
AGE	45.9 (13.2)	45.2 (12.1)	45.5 (12.5)	0.705
HHSIZE	5.0 (1.9)	4.1 (1.9)	4.5 (1.9)	3.003***
FARM_SIZE	2.4 (1.6)	2.9 (2.0)	2.7 (1.9)	3.457*
LIVESTOCK	4.9 (3.1)	6.2 (4.6)	5.8 (4.2)	10.582***
CONTACT	2.5 (3.2)	3.8 (8.1)	3.3 (6.7)	1.744***
FARM_EXP	15.8 (9.5)	14.6 (10.2)	15.0 (9.9)	0.627
DIS_MARKET	10.7 (6.7)	7.1 (10.7)	10.2 (6.9)	2.355***
Dummy Variables				Chi-square
SEX (male)	32.9	57.1	90.0	2.224***
EDUC (illiterate)	40.4	23.8	64.2	1.375***
COOPERATIVE (yes)	22.9	47.5	70.4	5.044***
OFF_FARM (yes)	6.3	10.0	16.3	1.038*
CREDIT (yes)	19.6	36.7	56.3	4.681**
TRAINING (yes)	25.4	44.6	70.0	3.144*

Note: *, **, and *** denotes significance level at 10%, 5%, and 1%, t-test is estimated as a mean difference between food insecure and food secured

Source: Own calculation based on field survey

Table 4: Results of binary regression model parameters estimating the effects of determinants

Explanatory Variables	B	S.E.	Wald	Sig.	Exp (B)
SEX	-0.741	0.705	1.105	0.293	0.477
AGE	0.030	0.016	3.391	0.266	1.031
EDUCATION	0.290	0.276	10.416***	0.000	0.914
HHSIZE	-0.712	0.156	20.960***	0.004	3.491
FARM_SIZE	0.075	0.127	1.348*	0.055	1.078
FARM_EXP	0.877	0.518	2.874	0.090	2.404
LIVESTOCK	0.149	0.81	3.396***	0.003	1.161
COOPERATIVES	0.230	0.478	8.232***	0.000	0.794
OFF_FARM	0.438	0.211	12.663***	0.000	1.039
CONTACTS	0.342	1.541	2.945	0.059	0.893
CREDIT	0.146	1.461	4.636**	0.046	2.244
TRAINING	0.518	0.477	1.178	0.078	1.678
DIS_MARKET	-0.013	0.031	0.167	0.683	0.987
Constant	-1.848	1.153	0.542	0.462	0.428
Model Prediction Success (%)		Food secure			85.8
		Food insecure			78.8
		Overall predicted			82.9
-2 Log-likelihood ratio for the model					174.452
H-L model test (df = 8)					14.058 (p= 0.08)
Nagelkerke R^2					0.63

Notes: *** p < 0.01, ** p < 0.05, * p < 0.1; Dependent variable: =1 if the household is food secured, 0 otherwise.

Conclusions

Food security remains an issue in Ethiopia particularly in the rural households. It is one of the greatest challenges for today's population and generations to come. Hence, this study, therefore, attempted to identify the status and driving factors of household food security in Minjar Shenkora and Ada'a *woredas* of rural Ethiopia. This study indicated that about 64% of sampled households were food secure while the remaining 36% are food insecure. The empirical evidence suggests that food security of rural households is greatly influenced by various factors.There is no one-size-fits-all solution to the challenge of food security. The binary logistic regression model results showed that the household head's education level, household size, livestock ownership, membership in agricultural cooperative, incomes from off farm activities, credit availability, and farm size all had significant effects on the probability that the

household will be food secure. Hence, interventions should target at improving rural financial services, markets and off-farm activities that increase households' income and focusing on those most significant variables when attempting to enhance household food security.

References

Aidoo A, Mensah J and Tuffour T (2013). Determinants of Household Food Security in the Sekyere-Afram Plains District of Ghana, 1st Annual International Interdisciplinary Conference Proceedings, pp. 514-521, *AIIC 2013*, 24-26 April, 2013, Azores, Portugal.

Akukwe TI, Oluoko-Odingo AA and Krhoda GO (2020). Do floods affect food security? A before-and-after comparative study of flood-affected households' food security status in South-Eastern Nigeria. Bulletin of Geography. Socio-economic Series, 47(47): 115-131.

Bashir M, Schilizzi S and Pandit R (2012). The Determinants of Rural Household Food security: The Case of Landless Households of the Punjab, Pakistan, Working Paper 1208, School of Agricultural and Resource Economics, University of Western Australia, Crawley, Australia.

Bogale A and Shimelis A (2009). Household level determinants of food insecurity in rural areas of Dire Dawa, Eastern Ethiopia. African Journal of Food and Agriculture, Nutrition and Development 9(9):1914-1926.

Burchi F, Fanzo J and Frison E (2011). The role of food and nutrition system approaches in tackling hidden hunger. International Journal of Environmental Research and Public Health, 8(2): 358–373.

Canali M and Slaviero F (2010). Food insecurity and risk management of smallholder farming systems in Ethiopia. In *Ninth European IFSA Symposium. Vienna (Austria)* (pp. 4-7).

CSA & WFP (2019). Comprehensive Food Security and Vulnerability Analysis (CFSVA). Ethiopia, WFP and Headquarters, WFP.

Dawit D and Zeray N (2017). Determinants of rural household food security in Wolaita Zone: the case of Humbo Woreda. Journal of Poverty, Investment and Development, 32: 65-82.

Diriba G (2018). Overcoming agricultural and food crises in Ethiopia: *Institutional evolution and the path to agricultural transformation*.

FAO (1996). Rome declaration on world food security and world food summit plan of action. FoodandAgricultureOrganization.

FAO, IFAD, UNICEF, WFP & WHO (2021). The State of Food Security and Nutrition in the World 2021. Transforming food systems for food security, improved nutrition and affordable healthy diets for all. Rome, FAO. https://doi.org/10.4060/cb4474en

Fekede G, Lemma Z and Jemal Y (2016). Determinants of farm household food security in HawiGudina district, West Hararghe zone, Oromia Regional National State, Ethiopia. J. Agric. Ext. Rural Dev. *8*: 12–18.

Funmilola FA and Patricia OA (2014). Determinants of food security among low-income households in Maiduguri Metropolis of Borno State, Nigeria. Asian Journal of Social Sciences and Humanities 3 (1): 74–86.

Gebre GG (2012). Determinants of food insecurity among households in Addis Ababa city, Ethiopia. Interdisciplinary Description of Complex Systems: INDECS, 10(2): 159-173.

GFSI (2021). Performance of countries based on their 2021 food security score. A report from the economist intelligence unit, Global Food Security Index 2021. Retrieved from http://foodsecurityindex.eiu.com/Index i oni June 1,2021.

Guyu FD and Muluneh W (2016). Determinants of seasonal food insecurity in the green famine belt of Ethiopia: the case of households in Belo-jiganfoy district, Benishangul-gumuz region. African Journal of Food Science, 10(11): 278-291.

Haile H, Alemu Z and Kudhlande G (2005). Caused of Household Food Insecurity in Koredegaga Peasant Assocition, Oromiya, Ethiopia. Working Paper. Faculty of Natural and Agricultural Sciences, Department of Agricultural

Economics, University of the Free State, South Africa.

Kahsay S and Mulugeta M (2014). Determinants of rural household food insecurity in LaelayMaichewWoredaTigray, Ethiopia. African Journal of agriculture and food security, 2(1): 106-112.

Kundu S, Al Banna MH, Sayeed A, Sultana MS, Brazendale K, Harris J and Khan MSI (2021). Determinants of household food security and dietary diversity during the COVID-19 pandemic in Bangladesh. Public Health Nutrition, *24*(5): 1079-1087.

Mohammed A, Wassie SB and Teferi ET (2021). Determinants of Smallholders' Food Security Status in Kalu District, Northern Ethiopia. Challenges, 12(2): 17.

Mulugeta M (2009) Challenges and Opportunities of Volunatry Resettlement Schemes in Ethiopia: A Case from JiruGamachu Resettlement Village, Nonno District, Central Ethiopia. Journal of Sustainable Development in Africa, 11(3): 83-102.

Shiferaw B, Kimer R and Gladwin C (2003). Determinants of Food security in Southern Ethiopia. A Paper Presented at the 2003 American Agricultural Economics Association Meetings in Montreal, Canada.

Shimeles A (2003). Dimensions and Determinants of Food Security among Rural Households in Dire Dawa, Eastern Ethiopia; School of Graduate Studies of Alemaya University: Dire Dawa, Ethiopia, 2003.

Tolossa D (2005). Rural livelihoods, poverty and food insecurity in Ethiopia, A case study at Erenssa and Garbi communities in Oromiya Zone, Amhara National Regional State, PhD Dissertation, Norwegian University of Science and Technology, NTNU, Trondheim.

UNDP (2021). Human development reports of Ethiopia. Retrieved on June 2021 from https://hdr.undp.org/en/countries/profiles/ETH.

USAID (2019). Food Assistance Fact Sheet Ethiopia; USAID: Washington, DC, USA.

Yamane T (1967). Statistics: an introductory analysis, 2nd ed., Harper and Row, New York.

****