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Contribution of Hot Pepper Production to Household Food Security: The Case of Gursum District, Oromia Regional State, Ethiopia

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Abstract
Food insecurity is the key policy challenge for Ethiopia in general and Gursum district in particular. To combat this problem diversifying the smallholders' farming systems and income sources is an option. In this regards, the production of cash crops like hot pepper, groundnut and other market-oriented crops is indispensable. Although hot pepper production is important source of income of households, systematic and rigors analysis of its contribution to households' food security has not been done in Gursum district. Thus, this research was undertaken in Gursum district of Oromia regional state in two kebeles with the objectives of examining food security status of household, analyzing the contribution of hot pepper in household food security and identifying the factors affecting household food security and hot pepper production. The research used primary data generated from 150 randomly selected sample households and secondary data from secondary sources. Household calorie consumption method was used to identify food security status of the sample household. The collected data were analyzed by using descriptive statistics like mean, standard deviation, frequency and percentage. The chi-square(X^2) test for systematic association of discrete/dummy variables with food security status and t-test for mean difference of continuous variables for food secure and food insecure households were used. Binary logit model was used to identify the factors affecting household food security in the study area. Among twelve hypothesized variables five were significantly affect food security status of the household those were household size at $p<5\%$, land size at $p<1\%$, level of education at $p<5\%$, non-farm participation and income from hot pepper at $p<1\%$ probability level. In general from the empirical analysis, similar to other studies on income from cash crop has contribution for food security, thus, this study also confirms that income from hot pepper has significant contribution in improving food security status of the household. But low price, lack of improved and other constraints challenges the production of hot pepper. Therefore, local government, both local and international Non-government Organizations and other stakeholders should jointly work on hot pepper production and its income to improve food security of household.
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Introduction

Global food security will remain a worldwide concern for the next 50 years and beyond (Rosegrant and Cline, 2003). Food security is also high on the global agenda: United Nations' Sustainable Development Goal number two aims to end hunger and ensure access for all to safe, nutritious and sufficient food all year around by 2030 (United Nations, 2015). Compared to other parts of the world, food insecurity is the greatest and severe in developing countries particularly in Sub-Saharan African countries, since the livelihood of the majority of the household depends on agricultural sector (Haile, 2005). For instance, more than 85% of people in Ethiopia depend on agriculture as their primary source of income (Taye *et al.*, 2010). The population of Ethiopia is estimated at about 90 million in 2015 (CSA, 2016). According to the IMF's World Economic Outlook, 2014 agriculture in Ethiopia provides 47% of the GDP, 81% of employment and 85% of foreign exchange. Being a predominantly agrarian economy underlines the country's continued heavy dependence on agriculture. Ethiopia's GNI per capita is USD 570 in purchasing power parity: one of the lowest in the world IMF (2014), thus food security is still a serious issue in Ethiopia.

Food security has become a burning issue in Ethiopia since it is an absolute prerequisite for political and social stability. It received national prominence in the aftermath of the recurring drought and famine and obviously became an immediate domestic policy concern. The gap between the dire need for food and food supply is compounded by rapidly increasing population, depletion of natural resources and the existing traditional way of farming (Endalew *et al.*, 2015). It even requires sacrifice to provide adequate supply of food in such a situation where natural and human factors have a negative impact on the agricultural production and resulted in recurrent droughts and sometimes in catastrophe FAO (2010). Therefore, to reduce poverty and food insecurity in addition to other strategies like productive safety net program, household asset building (Anderson *et al.,* 2015) and

developing other service sectors like irrigation, agricultural extension MFED (2010); Oakland Institute (2016) and diversification of income through producing different cash crops (Degye *et al.* 2012); (Amsalu *et al.,* 2015) like hot pepper and other vegetable crops is indispensable.

Hot pepper (*Capsicum annuum L.)* is the world's most important vegetable after tomato and used as fresh, dried or processed products, as vegetables and spices or condiments (Acquaah, 2004). This crop is prominent cash crop for many developing countries' farmers such as Ethiopia, Nigeria, Ghana, China, India, Pakistan, Bhutan, Indonesia, Cambodia and Thailand (Shih-wen *et al.*, 2013). It also lowers high blood pressure (Guarini *et al.,* 2012); (Mustafa, 2017) and increase peripheral circulation and most popular dishes in Ethiopian cuisine (MoA, 2009). Its importance is not only limited on consumption point of view but also very prominent to farmers by generating income, creating employment opportunity and ensuring food security. This enhances profitability of those who engaged in the production of pepper. According to (Mohammed *et al.,* 2015) research indicated that investment in hot pepper production and other vegetables (Amsalu *et al.,* 2015) is viable enterprise for income generation, poverty alleviation, job creation and improvement of food security to every household.

Hot pepper is produced in many parts of the country. It is the main part of the daily diet of most Ethiopian societies. The fine powdered pungent product is an indispensable flavoring and coloring ingredient in the common traditional sauce "*Wot*", whereas the green pod is consumed as a vegetable with other food items. The average daily consumption of hot pepper by Ethiopian adult is estimated 15g, which is higher than tomatoes and most other vegetables (MARC, 2004). Because of its wide use in Ethiopian diet, the hot pepper is an important traditional crop mainly valued for its pungency and color.

Hot pepper has been cultivated in Ethiopia for long period of time. It is the leading vegetable crop produced in the country. Green and red hot pepper covered 3.82% and 67.53% respectively of the total estimated area under vegetables in the country. Similarly, the national production of green and red hot pepper was 412,503.57 and 2,541,883.97 quintals with average productivity of 66.88 and 23.31qt per hectare respectively (CSA, 2014). However, the agricultural extension service, and marketing focus on this crop by governments, NGOs and other stakeholders is very low. Therefore, giving focus for solving these problems come up with improvement of the production and productivity of hot pepper to ensure contributions of hot pepper to household food security in enhancing their purchasing capacity of food grain crops undertaking this study is important.

2 Objectives of the study

To examine food security status of hot pepper producers and non-hot pepper producers household in the study area
To assess the contribution of hot pepper to household food security in the study area
To identify determinants of food security status of the household in study area
To identify factors that impedes contribution of hot pepper to household food security in the study area

3. Research Methodology

The study was conducted in Gursum district, East Hararghe Zone Oromia Regional State. The information discussed in this session included the characteristics of the study area where the research was conducted and the methodology implemented by researcher.

3.1. Sampling techniques and sample size determination

This study used multi-stage sampling technique in which both purposive and random sampling techniques were applied. At the first stage, out of 20 districts of East Hararghe zone, Gursum district was selected purposively based on the potential production of hot pepper and the researcher's knowledge of the area. In the second stage, out of the total of 39 kebeles with administrations of the district, 8 kebeles were randomly selected because they were relatively with more potential hot pepper producers than other kebeles producing hot pepper. From these 8 kebeles two representative kebeles were selected purposively. In the third stage, the households in the two kebeles were categorized into two strata, i.e., hot pepper producers and non-hot pepper producers and comprehensive list of both households was prepared. Then, 150 sample households, 75 from non-hot pepper producers and 75 hot pepper producers were selected. This sample size was determined by Yemane formula (1967) in drawing an adequate sample size from a given population at 95% confidence level, 0.5 degrees of variability and 8% level of precision in which the total of 150 sample household included from the comprehensive list of population size (4000).

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

Where, n= sample size, N= total comprehensive list of population, e= level of precision.

$$\mathbf{n} = \frac{\mathbf{4000}}{\mathbf{1+4000(0.08)^2}} = \mathbf{150}$$

3.2. Methods of data collection, data type and source

To generate information at household level, household level survey was undertaken using structured interview

schedule. Prior to conducting the interview, pre-test of the interview schedule was undertaken in selected two kebeles with 30 respondents 15 from hot pepper producers and 15 from non-hot pepper producers and accordingly revision made and finalized. Five enumerators were recruited based on their proficiency in communicating using Afan Oromo language, educational background, and prior exposure to similar work. Training was given to enumerators on the content of the interview schedule and procedures followed in the process of conducting the interview.

Only hot pepper producers were administered with questions related to hot pepper data in order to estimate monetary benefit to hot pepper participants/producers. To determine food security status of the sample households, data were collected on the amount and type of food items consumed by households for 7 days recall through posing questions to women who were most responsible to prepare food for the family when they were free to give information.

The three focus group discussion were held: first with 10 producers and 10 non-producers of hot pepper (on the reasons of not participating in the hot pepper) those who were active in giving information in order to generate information on overall management aspect of the product and in the mean-time site observation and storing system of the product was made to make a note on the way the farmers handling the products. In addition, discussion was also held with non-hot pepper producers, community representative: one man and one woman, and two kebele leaders to gather further information. Furthermore, review of documents from different offices was also carried out for secondary data.

3.3. Methods of Data Analysis

After the completion of data collection, coding and entering the data into SPSS version 20 software and Stata version 11 were used for the analysis. Descriptive statistics like mean, standard deviation, frequency distribution, and percentage were used to examine and understand the socio-economic situation of the sample respondents (hot pepper producers and non-hot pepper producers) on their food security status. The statistical t-test and chi-square test were used to analyze continuous and discrete/ dummy independent variables relation to dependent variable (food security status of the household) respectively.

The food items consumed by sample households' calorie content was computed using calorie conversion table of EHNRI (1968) and household members were also converted to their adult equivalent. Then, the amount of total calories consumed by each sample household was computed and divided by 7 days to get per day calorie consumed by household. This figure was divided to the Adult Equivalent (AE) of respective households and this would give the amount of calorie per AE for each sampled household. Thus, those households greater than the minimum amount of calorie required (2100 kcal) were classified as food secured otherwise not food secured Hoddinott (2001). The situation of household food security within hot pepper producers and non-hot pepper producers was seen independently.

he dependent variable was dummy variable, which takes a value of zero or one depending on whether or not a household is food secure or not. Here, the main purpose was to determine the probability that an individual/household with a given set of attribute would fall into food secure or food insecure group.

Econometric Model Specification

Linear probability model (LPM), binary logit and probit models were used to estimate dependent dichotomous variable (food secured or food insecurity). Although linear probability model is the simplest method, it is not logically attractive model in that it assumes that the conditional probability increases linearly with the value of explanatory variables. Therefore, linear probability model is not appropriate to test the statistical significance of estimated coefficients (Gujarati, 1995).

Unlike linear probability model, logit model shall guarantee that the estimated probabilities increase but never steps outside the 0 – 1 interval and the relationship between probability (Pi) and explanatory variable (Xi) is nonlinear Gujarati (1995). Thus, a logistic model was used to identify the determinants of food security and to assess their relative importance determining the probability of being in food secure.

Following Gujarati (1995), the functional form of logit model is specified as follows:

$$P_i = E(Y=\frac{1}{xi}) = \frac{1}{1+e^{-(\beta 0+\beta 1 x1)}} \text{ ---------- (1)}$$

For the case of exposition, it can be written (1) as;

$$P_i = \frac{1}{1+e^{-zi}} \text{ ---------- (2)}$$

The probability the given household is food secure is expressed as by (2) while, the probability of not food insecure is;

$$1-P_i = \frac{1}{1+e^{zi}} \text{ ---------- (3)}$$

Therefore, it can be written;

$\frac{Pi}{1-Pi} = \frac{1+e^{zi}}{1+e^{-zi}}$ ---------- (4)

Now, (Pi/1-Pi) is simply the odds ratio in favor of food insecurity. The ratio of the probability that a household will be food insecure to the probability of that it will not be food insecure. Finally, taking the natural log of equation (4) it can be obtained:

$L_i = \ln\left[\frac{Pi}{1-Pi}\right] = Z_i = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \text{----} + \beta_n X_n$ --------- (5)

Where Pi = is a probability of being food insecure ranges from 0 to 1

Zi = is a function of n explanatory variables (x) which is also expressed as:-

$Z_i = \beta o + \beta 1X1 + \beta 2X2 + \ - - - + \beta nXn$ ---------- (6)

βo, is an intercept

$\beta_1, \beta_2, \text{------}\beta_n$ are slopes of the equation in the model

Li = is log of the odds ratio, which is not only linear in Xi but also linear in the parameters.

Xi = is vector of relevant household characteristics

If the disturbance term (Ui) is introduced, the logit model becomes

$Z_i = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \text{-----} + \beta_n X_n + U_i$ ---------- (7)

4. Result and Discussion

4.1. Food Security Status of Household in the Study Area

The food security status of the hot pepper producers and non-hot pepper producers were highly different from each other in reference of the sampled household. From the following Table 1 among the sample households 84% of hot pepper producers were food secure. This indicates that hot pepper producers could access to purchase grain crops and food items than non-hot pepper producers. The chi-square test statistics also shows that there is significant different between hot pepper producers and non- hot pepper producers in food security status at p<1% probability level.

Table 1: Food security status of the household by category

Category	Food security status(N=150)		Total	X^2 value
	Food insecure	Food secure		
No-producers	47(62.7%)	28(37.3%)	75	
Producers	12(16%)	63(84)	75	34.2*** (0.000)
Total	59(39.3%)	91(60.7%)	150	

4.2. Demographic and Socio-Economic Characteristics of the Sampled Household

A. Sex of household

As indicated in Table 2 descriptive statistics shows that 68.1% food secure household were male and 31.87 were female. And chi-square result indicates that there is significant difference between food secure and food insure sampled household at p<1% probability level on sex of households which agrees with the findings of Genene, 2005 which male headed household works different income generating activities and access to food than females where they sometimes leave food for their child instead eating by themselves.

B. Credit service

From Table 2 those farmers access to credit services were more food secure. That is for food secure households 50.55% non-credit users and 49.45% credit users and for food insecure 72.88% were non-credit users and 27.12% were credit users. This indicates that more household being food insecure as a result of not access to credit.

C. Extension service

As indicated in Table 2 those farmers who did not use extension service were more food insecure that was 66.10% were non- extension users and 33.89% extension users and for food secure households that was only15.38% were non-extension users and 84.61% were extension users. The statistical chi-square test shows that there was statistically significance difference of using extension service on food security status of the sampled household at p<1%, however, this finding contradict with (Hussein and Janekarnkij, 2013), in the authors' findings the extension service has no significant contribution to household food security since the extension agents assigned in the kebele has many burden in addition to agricultural activities from different line departments like cooperative office, irrigation office, political issues and others.

D. Non-farm activities participation

As it is indicated in Table 2 those farmers who did not participate in non-farm activities became food insecure

64.41% and 35.59% participated in non-farm activities as compare to food secure (85.71%) and only 14.28% not participated) those who have more participation in non-farm activities and the statistical chi-square test shows there was significance difference of household participated in non-farm and not participated on their food security status at p<1% this result contradict with (Mequent *et al.*, 2014) and they conclude that non-farm activities has no relationship with food security status of household. According to the focus group discussion held with the selected household for discussion, for example, in place of selling their large livestock to purchase food grain crops they had been using non-farm activities income instead.

E. Education level of household

As it is indicated in Table 3 there is significance difference in education level of food insecure and food secure households that is as education level increase farmers use what they have efficiently and active in accepting improved agricultural technologies as compare to those who did not educate well. The t-test shows that there is statistically significant mean difference between food secure and food insecure sampled households at p<1% significance level and this finding agrees with (Kiros *et al,* 2018).

F. Age

As indicated in Table 3 the average mean of the food insecure and secure household was 35.45 and 36.17 with standard deviation of 10.67 and 10.57 respectively and nd the statistical t-test shows that there was no significant difference in age of food insecure and secure households this refers that that in study area the age is not significant factor affect the food security status of the household, however, this result was disagree with (Abonesh *et al.*, 2006) in which they found it significantly affect household food security in which they argue that as household mature enough they diversify their livelihood strategies and participate in different activities like off-farm and nonfarm activities in addition to agricultural activities as a result, improve their food security.

G. Household size

As indicated in Table 3 the mean of household size of food insecure household was 6.3 and 4.2 with standard deviation of 2.2 and 2.233 respectively. This shows that the more household member the more chance to become food insecure and the opposite is true. The statistical t-test shows that there is significance difference between food insecure and food secure households at p<1% and this result agrees with (Tasfaye, 2014) in which the author found that the many number of household member compete for food availability in the house.

H. Land size

As it is indicated in Table 3 the average land holding in the study area was 0.78. If we see the food insure households the mean of land holding was 0.57 hectare with standard deviation of 0.236 and food secure household 1 hectare. The statistical t-test shows that there is significant difference between food insecure and food secure households and positive relationship of land holding with household food security status at p<1% and this finding agrees with Kiros *et al.* (2018) the author found that having more hectare of land and using it in efficient way and diversify agricultural products helps farmers to improve their food security status.

I. Number of livestock (TLU)

As it is indicated in table 3 we can see that mean of food insecure holds 2.42 TLU with standard deviation of 1.81 and food secure households holds 2.87 TLU with standard deviation of 2.14. In this research it was hypothesized that number of livestock ownership has significant contribution on food security of households and increase the probability to be food secure. But, the t-test shows that there is insignificant difference of food insecure and food secure households.

J. Income from livestock (in birr)

Income from livestock is very important and farmers can get more money from livestock selling and in return purchase different food items and non-food items. In the study area farmers fatten the oxen and small ruminants (male goat and sheep) and sell in good price and use to purchase different non-food items like building materials, for ceremony, expense on health purpose and purchase of grain crops like maize, wheat and sorghum and others.as it is indicated in Table 3 the mean of income obtained from livestock selling of food insecure household was 4438.3 birr with standard deviation of 4748.9 and for food secure household 5843.8 birr with standard deviation of 6430.46. This shows that there was no that much difference on their annual income from livestock selling. In this research study it was hypothesized that income from livestock has significant contribution to household food security. But, the t-test shows there is no significance difference between food secure and food insecure households in reference of the income from livestock has contribution in becoming food secure.

K. Income from hot pepper (in birr)

In this research it was hypothesized as the hot pepper production has positive relation and has contribution in food security as other studies has the same roles for example irrigation to household food security conducted by (Getinet, 2011) water resource by (Tamene, 2014); income from non-timber forest products by (Ahmed, 2015); income from livestock (Habtamu, 2015); income from cash crop for food security specific to coffee by (Tadese *et al.,* 2018) as in Table 3 the statistical t-test shows that there is significant difference income contribution between food insecure and food secure sampled household at p<1%.

L. Income from groundnut

In this research it was hypothesized that income from groundnut has significant positive relation with food security status of household. As indicated in Table 3 the statistical, t-test shows that there is statistically significant income difference between food insecure and food secure households in the study area at p<1%.

Table 2: Descriptive statistics for discrete/dummy variables

Variables		Food security status		Total	X^2-test
		Food insecure(n=59)	Food secure(n=91)		
Sex	Female	40(67.80%)	29(31.87%)	69	
	Male	19(32.20%)	62(68.10%)	81	18.6(0.000***)
Credit service	No	43(72.88)	46(50.55%)	89	7.39 (0.007***)
	Yes	16(27.11)	45(49.45%)	61	
Extension service	No	39(66.10%)	14(15.38%)	53	
	Yes	20(33.89%)	77(84.61%)	97	40.29 (0.000***)
Non-farm participation	No	38(64.41%)	13(14.28%)	51	
	Yes	21(35.59%)	78(85.71%)	99	40.07 (0.000***)

Source: own survey 2018

*** Significance level at p<1%

Table 3: Descriptive statistics for continuous variables

Variables	Food security status				t-test
	Food insecure(n=59)		Food secure(n=91)		
	Mean	Standard deviation	Mean	Standard deviation	
Age	35.457	10.664	36.175	10.573	-0.405 (0.686)
Household size	6.338	2.2	4.2	2.233	-6.428 *** (0.000)
Total land size	0.572	0.236	1.002	0.661	-4.798***(0.000)
Leveducation	0.949	0.139	4.516	0.365	-7.638*** (0.000)
Number of LIV	2.423	1.811	2.872	1.140	-1.133 (0.1855)
Income from LIV	4438.31	4740.93	5843.85	6430.46	-1.44(0.1511)
Income from HP[a]	279.831	582.44	7655.13	6941.74	-8.132***(0.000)
Income from GN[b]	2461.69	1745.37	850.54	1447.32	6.14***(0.000)

HP[a]-hot pepper, GN[b]-groundnut, *** p<1%

Source: own survey 2018

4.3. Assessment of Hot Pepper Production Contribution to Household Food Security

4.3.1. Proportion of income earned from different source to household food security

In the study area farmers earns income from different sources such as hot pepper, livestock, no-farm and groundnut which this research selected them as potential sources of income to household food security. In order to get their potential contribution to household food security the overall annual income from each household (food insecure and food secure category) calculated and sum up. Then, the proportion of income sources to household food security calculated as follows:

$$\mathbf{Y=Xi/\sum X_{in}*100,}$$

Where, Y= proportion source of income (%), X_i= income obtained from its source, $\sum X_{in}$=sum of income

Source: Own formula

As indicated in table 4 the proportion of hot pepper in household food security (food secure household) it has 29.87% over other income obtained from other sources like groundnut and livestock as compare to food insecure one; and even if the contribution of non-farm income contribute to household food secure 44.18% which is greater than hot pepper proportion the increment level of hot pepper from 2.41% for food insecure and 29.87% for food secure was in greater proportion to non-farm in which the increment only from 38.19% for food insecure and 44.18% for food secure.

Table 4: Proportion of different source of income to household food security

Income source	Food security status and annual income				t-test
	Food insecure (n=59)		Food secure (n=91)		
	Mean income	Overall %	Mean income	Overall %	
Hot pepper	279.83	2.41	7728.76	29.87	-8.13***
Groundnut	2461.695	21.18	854.62	3.30	6.13***
Livestock	4440.678	38.21	11429.84	22.62	-1.44
Non-farm activity participation	4438.305	38.19	5853.63	44.18	-4.31***
Total	11620.51	100	25866.84	100	

Source: own survey, 2018

4.4. Determinants of household food security

Table 6: Maximum Likelihood Estimates of Binary Logit Model (BLM)

Variables	Coef.	Std. Error.	|Z| value	Odds Ratio	P>|Z|
AGE	0.0593	.1360	-0.44	0.9424	0.663
SEX	-0.4000	1.2109	-0.33	0.6703	0.741
LEVEL OF EDUCATION	0.7574	.3436	2.20**	2.1326	0.028
HOUSEHOLD SIZE	-1.2202	0.5718	-2.13**	0.2951	0.033
LAND SIZE	6.8444	2.6479	2.58***	938.6141	0.010
NUMBER LIVESTOCK (TLU)	0.3518	0.3358	1.05	1.421639	0.295
INCOMEFRLIV	-0.000159	.0 .0001212	-1.31	0.9998	0.189
CREDITSER	-1.1178	1.8909	-0.59	0.3269	0.554
EXTENSER	1.1252	1.4024	0.80	3.0809	0.422
NON-FARMPART	4.6902	2.0244	2.32***	108.8828	0.021
INCOME FROM HOTP	0.0025375	0.0009802	2.59***	1.0025	0.010
INCOME FROM GRNUT	0.0004658	0.0005312	0.88	1.00046	0.381
CONSTANT	-4.8068	4.5716	-1.05		0.293

No. of obs.= 150
LR Ch2 (12)= 174.69
Prob > chi2= 0.0000
Pseudo R2= 0.8688
Log Likelihood= -13.188
Source: Model output
Note: **,*** indicate significant at 5% and 1% respectively

4.5. Econometric Model Results Interpretation of Determinants of Food Security

A. Level of Education

Educated farmers are more technology user than uneducated farmers, thus, the model outputs show that there was significant contribution of education in food security status of household at p<5% probability level. The odds ratio shows that keeping other factors constant, the probability of household to become food secure increases by factor of 2.13. Know a day adult education is the most teaching system that rural peoples were benefiting from through where in to grassroots level in village. This result is similar and agrees with the research findings of (Tamene, 2014) and (Ogunniyi Adebayo *et al.*, 2018) they stated that as farmer be well educated he/she accepts different improved agricultural technologies.

B. Household size

Household size was hypothesized as negatively affect food security status of household and the econometric model output of odds ratio also confirmed that a member of household increment reduce food secured household to be food insecure by factor of 0.29 and there was significant difference between household with large and small family size (at p<5%) probability level this result agrees with (Mequenent *et al,* 2014).

C. Land size

Land size is one of the household the asset that constantly serves the household to be food secured and the model output shows that there was significant difference between food insecure and food secure households at p<1% and this agrees with (Kiros *et al,* 2018) and (Bogale and Shimalis, 2009). The odds ratio of the model shows that the household to be food secured would be increased by 938.61 factors with the land cultivation increasing by one hectare remain other factors constant.

D. Non-farm activities participation

No-farm participation is one of the sources of income for household. From table 4 the model analysis output shows that there was significant difference between food insecure and food secure household at p<1%. The odds ratio of the result also shows that other factors remain constant, the food securing of household would be increased by

factors of 108.88 in participation of non-farm activities with the increment of one birr obtained from non-farm participation this results agrees with the (Demeke *et al.,* 2011) they stated that households can earn additional income to improve their food security status.

E. Income from Hot Pepper

In this research study it was hypothesized that the hot pepper production income has significant contribution in food security status of the household where this hypothesis is agrees with (Ogunniyi and Adebayo *et al.*, 2018) which they stated that income from hot pepper have significant relationship with food security. The models shows that there was significant difference on food security status of household the probability that to be food secured at p<1%. The odds ratio shows, other factors remain constant; to be food secured of household would be increased by 1.002374 as the household income from hot pepper increased by one birr. This contribution of income from hot pepper to household food security similar with others findings were like (Getinet, 2011); (Tamene, 2014); non-timber forest products (Ahmed, 2015); livestock (Habtamu, 2015); cash crop for food security specified in coffee (Tadese *et al.,* 2018).

5.2. Conclusion and Recommendation

5.2.1. Conclusion

The findings of this research indicates that the hot pepper producers (84%) were better in position than non-hot pepper producers (37.3%) which indicates that the income obtained from hot pepper contribute for improving food security of the household in terms of enabling more in purchasing food crops at crop failures (shortage of food) with other variables constant and from model output hot pepper income has significant role in household food security. That is, among twelve variables these hypothesized as determine food security status of household five variables (level of education at p<5%, household size at p<5%, land size at p<1%, and nonfarm participation at p<1%), income from hot pepper at p<1% variables have statistically significant relationship with food security status of the households. Hot contribute to household food security shares 29.3% to other source of income.

5.2.2. Recommendation

Based on the research findings the following recommendations derived:

The government, Non-government organizations and other stakeholders should give focus for education in capacity building of farmers, non-farm facility expansion, intensifying production by technology options using on the farmers' land, and hot pepper price increasing through creating strong market linkages

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