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# Gender and education as predictors of food insecurity among coffee farming households of the Jimma zone, Southwest of Ethiopia

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## Abstract

**Background:** Adequate quantity and quality of food are required for optimal health, growth and development of human life. Thus, availability of food has been a major concern in every community at all time and context. Access to food can be worse in a cash crop setting where products are meant for parties other than the farming household itself. Meanwhile, the Ethiopian coffee sub-sector represents the livelihood of eight million farming households, generating a quarter of the foreign exchange earnings of the country. However, the net impact of such an agricultural system on the availability and access of food remains unknown to date. Thus, we used empirical data to assess a household's food insecurity and identify context specific determinants in the setting.

**Methods:** The study was conducted in three randomly selected coffee producing sub-districts of the Jimma Zone, an area which is believed to be the birth place of coffee. A total of 749 coffee farming households were included in the study. Food insecurity was measured using a household food insecurity access scale, while determinants were assessed using a structured questionnaire. Data were entered into EpiData and the analysis was performed using SPSS version 21.

**Results:** The study findings showed a high prevalence of food insecurity ( $n = 517$ ; 68.8%). In multivariable logistic regression, households with a formally educated head were found to be 39% less likely to face food insecurity as compared to those who had no formal education [ $OR = 0.61$  (0.38, 0.99)]. Similarly, households with an educated spouse were 36% less likely to have food insecurity [ $OR = 0.64$  (0.42, 0.97)]. Those households in which the husband was responsible for purchasing food were more than twice as likely to be food insecure than those in which the wife was responsible food purchasing [ $OR = 2.4$  (1.58, 3.33)]. Similarly, households which utilized saving and credit service were 59% less likely to have food insecurity than those did not utilise such a service [ $OR = 0.41$  (0.31-0.58)].

**Conclusion:** There exists a high prevalence of food insecurity among the studied households. Food security interventions in the setting should focus on gender, education and financial services rather than the classic income dominated approach as it fails to predict the existing prevalent food insecurity.

**Keywords:** Food insecurity, Coffee farmers, Cash cropping

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## Background

Adequate quantity and quality of food are required for the optimal health, growth and development of humans. Hence, the availability of food has been a major concern at all time and context in every community [1]. Food security, a concept that originated in the mid-1970s, was at the outset focused on ensuring the availability and stability of the price of basic food stuffs at a national level [2]. A decade later, a paradigm shift was made regarding the concept of food security through corroborating a critical dimension called “access”, but this remained tailored at the national level [2, 3]. subsequently, worldwide observations of “access” of food shifted from the national to the household level [3]. The Food and Agriculture Organization of the United Nations (FAO) later in 2001 supplemented the concept with a cross cutting theme called “stability” over availability, access and utilization. Consequently, the FAO defined food security as “a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” [2–6]. In contrast, food insecurity exists when people lack secure access to sufficient and safe amounts of nutritious food for normal growth and an active healthy lifestyle [4–6].

Despite significant global progress having been made over the last two decades, the number of hungry people remains unacceptably high. According to the Global Hunger Index (GHI) in 2014, the state of hunger in developing countries has improved since 1990, falling by 39% [7]. However, the goal of “feeding the world” remained far reaching. Sub-Saharan Africa and South Asia, where 60% of world’s food insecure people reside, are the most affected regions in the world. These regions have a predominantly rain fed agriculture, which has often resulted in a food system yielding a low per capita food availability for decades [8]. The Horn of Africa, where Ethiopia is located, is one of the most food insecure regions of the world; more than 40% and up to 70% of the population are undernourished [9]. According to the demographic health survey of Ethiopia (2011), more than one third of households in the country are food insecure [10].

The coffee sub-sector is vital to the Ethiopian economy. In 2014, coffee alone accounted for 25.8% of the total export earnings, providing income for about 8 million small-holder farming households [11]. Driven by such gains, one of the goals of the Ethiopian national agricultural program is “to rise agricultural productivity and commercialization” [12]. Consequently, there has been great interest in leveraging agriculture to maximize income across the country. Rural development agencies working in coffee producing areas are also operating within a framework of further expansion of coffee farming in neighboring regions. On the

other hand, critics of the cash crop agriculture system has raised the negative influence of cash cropping over staple food production and availability for those engaged in farming and processing [13, 14]. Skeptics of commercialization of agriculture also raise the financial risk small holder farmers could face as prices for major cash crops are set in volatile commodity markets and chains of larger firms [12–14].

Food access can be worse in a cash crop setting where products are not edible or are meant for parties other than the farming household. A study in Uganda has found coffee producing households had greater ownership of capital assets, access to inputs and higher income, but conversely, they were found to have poorer nutritional outcomes and were more food insecure compared to staple food producing farmers [15]. Likewise, in Ghana, farmers dedicating a greater percent of their land to cash crop (oil palm and/or cacao) production were found to have reduced food access, availability and utilization [16]. A high level of food insecurity was also observed among coffee farmers in Nicaragua (69%) and in a survey of Central America and Mexico (63%) [17, 18].

In Ethiopia, food insecurity has to a large extent been addressed by annual emergency food aid from abroad. In the past two decades, the country has been the largest recipient of food aid in Africa. In the meantime, the country has adopted a multi-sectoral and comprehensive approach involving financial, agricultural and education sub sectors towards food security, yielding a remarkable reduction of the GHI scale from 42.6 in 1995 to 24.4 in 2014 [19]. However, food insecurity and malnutrition remain prevalent, contrary to the country’s rapid economic growth, affirming the need for detailed investigations in each context. Moreover, there exists a notion of considering high income earning coffee producing regions as “food secured” in a general sense, if wrong, could result in apparent neglect in public health nutrition. To our knowledge, there has been no study done with the same objectives on coffee farmers of Ethiopia thus far. Hence, this study was done to assess food insecurity and its determinants among coffee farming population of the Jimma Zone, Southwest Ethiopia.

## Methods

### Study setting and design

A community based cross-sectional study was conducted to assess the prevalence of food insecurity and its associated factors among coffee farming households of the Jimma Zone, Southwest Ethiopia. The Jimma Zone is one of the 18 zones in the Oromia region of Ethiopia known for organic Arabica coffee production. According to the 2007 national census, the total population and number of households were 2,495,795 and 521,506, respectively. The Zone covers a total area of 15,569 km<sup>2</sup> and has reliably

good rain ranging from 1,200–2,800 mm per annum [20]. Having a very suitable agro-ecological setting, the Jimma Zone is rated as the lowest drought risk area in the country [21].

#### Sample size and sampling procedure

The sample size was calculated using the prevalence of food insecurity in the Mana wereda of the Jimma zone (42%), a design effect of 2 and a margin of error of 0.05 [22]. A sample size of 749 was estimated to have a power of 80, calculated using Epi info Version 7 open source sample size calculator. Being a registered resident coffee farming household of the weredas (administrative sub district) for a minimum duration of one recent harvest season was the inclusion criteria in this study. Multi-stage stratified sampling was used to collect data from respondents across the Jimma Zone. First, three of the nine top coffee producing weredas in the Jimma Zone (Mana, Gomma and Limukossa) were randomly selected. Then, the weredas were stratified by urban and rural area of residence and finally one third of the villages (gots) in rural setting and kebeles in semi urban were selected based on their proportion and used as primary sampling unit. The final calculated sample size was allocated proportional to population size for the urban kebeles and rural gots at each stage. All eligible households were identified by using family folder from agricultural extension workers and were included for the study.

#### Data collection and procedures

A structured questionnaire was used to collect data on socio-demographic characteristics, household asset, household food security, determinants and coping strategies. Data were preferably collected from the mother when accessible in accordance of the Household Food Insecurity Access Scale (HFIAS) instrument recommendations. Pre-testing of the questionnaire was conducted on 5% of the study households involving all trained data collectors. The actual data were collected by trained nurses, and supervision was made by trained graduate nutritionists. Ethical clearance was obtained from the review board of Jimma University, College of Health Sciences. Respective government and health institutions and local administrators were asked permission of entry using an official letter from Jimma University. A detailed description of the study was given to the kebele and “got” leaders and households with the aim of sensitizing and mobilizing the local population. In addition, informed verbal and written consent was taken from each of the participating household’s heads.

#### Measurements and analysis

HFIAS version 3 was used to measure food insecurity, a tool that has been developed by the FAO and Food and Nutrition Technical Assistance (FANTA) and validated

for use in several developing countries to assess household food security status including Ethiopia [10, 23]. HFIAS has three domains. These are (i) anxiety and uncertainty, (ii) insufficient quality and (iii) insufficient food intake (quantity) and its physical consequences. The wealth index was generated using principal components analysis, where the scores for the 25 selected groups of assets and utilities (which were used in earlier demographic surveys of Ethiopia) translated into latent factors and the first factor that explained most of the variation was used to group study households into wealth tertiles (see Additional file 1).

Data coding, editing and cleaning were done manually. Data entry was done by using Epi Data version 3.1. Then, after making the data appropriate for analysis, it was exported to SPSS version 20. Household Food Insecurity Access related domains, prevalence and Household Food Insecurity Access score were computed from HFIAS occurrence and frequency questions. Bivariate analysis was carried out to see the association between the dependent and each independent variable; variables having a *P*-value <0.25 were considered for multivariable analysis. In order to examine the relative importance of each independent variable by controlling the confounding factors, multivariable analysis was used and those variables with *P*-values <0.05 were declared statistically significant.

#### Results

A total of 749 households were included in this study. Most of the households were residents in a rural area (87.7%) while 12.3% resided in semi urban towns. The majority of them were Muslims (82.4%) and the rest Christians (15.1%). Most (76.5%) of the respondents were Oromo ethnic groups while the rest were combinations of six ethnic minority groups in the region. The majority of the interviewed heads of the households were married (91.5%), few were divorced (7.1%). Nearly 90% of the heads of the households were male. Regarding educational status, most of the household heads (77.8%) had a formal education while the corresponding value for the spouse was 68.2%. The mean family size was 5.13 with a standard deviation of (SD)  $\pm 1.8$ . A quarter (25.2%) of the households were in the lowest tertile of the wealth index of the studied population, and comparable households were found in the upper and middle tertile accounting for 34.7% and 40.1%, respectively. The majority (87.7%) of the households had less than one hectare of farm land (Table 1).

A higher proportion of the households (66.1%) ate “less preferred food” and more than two thirds (64.1%) reported “worries of food access” and a similar proportion of households (64.2%) had reported “less access of varieties of foods”. Affirmative responses for the last

**Table 1** Sociodemographic characteristics of coffee producing Households, Jimma Zone, Ethiopia, 2016

Variable		Frequency	Percent
Setting	Rural	657	87.7
	Urban	92	12.3
Religion	Muslim	617	82.4
	Ortodox	113	15.1
	Protestant	19	2.5
Ethnicity	Oromo	573	76.5
	Amhara	60	8
	Silte	55	7.3
	Dawero	49	5.3
	Others	21	2.8
Marital Status	Married	685	91.5
	Divorced	53	7.1
	Widowed	11	1.5
Sex Of The Household Head	Male	674	90
	Female	75	10
Household Head Educational Status	Forma Education	583	77.8
	No Formal Education	166	22.2
Spouse Educational Status	Forma Education	511	68.2
	No Formal Education	238	31.8
Family Size	2-4	321	42.9
	5-6	269	35.9
	7-8	159	15.8
Farm Size	<1 Hectare	657	87.7
	≥1 Hectare	92	12.3

three items about severity were lower compared to the first six items, indicating worry, access and availability of food. The prevalence of anxiety and uncertainty on food access, insufficient food quality and quantity and physical consequences of food insecurity were 64%, 68% and 39.9% respectively. Prevalence of food insecurity was 68.8% with an average HFIAS score of 6.82. Mild, moderate and severe food insecurity were 39 (5.2%), 348 (46.5%), 128 (17.1%), respectively. Reported seasonality of food insecurity was 83%, which was particularly apparent between the flowering and harvesting months (May to August). Reliance on less preferred food consumption was the coping strategy most reported ( $n = 336$ ; 44.9%), while limiting portion size of meal ( $n = 261$ ; 34.8%), borrowing food during scarcity ( $n = 234$ ; 31.2%) and reducing number of meals in a day ( $n = 207$ ; 27.5%) were reported. Conversely, sending household members to beg was the least coping strategy used by households ( $n = 47$ ; 6.3%).

In a univariate analysis, family size, dependency ratio, sex of household head, spouse educational status of the household head as well as the spouse, land ownership,

land size, use of agricultural input, access to credit and saving services, utilization of agricultural extension programs, gender based household food purchase, and wealth status showed associations ( $P < 0.25$ ) for further analysis using multiple logit fit. Thus, in a multivariate analysis, educational status of household head and the spouse, gender assigned on food purchase, and utilization of saving and credit service were found as the main predictors of food insecurity in the area (Table 2). Households whose heads had a formal education were 39% less likely to face food insecurity compared to those who did not receive a formal education [ $OR = 0.61$  (0.38-0.99)]. Similarly, households with an educated spouse were 36% less likely to have food insecurity [ $OR = 0.64$  (0.42-0.97)]. Households in which the husband was responsible for purchasing food were more than twice as likely to be food insecure than households in which the wife took food responsibility for purchasing tasks [ $OR = 2.4$  (1.58, 3.33)]. Furthermore, households which utilized saving and credit service were 59% less likely to have food insecurity than those did not [ $OR = 0.41$  (0.31-0.58)].

## Discussion

The proportion of food insecure households in the study area was found to be very high (68.1%), which may induce a large nutritional challenge prevailing in the setting. Comparable levels of food insecurity were observed among coffee farmers in Nicaragua (69%) [17] and in a survey of Central America and Mexico where the majority (63%) of coffee farming households were food insecure [18]. A similar phenomenon was also observed in Ghana, where farmers dedicating a greater percent of their land to cash crop (oil palm and/or cacao) production were found to have reduced food access, availability and utilization [16]. In the wake of convincing evidence of prevalent malnutrition among coffee farming households, organizations like Oxfam America has launched promising projects in Ethiopia aiming to improve the income of coffee farmers by involving multiple players in the coffee industry [24]. However, it is difficult to have an optimistic outcome of such initiatives operating through an economic approach alone, because the determinants of food insecurity are complex.

In this study, education remained one of the predictors of households' food insecurity, affirming the relevance of a basic education in such a context. Education can avert food insecurity by enhancing productivity, often regarded through economic paybacks. However, from a broader human development perspective, the impact of education on sustainability indicators goes far beyond, it contributes to the social, political as well as the cultural environment, which can have fundamental influence on the access and utilization of basic resources [25]. This finding is also in line with other studies done in Ethiopia and South Africa

**Table 2** Determinants of Food Insecurity among Coffee Producing Households of Jimma Zone, Ethiopia, 2016

Variables	Response	Total	Food Insecure N (%)	Food Secure N (%)	Crude Odds Ratio (95% C.I.)	Adjusted Odds Ratio (95% C.I.)	P value
Agricultural Input Utilization	Yes	406	265(65)	141(35)	0.69(0.51,0.95)	0.72(0.49,1.08)	0.12
	No	343	250(73)	93(27)	1.00		
Access To Credit Service	Yes	330	188(57)	142(43)	0.37(0.27,0.51)	0.41(0.31,0.58)	<0.01*
	No	419	327(78)	92(22)	1.00		
Agricultural Extension Package	Yes	356	232(65)	124(35)	0.72(0.53,0.99)	1.04(0.70,1.55)	0.85
	No	393	283(72)	110(28)	1.00		
Food Purchasing Gender	Male	276	218(79)	58(21)	2.22(1.57,3.14)	2.30(1.58,3.33)	<0.01*
	Female	473	297(63)	176(37)	1.00		
Wealth Index	Higher	293	200(68)	93(32)	1.00		0.25
	Medium	271	175(65)	96(35)	0.84(0.59,1.20)	0.77(0.52,1.13)	0.18
	Lower	185	140(76)	45(24)	1.44(0.95,2.19)	1.09(0.69,1.71)	0.72
Household head Education	Formal Education	583	380(65)	203(35)	0.43(0.28,0.65)	0.61(0.38,0.99)	0.04*
	No Formal education	166	135(81)	31(19)	1.00		
Spouse Education	Formal Education	511	331(65)	180(35)	0.54(0.37,0.76)	0.64(0.42,0.97)	0.04*
	No Formal education	238	184(77)	54(23)	1.00		
Sex Of The Household Head	Female	75	50(75)	25(25)	0.89(0.54,1.42)	0.86(0.49,1.52)	0.60
	Male	674	465(69)	209(31)			
Land Size	<=0.5 Hectares	364	249(68)	115(32)	0.96(0.71,1.31)	1.05(0.75,1.46)	0.78
	>0.5 Hectares	385	266(69)	119(31)	1.00		
Marital Status	Married	685	461(67)	224(33)	0.38(0.19,0.76)	0.54(0.25,1.14)	0.11
	Widowed/ Divorced	64	54(84)	10(16)	1.00		
Family Size					1.16(1.06,1.27)	1.10(0.99,1.22)	0.09
Dependency Ratio					2.03(0.75,5.41)	1.53(0.51, 4.59)	0.45

\*significant  $P < 0.05$ 

[26, 27]. Moreover, in their cross country analysis, De Muro and Burch (2007) [25] of the FAO suggested that primary education was a crucial element in reducing food insecurity in rural areas compared to other factors such as access to water, health, and sanitation [25]. They concluded that doubling primary education can have a reduction of food insecurity of 20% to 24%. Furthermore, the FAO global report labeled education as a “strong engine” which enhances productivity, employability and earning capacity to alleviate poverty and hunger. Considering its importance, education in the present study setting has relevant policy implications in minimizing food insecurity.

Women’s access to and control over income is key in assuring household food security [1, 7]. In the present study, gender-based division of labor related to food purchasing was found to be one of the predictors of food insecurity. Households in which the husband is responsible for purchasing food were found to be more than twice as likely to be food insecure than households whose food purchasing tasks were given to the wife. Women’s access to food is closely connected to the households food access as they are typically responsible as a consequence of

societal prescription [28]. In contrast, men are generally considered responsible for income-generating activities and big nonfood purchases. Classic studies have shown that, when income is predominantly controlled by the husband, the likelihood for it to be spent in non-food items is higher, hindering the mother access for food according to the preference of the household members [29–32]. A study in Kenya also reported gender disparity in the control and spending of cash income, where, men tended to control the income from cash crops and pay in a lump-sum, infrequent expenses, or consumer and prestige items rather than food [33].

The result of the present study also showed that households with access to debit and credit services had less odds of food insecurity, which is consistent with the findings in the Wolayta, and Tigray regions of Ethiopia [26, 34]. Utilization of debit and credit can give households the opportunity to be involved in income generating activities (trading and other non-farm activities) enhancing their purchasing power to escape the risk of food insecurity. In developing countries, a lack of access to finance represents a major constraint for smallholders’

investment, agricultural productivity as well as income creation [35]. This has been noted in the Pittsburgh Summit (September 2009) as well as the World Food Security meeting (October 2012), where leaders from the developed countries pledged to promote and implement policies that facilitate smallholders access to credit [36].

Wealth status, family size and land size did not show any association with food insecurity in the current study. Such variables are more capital related and their lack of statistical association may signify the peculiarity of the determinants of food insecurity in a cash crop setting. Here is more about gender, education and service than economic in terms of a monetary dimension. A similar phenomenon was observed in studies done in Ghana cocoa farmers and Kenya tea producers where wealth did not have an association with household food insecurity, showing the complexity of the causation of food insecurity in a cash crop setting [16, 37]. Our result of family size is not consistent with many studies where family size is the top predictor of food insecurity in the setting [26, 38, 39]. The probable cause for this lack of association could be due to the confounding effect of labor. In low mechanized cash crop agriculture, human labor is crucial for land preparation, weeding and harvesting processes which can have a tremendous impact on agricultural production.

## Conclusion

There exists a high prevalence of food insecurity in the study setting. The odds of household food insecurity is significantly influenced by educational status, utilization of saving and credit services, and gender assignment related to the purchase of food. Therefore, prevention of food insecurity in such a setting should focus on a multi-sector action for enhancement of gender equity education, financial services and cash management skills. Furthermore, a longitudinal study on the seasonality of food insecurity, coping mechanisms and their implications on vulnerable members of the household is required, particularly in Ethiopian coffee growing communities that have been largely neglected from the research process thus far.

## Additional file

**Additional file 1:** Household wealth. (DOCX 13kb)

## Abbreviations

FANTA: Food and nutrition technical assistance; FAO: Food and agriculture organization of the United Nations; GHI: The global hunger index; HFIAS: Household food insecurity access scale; OR: Odds ratio; SD: Standard deviation

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## Availability of data and materials

The data supporting the conclusions of this article is included within the article (and its Additional file).

## Authors' contributions

All stated authors (KH, BZ and TB) were involved in the study from the inception to design, acquisition of data, analysis and interpretation and drafting of the manuscript. All authors read and approved the final manuscript.

## Competing interests

The authors declare that they have no competing interests.

## Consent for publication

Not applicable.

## Ethics approval and consent to participate

Permission to conduct the study was obtained from the Institutional Review Board of Jimma University, College of Health Sciences, Ethiopia. Detailed description of the study was given to the community leaders and households with the aim of sensitizing and mobilizing the local population. Informed verbal and written consent was taken from each participating household heads.

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