

# The role of productive safety nets in improving household food dietary diversity in the Amhara Region of Ethiopia: A case study on Lay Gayint District

<sup>1</sup>Arega Bazezew Berlie

## Abstract

**Background:** A range of factors from physical environmental circumstances to policy and institutions related issues affect household food dietary diversity. The primary objective of the study was to assess household dietary diversity and the role of productive safety nets (PSNP) in improving it, taking the case of Lay Giant District.

**Methodology:** Quantitative research method was employed and structured interview was the major data collection instrument for the study. A total of 210 households were sampled for the structured interview. The survey began in mid-March 2011 and continued up to the end of April 2011. Descriptive and inferential statistics were used to analyze the collected data. Dietary diversity score (DDS) was calculated using a 24-hour recall period. Using a modified version of a regional food balance model, household kilocalorie (kcal) intake was calculated to analyze the food security situations of the households.

**Results:** The study revealed that the average dietary diversity score (DDS) was 3.1. The dominant food items consumed within a 24-hour recall period were cereals and legumes. Taking 2100 kcal as a benchmark, 75% of the households suffered from food insecurity. The situation was worse in female-headed households in which 86% of them were food insecure.

**Conclusion:** Even though the effect was barely statistically significant in multi-variate analysis, households which were beneficiaries of the safety net program seemed to suffer from lack of food dietary diversity. In addition, the study revealed that food DDS showed variations between agro-ecologies in that 52% households from *Woina Dega*, 35% of households from *Dega*, and 82% households from *Kolla* agro-ecological zones were safety net beneficiaries; with DDS values of 2.1, 4.3, and 2.3 respectively. [*Ethiop. J. Health Dev.* 2014;28(3):191-201]

## Introduction

Chronic food insecurity has affected millions of Ethiopians for many decades. The vast majority of poor households live in rural areas that are heavily dependent on rain-fed agriculture and thus, in years of poor rainfall, the risk of widespread starvation is high (1). This is due to the fact that enough food in terms of quantity and quality is an important factor for a nation to feed its people. The World Bank (2) stated that with 80% of population dependent on rain-fed agriculture, Ethiopia is particularly vulnerable to weather-related shocks. Its Global Hunger Index is alarming (30.8) and this made Ethiopia to be 174<sup>th</sup> out of the total 184<sup>th</sup> countries on the Global Hunger Index list (3).

With the objectives to minimize such predicaments, the government of Ethiopia in collaboration with donor organizations, took social protection measures in chronically food insecure areas of the country. IFPRI (4) and Van Uffelen (3) noted that in situations of chronic food insecurity and poverty, social protection is becoming more central to secure food at household level. However, Taffesse (5) stated that transfer of food aid that had been implemented for many decades, had not lifted households from chronic food insecurity and that it was time to develop new policies and strategies to avert the situations. These situations forced the country to develop an integrated food security program, of which PSNP is one and core element that had been launched in 2005.

Particularly in the aftermath of major regional food security crises in the Greater Horn of Africa and the Sahel in 2011 and 2012, safety net programs had become an important strategy in improving household food availability(3). According to Degye et al. (6), humanitarian assistance such as PSNP helped to prevent mortality and reduce malnutrition at times of food crises in many drought prone areas of Ethiopia. However, some scholars such as Van Uffelen (3) indicated that PSNP was not able to improve household dietary diversity or food availability; rather it develops dependency syndrome on the side of the beneficiaries. Degye et al. (6) added that rural transfer programs in Ethiopia serve as temporary safety nets for food availability and are limited in boosting the dietary diversity of households and their coping strategies. That is, households which participated in the programs increased their supply of food as a temporary buffer to seasonal asset depletion. Likewise, Brown et al. (7) revealed that the Ethiopian PSNP delivers cereals (wheat) and oils to the beneficiary households and these situations relatively improved the food availability but were not able to improve the dietary diversity. In relation to this, Taruvinga et al. (8) noted that lack of dietary diversity is a challenge for rural communities to improve nutritional problems of their children.

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<sup>1</sup>Department of Geography and Environmental Studies, Bahir Dar University, Email: [bazezewarega@yahoo.com](mailto:bazezewarega@yahoo.com).

In the Amhara region, the focus of the present study, about 3 million PSNP beneficiaries were registered in 64 chronically food insecure districts including Lay Gayint (5). In Lay Gayint District, about 80,000 people are documented as PSNP beneficiaries making the largest beneficiaries in South Gondar administrative zone. Though PSNP had been implemented in the study area since 2005, the program was not able to lift the beneficiary households out of chronic food insecurity (9). Thus, it is time to evaluate the PSNP and try to understand the extent to which beneficiary households improved their food security by measuring household dietary diversity and food energy supply.

Many scholars such as Brown and Gilligan et al. (1), Amedisa (7), Shumete (10) and Taffesse (5) have made an evaluative type of study on PSNP in relation to graduating and targeting of beneficiary households. However, none of them raised the relationship between safety nets and household DDS. This made the current study peculiar in approach and methodology, which could help policymakers to reconsider the implementation of the transfer in the study area in particular and the country in general. Since this kind of study is original, there is a serious limitation in accessing related scientific works and literature. Therefore, this study intended to fill these gaps. The general objective of the study was to assess the contributions of PSNP to household food security measured by kilocalorie intake and dietary diversity score. The specific objectives include: (i) investigate food groups consumed by rural households in the study area (ii) examine the situations of DDS and kilocalorie supply between agro-ecologies and safety net beneficiary and non-beneficiary households (iii) identify determinant variables to households DDS.

## Methods

### Research Design:

The study employed cross-sectional survey research design. This is due to the fact that survey research design could help to collect and analyze quantitative data such as dietary diversity score and kilocalorie availability of households.

### Description of the Study Area:

The study was carried out in Lay Gayint District in the Amhara Region of Ethiopia (Figure 1). Lay Gayint covers a total area of 1320.3 km<sup>2</sup> and has a population density of 185 persons per km<sup>2</sup>, thus one of the very densely populated districts in the region. The topography is rugged with elevations varying between 1200 m to above 4000 masl. The area receives annual rainfall of 898.3 mm. The mean annual temperature ranges from 4°C (on top of Guna Mountains) to 28°C (at the bottom of the Tekeze river valley). Based on the traditional agro-ecological classification, three agro-ecological zones are found in the area: *Dega* (cool), *Woina Dega* (temperate) and *Kolla* (hot tropical). Small scale mixed agriculture is the dominant source of livelihood to the local people.

### Study Period:

The fieldwork for the study was started in December 2011. From December to January 2011, some preliminary survey was made to have general information about the situations of food security and PSNP in the district. The actual survey began in mid-March 2011 and continued up to the end of April 2011.

### Sample size Determination:

Using Kothari (11) sample size determination formula, the total sample size for the study was determined as shown below:

$$n = \frac{z^2 \cdot p \cdot q \cdot N}{e^2 \cdot N - 1 + z^2 \cdot p \cdot q}$$

Z= 2.005 (at 95.5% confidence level); n = total sample size; N= total population of the study, P = 0.02 (the result of past data); q=1-p; e = the estimate made was within 2% true value using the formula; a total of 197 sample households were selected for the survey questionnaire. However, for fear of missing data, 210 sample size was used for this study. In relation to this, Naing et al. (12) contends that it is wise to oversample 10% - 20% in case there happen to be missing data. Finally, 210 households were sampled for the structured interview from the three RKAs based on the sampling frames obtained from the RKA offices. Nonetheless, nine questionnaires were not correctly filled for analysis in *Kolla* agro-ecological zones; this made the total sample size to be 201 in the three selected RKAs. Finally, a total of 110 safety net beneficiaries and 91 non-safety net beneficiaries were selected using proportional stratified systematic sampling techniques.

**Sampling procedures:** The study district was selected purposively based on the researcher's familiarity with the area and severity of the problem. In the district, there were 19 RKAs. The specific rural *kebele* administrations (RKAs) were selected in a cluster sampling approach where the 19 RKAs in the district were first clustered into three agro-ecological zones (*Dega*, *Woina Dega* and *Kolla*) and three RKAs were selected one each from the three agro-ecological zones in a random sampling procedure.

### Data Collection Techniques:

The primary data from household survey were collected using questionnaires. The questionnaires were composed of both closed and open-ended types of questions and covered various issues: demographic and socio-economic characteristic of respondents, livelihood assets, and food security related issues, household income, and the role of PSNP in improving household food security. The researcher, six enumerators all speak the local language of the area where the survey was conducted. The enumerators were first trained by the researcher about how to present and explain each question to the respondents and advised to inform each respondent the purpose of the survey before starting the actual interview.

**Measurement of Food Dietary Diversity:**

It is usually measured by summing the number of food groups consumed over a reference period (13). The higher the sums of the dietary diversity score (DDS), the more food groups are consumed, and are food secure (14). The reference period for this study was the type of food groups households consumed for the last 24-hour recall period. Thus (15) a 24-hour recall is usually adequate to measure DDS. The twelve food groups according to (14, 15) include: (a) cereals (b) roots and tubers (b) vitamin A rich plant foods (green vegetables) (c) other fruits (d) other vegetables (e) meat/poultry/fish (f) eggs (g) legumes/pulses (h) dairy products (i) cooked oil (j) sugar/honey (k) miscellaneous. FAO (16) asserts that households which consume three or fewer food groups fall into nutritional inadequacy; four food groups into medium whereas five or more are under nutritionally food secure.

**Measurement of Food Energy Supply:**

Food energy supply measured in kilocalorie (kcal) was used to determine the food security status of a household (17, 18). In the calculation of kcal intake, amounts of calorie available in a household were determined using a modified version of a regional food balance model, which was also used by (19). The model is given as:

$$HHFA = Y + FP + FA + R/G - S - SR - PHL$$

Where HHFA = household food availability; Y = own production; FP = food purchased; FA = food aid; R/G = remittance/gift; S = amount of grain sold; SR = seed reserves (5%); PHL = postharvest loss (10%). The results were then converted into kilograms and then by using the food conversion table, it was changed into kilocalories (20). These results were then divided by the number of household members as adult equivalent and the number of days in the recall period. In this study, a minimum of 2100 kilocalorie per capita per day was used to identify food secure and food insecure households. This is because the government of Ethiopia has set the minimum acceptable weighted average food requirement per adult equivalent per day at 2100 kcal (19).

**Data Analysis:**

Upon completion of the quantitative data collection, the data were coded, edited and entered into SPSS and presented using descriptive statistics such as frequencies, percentages and tables. Inferential statistics such as independent t-test was used to test the relationship between beneficiary and non-beneficiary households and kilocalorie intake of the households.

Multiple linear regression model was employed to identify determinants of rural household food dietary diversity score. Food dietary diversity score is a continuous variable and was taken as dependent variable for the regression modeling. The independent variables for the model include demographic (sex, age, family size) and socioeconomic variables (income, safety nets, livestock owned, crop production, credit availability).

Whether the model was fit and good enough was checked by using coefficient of determination (adjusted  $R^2$ ) and ANOVA. Once the model fitness was checked, some of the statistical techniques such as Multi-collinearity, Tolerance and Variance Inflation rate (VIF) were calculated using collinearity diagnostics. Multi-collinearity occurs when two or more independent variables are approximately determined by a linear combination of the independent variable in the model (13). When the collinearity is perfect linear, it is impossible to obtain a unique estimate of the regression coefficient with all the independent variables. Accordingly (13), a bivariate correlation coefficient greater than 0.8 (in absolute terms) between two independent variables indicates the presence of significant multi-collinearity effect. Hence, the interactions between independent variables were checked.

**Ethical Considerations:**

Before starting the actual data collection techniques, there were in-depth discussions about the issues of confidentiality between respondents. Formal letters of support were written to the office of district health and agricultural offices. Ethical conditions were cleared by ethical committee of the Faculty of Social Sciences, Bahir Dar University.

**Results****Demographic Characteristics of Households:**

The total family members of the sampled households were 1052, of which 572 were males and 480 females. The age of respondents ranges from 20 to 85 years, with a mean of 50.5 and standard deviation of 13.5. While considering the two sexes separately, 11% of the males and 9% of females belong to the age group less or equal to nine years. About 3% of the males and 0.9% of the females were above the ages 64 years. The average family size for the surveyed households was 5.2 with a standard deviation of 2.0. About 65% of the respondents in all agro-ecologies had a family size between four and seven, while 24.4% had one up to three family members. The largest family size was 10 and was reported in *Dega* agro-ecological zone of the study area.

The survey results showed that unmarried, divorced and widowed household heads were very few (15%) in number. The majority of surveyed households (85%) were married and live together. As far as education of the households is concerned, about 61% in both agro-ecological zones could not read and write, while 6.5% of the respondents have some form of formal education. More importantly, about 93% of the female-headed households could not read and write during the field survey.

**Dietary Diversity Score as a Measure of Household Food Security:**

As shown in Table 1, the major food items consumed by the sampled households during the survey were cereals

(94%), legumes/pulses (68.7%), sugar/honey (52.2%), tubers and roots (43.8 %). In both agro-ecological zones, the use of vegetables, fruits and eggs were low, though these types of food groups are available in their surroundings.

Table 1: Sampled households' response to the types of food consumed within 24 hours in Lay Gayint District (2011)

Food items consumed within 24 hours	Dega N= 70	Percent	Woinadega N= 70	Percent	Kolla N= 61	percent	Total percent
Cereals	70	100	61	87.1	58	95.1	94.0
Tubers and roots	40	57.0	25	35.7	23	37.7	43.8
Legumes/pulses	57	81.4	37	52.9	44	62.9	68.7
Cooked oils, fat	29	41.4	13	18.6	6	9.8	23.9
Fruits	5	7.1	1	1.4	4	5.7	5.0
Vegetables	7	10.0	1	1.4	0	0.0	4.0
eggs	18	25.7	5	7.1	3	4.9	12.9
Dairy products	32	45.7	2	2.9	2	3.3	17.9
Meat	32	45.7	14	20.0	13	21.3	29.4
Vitamin A rich plants	0	0.0	0	0.0	1	1.6	0.5
Sugar/honey	35	50.0	32	45.7	38	62.3	52.2
Miscellaneous	15	21.4	23	32.8	19	31.1	28.4

As it can be seen in Figure 1, non-safety net beneficiary food secure households consume on the average five food items against three of the beneficiary food secure households.

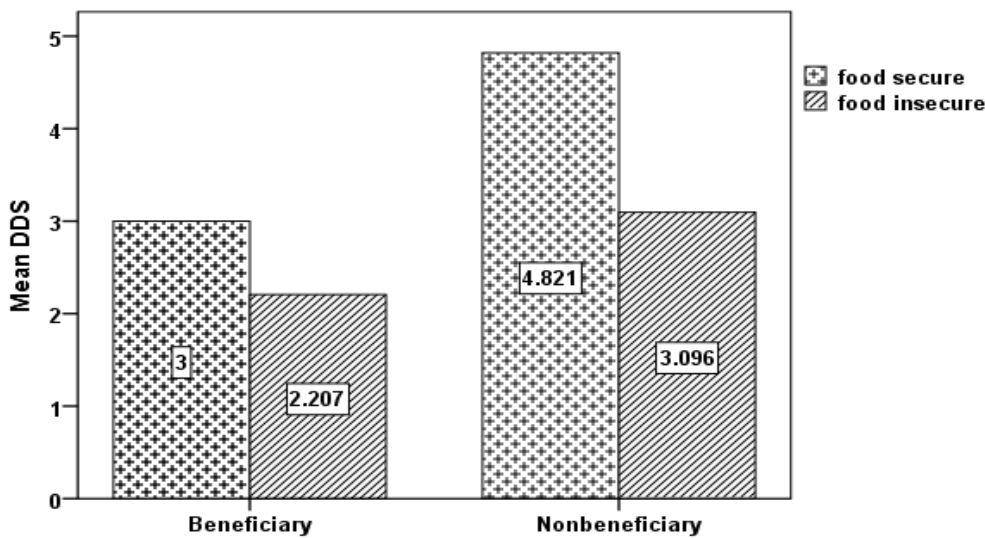


Figure 1: The relationship between mean DDS, safety net beneficiary status and household food security in Lay Gayint District (2011)

To see the relationship between DDS and safety nets beneficiaries, bivariate linear regression model was employed. The result showed that as safety net beneficiaries increase by one unit, DDS decreases by a factor of 0.427 at  $p < 0.001$ . The implication is that being a safety net beneficiary does not mean securing food at

household level. In all agro-ecologies, the mean DDS was about 3.0 with a standard deviation of 1.751. Agro-ecologically, *Dega* was better and *Woina Dega* scored the minimum in dietary diversity score (Figure 2).

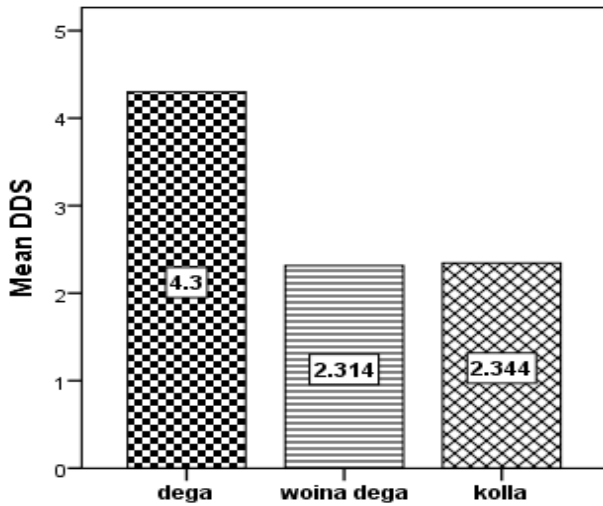


Figure 2: The relationship between mean DDS and agro-ecologies in Lay Gayint district (2011)

As shown in Table 2, ownership of livestock has played a significant role in improving household DDS. To understand the relationship between DDS and total number of livestock owned, bivariate linear regression

was employed. The result showed that as the number of livestock increased by one unit, DDS increased by a factor of 0.654 at  $p < 0.001$ .

Table 2: The relationship between DDS and livestock ownership (2011)

DDS	Number of livestock					Total
	0-10	11-20	21-30	31-40	41-50	
0-2	95	5	0	0	0	100
3-4	39	13	2	2	1	57
5-6	12	14	5	3	0	34
7-8	1	2	4	1	1	9
> 8	0	0	0	0	1	1
Total	147	34	11	6	3	201

As shown in Figure3, Dega agro-ecology was better in DDS as compared to other zones. This showed that Kolla and Woina Dega zones were suffered from

deficiency of DDS. The same Figure also revealed that relatively better of households practiced DDS better than the other wealth categories.

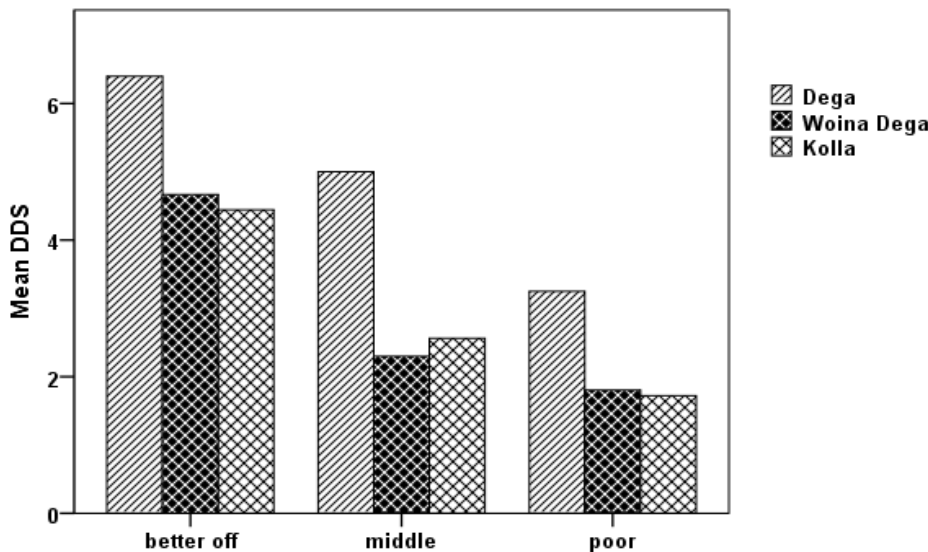


Figure 3: The relationship between wealth categories, DDS and agro-ecology (2011)

Table 3 shows that total income of households has direct relations to DDS. This means that as the household income increased, DDS also increased significantly. To see the relationship between DDS and total income of the sample households, bivariate linear regression was employed. The result showed that as the total income of the households increased by one unit, DDS increased by a factor of 0.464 at  $p < 0.001$ .

Figure 4 demonstrates that there was a difference between beneficiary and non-beneficiary households in the use of DDS. Likewise, female-headed households were disadvantageous in the use of DDS in the study area. The same figure also indicates that non-beneficiary households were much better than beneficiary households in DDS.

Table 3: The relationship between total income and DDS (2011)

Total income	DDS					Total
	0-2	3-4	5-6	7-8	> 8	
0-1500	95	46	23	1	0	165
1501-1800	4	9	7	4	0	24
1801-2100	0	1	1	1	1	4
2101-8500	1	1	4	2	0	8
Total	100	57	35	8	1	201

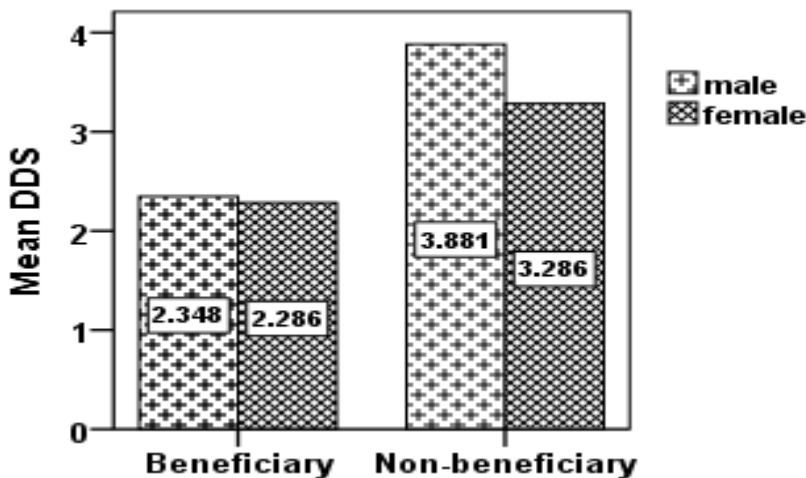


Figure 4: The Association between DDS, safety net beneficiary status and sex of households (2011)

As shown in Figure 5, *Dega* was better in DDS both irrespective safety net beneficiary and non-beneficiary status. In all agro-ecologies, *Woina Dega* zone was the least in DDS in both safety net beneficiary and non-beneficiary households. In relation to this, a two-way ANOVA was conducted to explore the influence of safety net beneficiary status and agro-ecological zones on levels of dietary diversity score, as measured by the Life Orientation test (LOT). Agro-ecologies were divided into three groups (*Dega*, *Woina Dega* and *Kolla*). The result showed there was a statistically significant main effect for agro-ecology ( $F(2, 195) = 29.833, p = 0.000$ ). Likewise, there was a statistically significant main effect for beneficiary and non-beneficiary households ( $F(1,$

$195) = 31.030, p = 0.000$ ). The effect was large (partial eta squared = 0.237 and 0.137 for beneficiary and non-beneficiary households, respectively). Post-hoc comparisons using the Tukey HSD test indicated that the mean dietary diversity score for *Dega* (mean = 4.3,  $SD = 1.844$ ) was statistically significantly different from the *Woina Dega* zone (mean = 2.31,  $SD = 1.22$ ) and *Kolla* zone (mean = 2.34,  $SD = 1.23$ ) at  $p < 0.001$ . However, the value for *Woina Dega* and *Kolla* zone was not significant ( $p > 0.05$ ). The effect for beneficiary households ( $F(1, 195) = 31.030, p = 0.000$ ) was significant while, the interaction effect of agro-ecology \* safety net beneficiaries ( $F(2, 195) = 1.299, p = 0.275$ ) did not reach statistical significance.

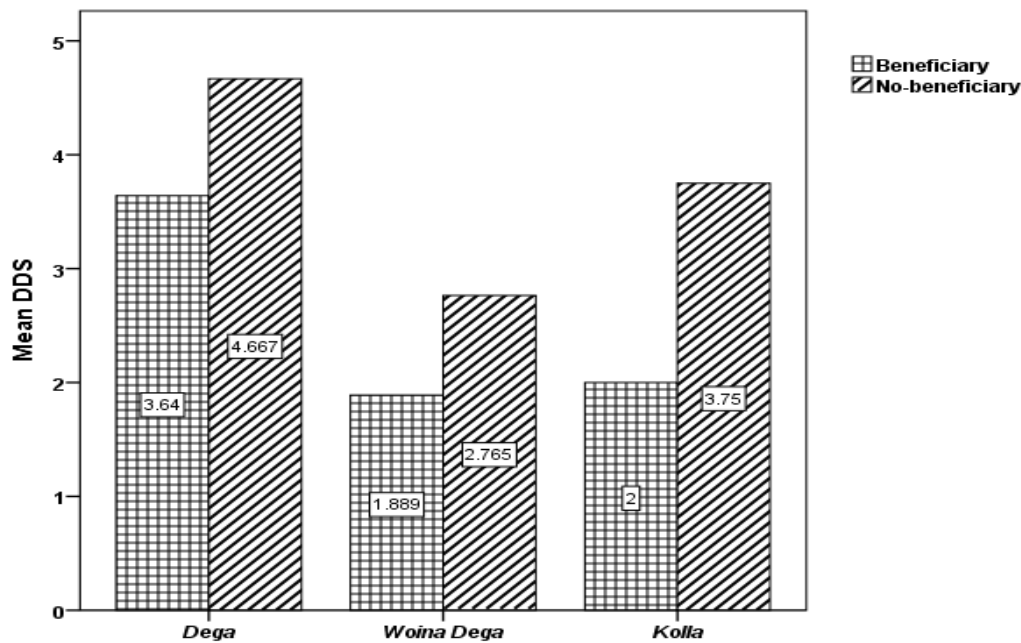


Figure 5: The relationship between DDS, beneficiary households and agro-ecology (2011)

**Food Dietary Energy Supply of Households:**

As shown in Table 4, about 18% of the non-beneficiary households consumed greater than 2100 kcal against 7% of the beneficiary households.

About 75% of the respondents consumed less than 2100 kcal, indicating that they were food insecure.

Table 4: Kcal intake and household safety net beneficiaries (2011)

Kcal intake of households	beneficiary	non-beneficiary	Total
0-499	18.9	3.5	22.4
500-899	12.4	9.5	21.9
900-1299	9.5	8.0	17.5
1300-1699	5.5	7.0	12.5
1700-2099	3.5	4.2	7.7
2100-2499	4.2	3.5	7.7
2500-2899	1.5	1.0	2.5
2900-3299	1.0	4.0	5.0
>3300	0.5	7.0	7.5
<b>Total</b>	<b>57.0</b>	<b>43.0</b>	<b>100</b>

As shown in Figure 6, Dega was better in kilocalorie intake both in safety net beneficiary and non-beneficiary households. Among all agro-ecologies, Woina Dega zone was the least in terms of kilocalorie intake both in safety net beneficiary and non-beneficiary households. In relation to this, a two-way ANOVA was conducted to explore the main effect of safety net beneficiary status and agro-ecological zones on household kilocalorie intake as measured by the Life Orientation test (LOT). The result revealed that there was a statistically significant main effect for agro-ecology ( $F(2, 195) = 16.01, p = 0.000$ ). Likewise, there was a statistically significant effect for beneficiary and non-beneficiary households ( $F(1, 195) = 33.181, p = 0.000$ ). The effect

was large (partial eta squared= 0.141 and 0.145 for agro-ecology and safety net beneficiary and non-beneficiary households respectively). Post-hoc comparisons using the Tukey HSD test indicated that the mean kilocalorie intake for Dega (mean= 2206.184, SD=1573.778) was statistically significant different from the one for the Woina Dega zone (mean =1026.22, SD=986.00) and Kolla zone (mean = 1653.082, SD=1181.231) at  $p < 0.001$ . The main effect for beneficiary and non-beneficiary households ( $F(1, 195) = 33.810, p= 0.000$ ) was statistically significant while, the interaction effect among agro-ecology and safety net beneficiaries ( $F(2, 195) = 1.152, p=.218$ ) to household kilocalorie intake did not reach statistical significance.

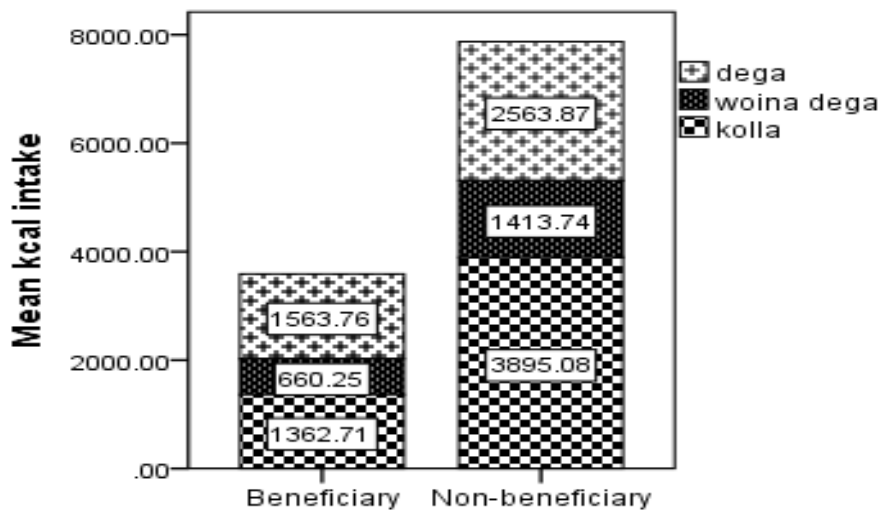


Figure 6: The relationship between kcal intake, beneficiary households and agro-ecology (2011)

The result of Figure 7 illustrates that kilocalorie intake of households was better in *Dega* agro-ecology than in other two zones. The study also found out that the two zones were the major receptors of safety transfer for more than

a decade. In all agro-ecology zones, which is similar to DDS, better-off households were greater in kilocalorie intake than in other wealth categories.

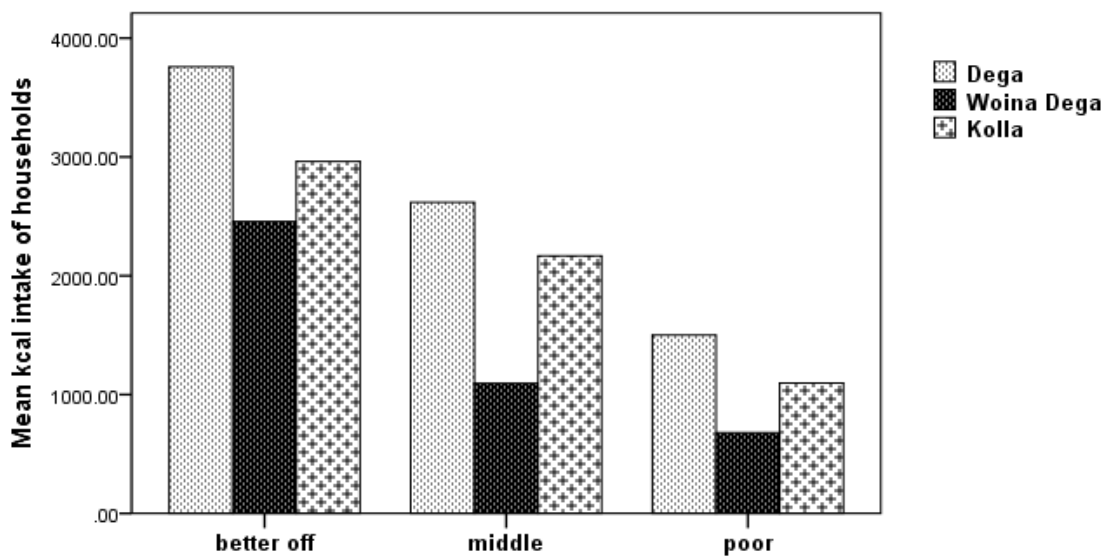


Figure 7: The relationship between kcal intake, wealth categories and agro-ecology (2011)

**Determinants of Rural Household Dietary Diversity Score (DDS):**

Given the importance of dietary diversity and its possible link to household food security, this section identifies the major determinants of rural household dietary diversity score. A range of demographic and socio-economic factors generally influence household DDS. In this study, DDS was taken as a proxy to their food security outcomes and hence the dependent variable for the regression modeling. A total of 10 variables were selected for the model (Table 5). Six variables were significant at 1%, 5% and 10% probability levels (Table 5). The maximum likelihood estimates of the multiple regression model showed that agro-ecology, total

income, total crop production, total livestock production, safety net and kilocalorie intake were the determinant variables influencing household dietary diversity score and hence their food security outcomes. The adjusted  $R^2$  was 0.761, indicating that about 76.1% of the variations in DDS of the sample households was captured by the model.

Agro-ecology as a variable captures the influence of locational factors on household DDS. It was found out that households in the *Kolla* and *Woina-Dega* zones earned less DDS compared to those living in the *Dega* agro-ecological zone. Being located in *Kolla* and *Woina Dega* zones decreased the DDS by a factor of 0.33 at  $p <$



0.01. The regression result showed that possessing one tropical livestock unit (TLU) of cattle has the likelihood of increasing HDDS in the study area. That is, a unit increase in livestock ownership (in TLU) increases household DDS by a factor of 0.346 at  $p < 0.01$  (Table 5). Total income of the households positively and significantly correlated to household DDS. This means that other variables remaining constant, earning income from different sources has the probability of increasing HDDS in the study area. That is, a unit of increase in

total income increased household DDS by a factor of 0.211 at  $p < 0.01$ . As it shown in Table 5, education of the household has positive and significant relation to DDS. Other variables remaining contestant, a unit of increase in household education increases household DDS by a factor of 0.209 at  $p < 0.001$ . The regression results showed that kilocalorie availability at the household level increases dietary diversity score by a factor of 0.133 at  $p < 0.05$ .

Table 5. Multiple linear regression results

Explanatory variables	Unit of measurement	Standardized Coefficients Beta	t	P Value
(Constant)			4.650	0.000
Agro-ecological zone	Categorical (1= Dega, 2= Woina-Dega, 3 =Kolla) and Degaas a refeence	-0.323	-6.016	0.000**
Household size	Continuous variable	0.076	1.328	0.186
Education	Categorical	0.209	-3.014	0.003**
Sex of HHHs	Dummy (0= F, 1=M)	0.007	0.131	0.896
Age of HHHs	Continuous variable	0.012	0.242	0.809
Total income	Continuous variable	0.211	3.459	0.001**
Crop production	Continuous variable	-0.178	-2.900	0.004**
Total livestock	Continuous variable (measured in TLU)	0.346	4.872	.000**
Access to credit	Dummy (0 = yes, 1= no)	-0.008	-0.163	0.871
Safety nets beneficiary	Dummy (0= beneficiary, 1= non beneficiary)	0.102	1.786	0.076
Kilocalorie	Continuous variable	0.133	2.090	0.038*
F(7, 193)= 22.5, $p < 0.001$				
Adjusted R <sup>2</sup> = 0.761				

\*Significant at 0.05, \*\*Significant at 0.01, HHHs = household heads

## Discussion

This study was conducted on 201 households in Lay Gayint district as a case study site. A range of factors from demographic to socio-economic governs household dietary diversity. The descriptive statistics results revealed that farmland, number of livestock owned and total income of households had explained DDS and food energy supply in the study area. In relation to this, Tafesse (5) indicated that shortage of land and livestock are the main causes for household food dietary diversity insecurity. The same author noted that safety net beneficiary households were chronically food insecure, while non-beneficiary households were better in food security. The per capita kilocalorie result confirmed that about 75% of the sampled households were food insecure. Considering 2100 kcal as a benchmark (16), Kolla (87%) and Woina Dega (93%) of the sample households were food insecure. In relation to this, Girma et al. (20) in a study conducted in Ethiopia indicated that about 98% of the respondents were subjected to nutritionally inadequate diet and nearly 75% of household were food insecure. However, Degye et al. (21) noted that, using the major indicators, food security situation of rural households was very low, 57.3% of them suffered from lack of food dietary diversity, primarily dependent on staples for their food energy source, and consuming a

few number of food groups. Kilocalorie intakes of households were compared between beneficiary and non-beneficiary households. The result showed that beneficiary households] suffered from kilocalorie deficiency. However, a study made by (1) noted that there was no difference in the growth rates of kilocalorie acquisition between beneficiary and non-beneficiary households.

Household income has improved in dietary diversity and food energy availability in the study area. This result was in agreement with the works of (22): . . . "Household income makes a difference between food secure and insecure households in Dire Dawa Town." Doan, (23) differently stated that no matter which model specifications and estimation methods are adopted, the estimation results show that higher income improves diet variety. Bamlaku and Solomon (24) also indicated that there was significant relationship between household income and calorie intake of the households. Swindale and Paula (25) added that a more diversified diet is highly correlated with such factors as kilocalorie adequacy and household income. The same author further indicated that even in very poor households, increased food expenditure resulting from additional

income is associated with increased quantity and quality of the diet.

The study revealed that the average DDS of households was 3.1. Smith et al. (26) had calculated the DDS of Ethiopia and found out that the mean DDS was 4.7 and the percentage of households with low dietary diversity was 40%, which was much better than the present study. Similar study by (27) in South Africa indicated that the mean DDS of households was 3.6 with a standard deviation of 1.4. However, a study made in Malaysia (28) calculated the average of DDS as 6.0, which was much greater than the present study. Dietary diversity score was also 6.5 in India (29). The study revealed that DDS is dominated by cereals and legumes, which accounted for 94% and 68.7% respectively. The result was consistent with the results of other studies (18) which says the items with the highest frequency of consumption were from the cereals (99.6%), legumes and nuts by 19.7% but eggs were low (13.3%). The food intake pattern of Malaysian households showed that their typical diets have high protein and energy-based foods. Degye et al. (21), on their part, pointed out that there was much variation in household consumption patterns in Ethiopia, depending on specific geographical and socio-cultural characteristics where kilocalorie consumption is low, a high percentage of their consumption comes from cereals, and per capita intake of calories was relatively higher in rural than urban areas.

The multiple linear regression results showed that agro-ecology, total income, total crop production, total livestock production, safety nets and kilocalorie intake were the determinant variables influencing rural household dietary diversity score and hence their food security outcomes. In relation to this, Taruvinga et al. (8) noted that household size, age, sex composition, employment status, household income and level of education were the major determinants of household food dietary diversity.

### **Conclusion:**

The comparison between beneficiary and non-beneficiary households in relation to DDS and kcal availability shows low dietary diversity and deficiency in food availability among beneficiary households, even though the difference is not statically significant in the multivariate regression. The implication may be that safety net transfer alone was not able to improve food security components (food energy availability and nutritional status). Unless it is backed by household asset building programs, income transfer projects alone did not account for changes in household food dietary diversity in the study area.

Though food consumption of the study area is based on familiar foods that are inexpensive and easily obtained, the dietary diversity scores and kilocalorie intake showed that food security is critical and considerable numbers of households (75%) were exposed to food insecurity.

The study also revealed that sources of income and asset creation were imperative for improving household DDS and kcal intake. Hence, households have to be empowered in asset building and livelihood diversifications to improve the availability of food and dietary diversity. Besides, development agents and health experts have to play roles in creating awareness to consume food types available in their surroundings. The study also revealed that household dietary diversity is associated with limited food items such as cereals and legumes. In this regard, the local government in the study area has to take rapid food security assessment in order to formulate and implement relevant policies, strategies, and programs. It was also indicated that income growth remains important in improving dietary diversity of the households in the study area. Hence, income enhancement policies and strategies should target the poor, who are the most vulnerable, yet received marginal benefit from economic growth.

The results of the study would alert policymakers to reconsider the implementation of the transfer program in improving household food security. However, the paper was not free from limitation for the reason that it was confined only to one district located in drought-prone areas of the Amhara region. Thus, further studies with increased area coverage and sample size to make generalization to similar environments in the country are recommended. Put differently, appropriate evaluation methods should be made to unravel the complex relationships between household dietary diversity score and safety net beneficiaries in drought-prone areas of the country.

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