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Comparative Analysis of Indigenous and Non-indigenous Household Dietary Diversity Status: The Case of Bambasi, Benishangul Gumuz Regional State, Western Ethiopia

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ABSTRACT

Malnutrition remains one of the development challenges in Ethiopia in general and in Bambasi district in particular. The aim of this study is to assess dietary diversity level and its associated factors among indigenous and non-indigenous households in Bambasi district, Western Ethiopia. A cross sectional survey covered a sample of 260 households. A multi stage sampling procedure was used. A descriptive statistics analysis was applied. An order logistic regression model was used to determine the factors that influence both indigenous and nonindigenous household dietary diversity. The result of the study revealed that an indigenous household had better dietary diversity status than nonindigenous household heads. Age of the household heads, access to extension and access to nearest markets are the major determinants of rural households in the area. Despite this, access to credit, farm income, farm size and dependency ratio are the major determinants for nonindigenous household heads whereas participation in small scale irrigation and education are major factors of dietary diversity of the indigenous household heads. Therefore, we recommended that food and nutrition interventions focusing on improving dietary diversity and quality should pay due attention to develop community specific interventions instead of generalized interventions. However, further investigation focused on seasonal dietary diversity and individual level dietary diversity of the study area.

Key words: Dietary diversity, Indigenous and Non-indigenous Household, Ordered logit model

Introduction

Globally, more than 800 million people were suffering from food insecurity and malnutrition due to consumption of monotonous food groups. The monotonous consumption habits of the population of the world is related with low level of income, climate change, conflict and war, population growth and others [1]. This indicates the food insecurity directly or indirectly contributes for under-nutrition and over-nutrition, and high rate of multiple forms of malnutrition coexist in many countries especially low and middle-income counties and is concentrated among the poor.

In developing countries, the majority of households resides in rural areas and their livelihoods are obtained from agriculture and other agriculture related activities; increasing agricultural productivity is seen as the critical step for ensuring sustainable food security [2]. The growing substantial evidence on dietary diversity indicates that the success of agricultural productivity depends on the expansion of market opportunity [3, 4, 5], utilization of improved agricultural technologies, and improvement of access to different services like extension (health and agriculture), credit services, information access and expansion of formal and informal education in Ethiopia.

The prevalence and coexistence of different forms of malnutrition could exist not only within the countries and communities but also within the households and individual persons who may be affected throughout their lifetime [1]. Malnutrition affects all segments of the world population even if there is a disparity in the distribution, prevalence and forms of malnutrition.

The food consumption trend in Ethiopia is neatly associated with settlement of the population, cultural taboos and religious practices. For instance, the Orthodox church followers are restricted to consume animal derived food sources during the fasting seasons which account for five to seven months per year for adults [6]. Therefore, in Ethiopia, the consumption habits of food largely depend on cereals and low dense food varieties and limited animal sources of food [7, 8, 9].

The traditional dietary practices show disparity among indigenous and non-indigenous households that involves the consumption of locally available and processed foods. It is the assumption of disparity that is being driven in large part by change in the agricultural production system and eventually in food production and consumption. This disparity is bold in low and middle-income countries since these countries may use food produce and commercial crops and livestock in a traditional way. This traditional production system of agriculture leads to limited consumption of diverse and nutritious food groups to enhance health and the health system of the people. According to Kuhnlein [10], indigenous households had better food consumption habits than non-indigenous households since the indigenous households consumed wild plants and animals in addition to farm products. This study aims to compare the dietary diversity status of the indigenous and non-indigenous household and to identify the major determinants of the dietary diversity status of the two communities in the study area.

Research Methodology

Research Sample:

Bambasi district was selected purposively. A cross sectional survey design was used. In this study, the total population of the district was divided into groups by using ethnics (indigenous and non-indigenous households). The participants were selected from a list of communities from the selected kebeles. For this study, a total of 260 households was randomly selected from five kebeles of the district. Among the total sampled households there were about 111 indigenous households and 149 non-indigenous households which were selected and interviewed to obtain information on the dietary diversity differences between these ethnic groups. A survey was conducted by using a semi structured interview schedule. All respondents of indigenous households were local language speakers (*Bertigna*) in addition to the Amharic language whereas the non-indigenous households were spoken *Amharic* and *Affan Oromo*. Therefore, the interview schedules were initially prepared in English and translated in Amharic. This interview schedule consists of socio-demographic characteristics, economic activities, farming systems, food consumption habit, and other cross cutting issues which related to dietary diversity. This interview schedule was adopted from FAO [11] guidelines and followed the standard procedures and technical issues of the survey instrument. The survey instrument was pre-tested and made comprehensive modifications based on feedbacks. Seven days recall of the Household Dietary Diversity Score (HDDS) questionnaire with 12 food groups was used to determine dietary habits and quality of food consumption of these households [11].

A written permission for the collection of data was obtained from the Haramaya University department of Rural Development and Agricultural Extension, Ethiopian agricultural research institute and Bambasi district agriculture office. Both Microsoft excel (Ms Excel 2010) and Statistical Package for Social Science software version 22 (SPSS Version 22) was used to analyses the data. Descriptive and econometric model analysis were used to assess the consumption and dietary diversity difference of rural indigenous and non-indigenous households. The model fitness and the presence of multicollinearity were assessed. The data were presented as average, percentage and standard deviation.

Empirical Model Specification:

The general objective of this study was to examine the major determinant of rural indigenous and non-indigenous household dietary diversity of the study area. Determinants of dietary diversity is composed of many factors including socio-economic factors, biophysical, demographic factors, and other issues. Therefore, to examine the dietary diversity of the rural households needs an appropriate model to accommodate all these aspects of data and to reach feasible and pertinent outcomes. Research studies on the household dietary diversity were analyzed by using different econometric models [12, 13, 14, 15, 16]. However, this study was categorical and ordinal in nature. The outcome of this study represents an underlying continuous scale subdivided into three categories; the best modeling framework is an ordered logistic model [17, 18, 19, 20]. The ordered logistic model is widely used for analyzing such categorical dependent variables [17, 18, 21].

Dietary diversity is divided into three categories in ascending order of diversity and codes as: 0 = low dietary diversity (LDD), 1 = medium dietary diversity (MDD) and 2 = high dietary diversity (HDD). Let "y" denote the observed dietary diversity level in the household *i,* y* the latent dietary diversity measure. "*x*" is the matrix of independent variables. In this study, *j* = 3. The latent regression of dietary diversity of the y_i^* is expected as:

$$y_i^* = x_i\beta + \varepsilon_i$$

Where *i* is the observation, β are the regression coefficients for "*x*", which is the identically and independently distributed error term.

Let μ_κ be the dietary diversity thresholds = 1, 2… j. level κ =1 represents the minimum threshold (low dietary diversity). The values of "y" are represented as

y = 0 low dietary diversity if $y^* \leq \mu_1$

y = 1 medium dietary diversity if $\mu_1 < y^* \leq \mu_2$ …… (2)

y = 2 high dietary diversity if $y^* > \mu_3$

Where a "*j"* denotes the number of dietary diversity levels (categories). The general form of the probability that the observed y falls into category j and the "μ"s and the "β"s are to be estimated with an ordinal logit model is

$$Prob\ (y = j) = 1 - L(\mu_{j-1} - \sum_{i}^{k} B_k x_k) \ldots\ldots\ldots (3)$$

Where *L* = represents the cumulative logistic distribution. The "β" values for all *j* dietary diversity levels are the same. However, this parallel line assumption may very often not hold [22].

Results and Discussion

Socio-demographic characteristics

About 260 respondents were selected from Bambasi district using multistage sampling methods and among the 260 households 111 (42.69%) respondents were from indigenous households and the rest 149 (57.31%) were from non-indigenous households. Most of the sample (80.0%) of the head households were men. The age distribution of the respondents ranges from 23-71 years. The results in Table 1 show that 80.18% and 83.22% of indigenous and noun-indigenous household heads were married, respectively.

The mean age of indigenous household heads and non-indigenous household heads were 45±10.44 and 47.54 ± 9.52 years, respectively. The descriptive and inferential analysis result of the two ethnic groups shows a mean significance difference between age of household heads from indigenous and non-indigenous household at less than one percent. The comparison in family sizes was recorded higher from indigenous households (4.95±1.99) than non-indigenous households (4.11±1.36) in the study area. The *t*-test result revealed that there is a significant mean

difference of family size between indigenous and non-indigenous households at less than one percent (Table 1).

There is a significant mean difference between indigenous and non-indigenous households of the household head's annual farm income (9600 ± 529 and 9360 ± 854 in ETB, respectively). Similarly, the mean annual off/non-farm income of the household heads show there is a significant mean difference between two ethnic groups in the study area. About 30.63% of indigenous household heads were illiterate while 26.17% of non-indigenous were illiterate. Similarly, the non-indigenous household heads have higher attendance of formal education than indigenous household heads (Table 1).

Table 1. Socio-demographic characteristics of the study population of Bambasi district, 2018

Variable	Indigenous (N=111)		Non-indigenous (N=149)		*t*- test or x^2 test
	Mean or %	SD	Mean or %	SD	
Family size (AE)	4.95	1.994	4.11	1.364	4.041***
Dependency ratio	1.08	0.765	0.87	0.672	2.393**
Age of household head	45.00	10.435	47.54	9.521	-2.045**
Farm size (ha)	2.12	0.896	1.37	0.785	7.218***
Livestock Ownership (TLU)	5.76	3.962	4.74	3.530	2.191**
Crop diversity (CDI)	0.28	0.057	0.27	0.072	0.559
Annual farm income (ETB) (x 1000)	9.60	0.529	9.30	0.854	3.195***
Off/non-farm income (ETB) (x 1000)	1.47	3.270	2.95	4.137	3.109***
Market distance (km)	7.18	1.215	10.75	2.010	-16.594***
Sex (being male)	78.38		81.21		0.318
Marital status					
Married	80.18		83.22		
Divorced/separated	9.01		7.38		9.026*
Widowed	10.81		9.40		
Educational Status					
Illiterate	30.63		26.17		
Able read and write	27.93		28.19		0.836
Primary school	36.94		41.61		
Secondary school	4.50		4.03		
Home gardening (yes %)	94.59		87.25		3.950**
Participation in irrigation (yes %)	90.09		43.62		59.230***
Access to Extension (yes %)	90.99		79.19		6.664**
Access to credit (yes %)	84.68		62.42		15.621***

***, **, * statistically significant at 1, 5 & 10%, respectively

The comparison in the participation in an irrigation scheme revealed that the indigenous household heads were higher than their counterparts in the area. As indicated in Table 1, about 90.09 % of indigenous households and 43.62% of non-indigenous households had participated in small scale irrigation schemes to produce seasonal and perennial crops. This shows there is a statistically significant proportional difference between those societies at $p < 0.0001$ ($x^2 = 59.23$).

Food consumption of indigenous and non-indigenous households

In Ethiopia the consumption pattern of the population is diverse, and, unlike other developing countries, no single crops dominate the national food baskets [23]. This indicates that the food basket of Ethiopian households consists of a wide variety of staple and grains. In this regard, the quality, quantity and composition of food consumption vary by place of residence, agroecology, ethnic cultural trends, socioeconomic level of the people and livelihood strategy.

The regional consumption patterns generally relay on staple starch food and food grains. For instance, Benishangul Gumuz consistent with production potential of cereal crops such as maize, sorghum, finger millet, the population were the highest consumers of cereal crops as well as legume crops (ground nut, chick pea) [23]. Therefore, the consumption behaviors of the sample household relied on cereal and legume or protein rich sources of food.

Table 2. Food group consumption between indigenous and non-indigenous households

Food group	Indigenous (n=111)	Non-indigenous (n=149)	Chi-square test
	Percent	Percent	(X^2)
Cereals	100.00	100.00	-
White root & tuber	41.44	26.80	6.122**
Vegetable	62.16	75.17	5.087**
Fruits	17.12	19.46	0.233
Meat	42.34	46.31	0.405
Egg	49.55	23.49	19.087***
Fish	7.21	1.34	5.917**
Legume	37.84	44.30	1.092
Milk & dairy products	84.68	61.74	16.44***
Oil	91.89	90.60	0.131
Sweet	77.48	73.15	0.634
Spice	80.18	94.63	13.014***

***, and ** statistically significant at 1% and 5%, respectively

The observed distribution of food varieties consumption suggests that on average, both societies' diets are commonly dominated by food groups of cereals, oils, condiments and sugars (sweet). This may show for the communities of the study area the consumption of food variety tends to be more crops and crop products rather than animal derived food groups (exception of milk and dairy products). Table 2 shows the proportional consumption of various food groups by the indigenous

and non-indigenous households of the study area. There is statistically disparity between indigenous households and nonindigenous households in the consumption of some food groups: white and root and tubers, vegetables, spices, eggs, milk and dairy products and fish. Therefore, the study shows the indigenous households consumed better in terms of food variety than the nonindigenous households. Similarly, as compared within the animal derived food, based on the proportion of consumption, of all other animal derived foods, milk had the highest consumption and fish had the least food groups by both indigenous and non-indigenous households in the study area. From animal derived food groups, the indigenous households were better consumers than the non-indigenous households. Evidently, the consumption of white root and tuber, eggs, fish milk and dairy products, oils, and sugar and sweets food groups by indigenous households was much higher than for the nonindigenous households. In general, the culinary and consumption habits in each groups of the society are homogeneous in relation to the consumption of cereals, oil and spice food groups.

Dietary diversity of indigenous and nonindigenous households

The dietary diversity categories of the study population were conducted by adapting the FAO [11] version of dietary diversity guideline. According to the FAO guideline we create mutually exclusive categories of dietary diversity as derived from 12 food groups into: low, medium and high dietary diversity. Based on this category, Figure 1 shows the three categories of indigenous and non-indigenous household heads dietary diversity status. Generally, the study revealed that the indigenous household heads have the smallest number of low dietary diversity status than the nonindigenous household heads. Comparing dietary diversity status of the two ethnic groups, indigenous household heads have better than the counter part in the study area (Fig. 1). This distinct proportional difference in household dietary diversity status was statistically significant at (χ^2 = 9.514) p <0.001. The mean dietary diversity score for indigenous household heads was 2.14±0.06 and for nonindigenous household heads was 2.03±0.07). This shows that indigenous households had a relatively higher dietary diversity score than non-indigenous household heads. About 84.70 % of the indigenous households and 70.5% of non-indigenous households consumed more than four food groups within a seven-day period.

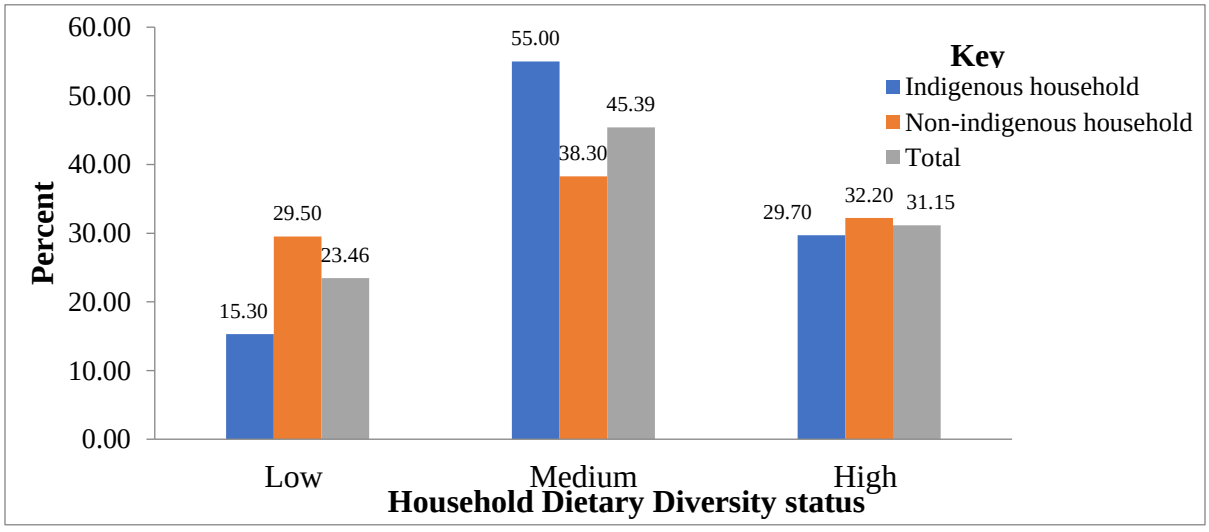

Figure 1. Comparison of dietary diversity condition of indigenous and nonindigenous households

Determinants of Household Dietary Diversity

This section presents the major determinants of household dietary diversity of indigenous and nonindigenous households. Many variables assumed to be major determinants of dietary diversity status of the study society were tested for their significance of prediction on the outcome variable. All necessary tests were made to check the multicollinearity effects of predictor variables. The ordered logistic regression analysis shows that age of the household heads was an important determinant of dietary diversity status of the study area. This was true for both study societies, but the marginal effects analysis of the household dietary diversity has different values. A one-year increase in the age of the indigenous and nonindigenous household head increases by the probability of falling into higher dietary diversity by nearly 1% reduces the likelihoods of being in a low dietary diversity by 0.32% and 0.87% of indigenous and nonindigenous households of the study population, respectively. Those who are old aged household heads may have more experiences in the social and physical environment and have accumulated knowledge of farm production as well as food nutritional values than young aged households. This study result is supported by studies undertaken in Kenya [16] and Ethiopia [24].

The other significant factor for study households was the dependency ratio. It was found that households with lowest dependent members in the households were found to be in higher household dietary diversity. This was true for nonindigenous the society but not for the indigenous society. The result shows that the dependency ratio has a strongly and negatively significant relationship with better dietary diversity ($P<0.001$). The household could diversify their job opportunities by coordinating and contributing their labor for agricultural production and income generation. It is expected that when the household members are involved in different job opportunities for diversifying their income, they can improve the purchasing power of various food items and enable the household to achieve a high dietary diversity status. This result is supported by a study done in Ethiopia [8] and in India [25].

The household educational level has a relationship with dietary diversity. In the present study, indigenous household heads were more significantly influenced by education status. This could be that education has a significant relationship with household dietary diversity. However, the magnitude and the direction of the predictor variables were not similar. As indicated in Table 3 the household which did not attend formal education (illiterate) have a negative and significant influence on high dietary diversity while the household who is able to read and write has a negative and significant relationship with household dietary diversity for indigenous households; however, this was not true for nonindigenous households. This could be that more educated households will ensure the household members to be diversified food consumers through gaining information from various sources. Education improves the knowledge health and nutrition but also lowers the cognitive cost associated with consuming a variety of food items. The educated household head assigns a significant proportion of the food budget to various food groups [26, 25] that are nutritionally dense mainly since these people have a greater awareness and understanding of the health benefits of food groups [27].

Table 3. Maximum likelihood estimates of ordered logistic regression analysis for indigenous households (N= 111)

DD1SLEVEL	Coef.	Std. Err.	Z	P>|z|	Marginal effects of HDDS level		
					LDD	MDD	HDD
					dy/dx	dy/dx	dy/dx
AGE	0.075	0.030	2.52	0.012**	-0.0032	-0.0059	0.0092
SEXHEAD (Female)	2.281	1.708	1.33	0.182	-0.0983	-0.1805	0.2789
MARTALST (Married)	1.981	1.123	1.76	0.078*	-0.0854	-0.1568	0.2422
ADULT_EQUVT	-0.175	0.178	-0.98	0.326	0.0075	0.0138	-0.0214
DEPRATIO	-0.314	0.417	-0.75	0.452	-0.0135	-0.0249	0.0384
ILLITRATE	3.873	1.503	2.58	0.010**	0.1671	0.3066	-0.4737
ABLREADWRT	3.126	1.462	2.14	0.032**	-0.1348	-0.2475	0.3822
PRIMARY	2.524	1.402	1.8	0.072*	-0.1089	-0.1998	0.3087
FARMSIZE	0.165	0.389	0.42	0.673	-0.0071	-0.0130	0.0201
CDI	-9.458	5.415	-1.75	0.081*	-0.4079	-0.7487	1.1566
TLU	-0.046	0.070	-0.66	0.509	0.0020	0.0037	-0.0056
HOMEGARD	-0.092	1.127	-0.08	0.935	0.0040	0.0073	-0.0112
FARMICOME	-0.509	0.678	-0.75	0.452	0.0220	0.0403	-0.0623
OFF-INCOME	-0.084	0.079	-1.06	0.228	0.0036	0.0067	-0.0103
ACCEXTN	4.152	1.198	3.47	0.001***	-0.1791	-0.3287	0.5077
CREDIT	-0.421	0.719	-0.59	0.558	0.0182	0.0333	-0.0515
MARKDIS	1.050	0.285	3.69	0.000***	0.0453	0.0831	-0.1284
PARTCIRR	3.722	1.057	3.52	0.000***	-0.1605	-0.2946	0.4552
/cut1	4.535	9.353					
/cut2	9.380	9.398					

***, and ** statistically significant at 1% and 5%, respectively

According to the study, farm size was another determinant of dietary diversity in the area. However, this was not true for the indigenous society. Farm size of the nonindigenous household heads influenced positively and significantly household dietary diversity at less than 1% probability level. A one-unit increase in the land holding of the household head increases by the likelihood of falling into a higher dietary diversity by nearly 21% and reduces the probability of falling into a lower dietary diversity by 19.39%. This could be explained by the probability that greater farm size increases farmers' possibilities of cultivating more diverse crop types which in turn would help them to produce higher yields. The successful more production helps to enhance and improve the consumption of diversified food groups of the households. This study is consistent with the study undertaken by Mbwana [28].

Table 4. Maximum likelihood estimates of ordered logistic regression analysis for nonindigenous households (N= 149)

DD1SLEVEL	Coef.	Std. Err.	Z	P>|z|	Marginal effects of HDDS level		
					LDD	MDD	HDD
					dy/dx	dy/dx	dy/dx
AGE	0.050	0.021	2.37	0.018**	-0.0087	-0.0007	0.0094
SEXHEAD (Female)	0.416	0.886	0.47	0.639	-0.0728	-0.0056	0.0784
MARTALST(Married)	0.042	0.548	0.08	0.939	-0.0073	-0.0006	0.0079
ADULT_EQUVT	0.230	0.150	1.53	0.126	-0.0402	-0.0031	0.0433
DEPRATIO	0.881	0.301	2.93	0.003***	0.1540	0.0118	-0.1658
ILLITRATE	2.745	1.867	1.47	0.142	0.4799	0.0369	-0.5168
ABLREADWRT	-2.070	1.808	-1.14	0.252	0.3618	0.0278	-0.3896
PRIMARY	1.582	1.810	0.87	0.382	-0.2765	-0.0213	0.2978
SECONDARY	0.660	2.095	0.32	0.753	-0.1154	-0.0089	0.1243
FARMSIZE	1.109	0.336	3.30	0.001***	-0.1939	-0.0149	0.2088
CDI	0.042	2.627	0.02	0.987	-0.0074	-0.0006	0.0080
TLU	-0.001	0.061	-0.01	0.995	0.0001	0.0001	-0.0002
HOMEGARD	-0.186	0.557	-0.33	0.739	0.0325	0.0025	-0.0350
FARMICOME	1.494	0.352	4.25	0.000***	-0.2612	-0.0201	0.2813
OFF-INCOME	-0.001	0.044	-0.03	0.976	0.0002	0.0000	-0.0002
ACCEXTN	1.399	0.437	3.21	0.001***	-0.2446	-0.0188	0.2634
CREDIT	0.781	0.383	2.04	0.042**	-0.1365	-0.0105	0.1470
MARKDIS	0.259	0.101	-2.56	0.010**	0.0454	0.0035	-0.0489
PARTCIRR	-0.004	0.367	-0.01	0.991	0.0007	0.0001	-0.0008
/cut1	22.286	13.472					
/cut2	24.609	13.501					

***, and ** statistically significant at 1% and 5%, respectively

The other significant and important determinant of household dietary diversity was household annual farm income. It was found that households with a low annual farm income were more likely to have lower dietary diversity compared to those with a higher farm income. But this was not true for all study societies. Annual farm income had a positively and significantly important influence on the nonindigenous household but not for the indigenous household in relation to dietary diversity conditions. A one unit (ETB) increase in the annual farm income of the nonindigenous household head increases the likelihood of falling into higher dietary diversity by 28.13% and reduces the probability of falling into lower dietary diversity by 26.12%. This might be since the nonindigenous rural households obtain their wealth (income) from selling agricultural products and purchase food crops to fill nutritional requirements. However, the indigenous households might be attaining nutritious foods through gathering and hunting wild animals and plants in addition to purchasing and on farm production. This study finding is consistent with study results reports from India [25], China [29], and Malawi [30].

According to the study, access to agricultural extension services was another determinant of household dietary diversity. Access to agricultural extension services was positively and significantly correlated with high dietary diversity of the study populations at less than 1% probability level. But the magnitude of significant influence of access to extension on household dietary diversity varied across the two societies. For instance, as indicated in Tables 3 and 4 the households who have the access to extension services in the probability of the indigenous and non-indigenous household falls into high dietary diversity increases by 50.77% and 26.34% and reduces the likelihood of being characterized by low dietary diversity by 17.91% and 24.46%, respectively. The probable reason could be extension services widens the farmers` knowledge, skill, and experiences with regards to the utilization of improved agricultural technologies and farm management practices. This successful utilization of farm operations helps to promote farm production and productivity as well as improves the consumption of diversified food groups – solve nutritional problems of chronic energy deficiency and micronutrient deficiencies of rural households.

Another factor that was correlated with household dietary diversity of both societies is the walking distance (in kilo meters) to a distant market which would negatively influence the higher dietary diversity situations. The findings of this study reveal that households that are walking more distance for getting to the marketplace is more likely to have lower dietary diversity than the households who have less walking distance. This confirms that reducing the walking distance to the local market by one kilometer would have a larger positive effect on household dietary diversity. This implies that the nearest market access matters for dietary quality of farm households [3]. However, the magnitude of significance influences the market distance on household dietary diversity was different across the societies. For example, all other things constant, a one unit (km) increase in the market distance for the indigenous and nonindigenous household head decreases 12.84% and 4.89% by the likelihood of falling into higher dietary diversity nearly 13% and 5% and increases probability of falling into a lower dietary diversity by 4.53% and 4.54%, respectively. A shorter and better market access has a positive influence on household dietary diversity since the household head is able to be purchase better quality and various food items [14,31].

According to the study, participation in small scale irrigation schemes was another determinant of dietary diversity in the area. Participation in a small-scale irrigation scheme by the household head influenced positively and significantly household dietary diversity at less than 1% probability level. However, this was not true for the nonindigenous society. This implies that the indigenous households who were participating in small scale based agricultural production were more likely to have better dietary diversity at the household level. This could be explained by the probability that participation in an irrigation farming of households leads to the cultivation of more diverse crop types which in turn would help them to produce more yields since they can produce two or more within one cropping season. Eventually, the production of varied crops through irrigation that improves the consumption of diverse food groups from production as well as earns more income from selling their farm products. This finding is consistence with Taruvinga *et al.* [13] who reported that access to irrigation significantly and positively affects the household dietary diversity.

Access to credit is one of the most important determinants of household dietary diversity in the study area. The coefficient of access to credit service by the household was positive and significant in households indicating that the households who have access to credit services were likely to be have a better dietary diversity status. This is not true for nonindigenous societies. A possible explanation of the credit services receipts is economically equipped with the knowhow and awareness of how to utilize the financial resources effectively and efficiently. The positive influence of access to credit on household dietary diversity has been well acknowledged in the theoretical and empirical literature. For instance, Degye [32] and Anduamlak, [33] have reported a positive and significant effect on household dietary diversity of access to credit. Therefore, our findings are consistent with the theory and past empirical study findings.

Conclusion and Recommendation

The purpose of this study was to examine the factors that affect the dietary diversity status among indigenous and nonindigenous rural households in Bambasi district. The study found differences in dietary diversity status between indigenous and nonindigenous households. The dietary diversity status in the study revealed that about nearly $3/4^{th}$ and $2/3^{rd}$ of indigenous and nonindigenous households consumed more than four food groups. Comparatively, indigenous households have better dietary diversity status than nonindigenous one. The major factors which affect dietary diversity status of both societies are age of household head, access to extension services and distance to market. Despite this, access to credit, farm income, farm size and dependency ratio are the major determinants for nonindigenous household heads whereas participation in small scale irrigation and education are the major factors of dietary diversity of the indigenous household heads. Therefore, we recommended that food and nutrition interventions focusing on improving dietary diversity and quality should pay due attention to develop community specific interventions instead of generalized interventions. Food and nutritional security interventions focusing on promoting market access and enhancing and create better access to extension services of the societies. Additionally, interventions in all significant factors that enhance and improve may be recommended to help the household to improve the diet quality and diversity in the study area. However, further investigation focused on seasonal dietary diversity and individual level dietary diversity of the study area.

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References

[1] WHO (World Health Organization), "The State of Food Security and Nutrition in the World 2018: Building climate resilience for food security and nutrition.". .2018. Rome, FAO. Licence: CC BY-NC-SA 3.0 IGO.

[2] Headey, Derek, and H. Alderman. "The relative prices of healthy and unhealthy Food in 177 countries." *Alcohol* 2(4), 2017.

[3] Berhane, Gebremedhin, Tesfamichael Gebreyohannes, Kristine Martens, and Kristine Walraevens. "Overview of micro-dam reservoirs (MDR) in Tigray (northern Ethiopia): Challenges and benefits." *Journal of African Earth Sciences* 123: 210-222, 2016.

[4] Jones AD., "On-Farm Crop Species Richness Is Associated with Household Diet Diversity and Quality in Subsistence- and Market-Oriented Farming Households in Malawi." *Journal of nutrition*; 147(1):86–96. 2017. http://doi.org/10,3945/jn.116.235879

[5] Somé, J. W., and Jones, A. D., "The influence of crop production and socioeconomic factors on seasonal household dietary diversity in Burkina Faso." *PloS one*, *13*(5), 2018. e0195685

[6] Rakesh, B. and Tafesse, Y., "A study of the impact of orthodox Christians' fasting on demand for biscuits in Ethiopia." *African Journal of Marketing Management* 2, 10-17, 2010.

[7] Girma N., Melkie E., Degnet T., Amanuel N., and Rigbe W., "Dietary diversity and associated factors among rural households in South Gondar zone, northwest Ethiopia." .2015. *Feed the future –Research Award*.

[8] Workicho, A., Belachew, T., Feyissa, G. T., Wondafrash, B., Lachat, C., Verstraeten, R., and Kolsteren, P. (2016)., "Household dietary diversity and Animal Source Food consumption in Ethiopia: evidence from the 2011 Welfare Monitoring Survey." *BMC public health*, *16*(1), 1192, 2016.

[9] Direslgne M., Begosew M. and Gistane A., "Household dietary diversity and associated factors in Mirab Abaya Wwereda Southern Ethiopia; community-based cross-sectional study." 2016.

[10] Kuhnlein, H. V., Erasmus, B., & Spigelski, D., "Indigenous peoples' food systems: the many dimensions of culture, diversity and environment for nutrition and health." .2009. Rome: Food and Agriculture Organization of the United Nations.

[11] FAO, "Guidelines for measuring household and individual dietary diversity." 2011. Rome: Food and Agriculture Organization of the United Nations

[12] Kiboi W., Kimiywe J. and Chege P., "Determinants of dietary diversity among pregnant women in Laikipia County, Kenya: a cross-sectional study.".2017. *Journal of BMC Nutrition.*

[13] Taruvinga, A., Muchenje, V., and Mushunje, A., (2013). "Determinants of rural household dietary diversity: The case of Amatole and Nyandeni districts, South Africa." *International Journal of Development and Sustainability*, *2*(4), 1–15, 2013.

[14] Pauze, E., Batal, M., Philizaire, Y., Blanchet, R., and Sanou, D., "Determinants of diet quality among rural household in an intervention zone of Grand Anse, Haiti.": *Journal of food Security* Vol. 8: pp, 1123-1134, 2016.

[15] Samson G., Kaleab B., Tilahun B., Manisha T., Yonas A., Yewelsew A. and Nigusse R., (2017). "Predictors of dietary diversity in children ages 6 to 23 month in largely food insecure area of South Wollo, Ethiopia."; *Journal of Nutrition* (33); 163-168, 2017.

[16] Demeke, M., Meerman, J., Scognamillo, A., Romeo, A., and Asfaw, S., "Linking farm diversification to household diet diversification: Evidence from a sample of Kenyan ultra-poor farmers". ESA Working Paper No. 17-01. 2017. Rome, FAO.

[17] Greene WH., "Econometric analysis." .2003. Prentice Hall, Upper Saddle River, NJ, USA. 1026 pp.

[18] Gujarati, D.ND. N., "Essential of Econometrics", .2004. 4th edition. Mc-Grew hill companies, 1003p

[19] Long J. S, and Freese J., "Regression models for categorical dependent variables using Stata." .2006. Stata press.

[20] Ingelmo, F., Molina, M. J., de Paz, J. M., & Visconti, F., "Soil saturated hydraulic conductivity assessment from expert evaluation of field characteristics using an ordered logistic regression model." *Soil and Tillage Research*, *115*, 27-38, 2011. http://doi.org/10.1016/j.still.2011.06.004

[21] Train K., "Discrete choice methods with simulation." 2009. Cambridge University Press,

[22] Sasidharana L, Menéndez M., "Partial proportional odds model - An alternate choice for analyzing pedestrian crash injury severities." Accident Analysis & Prevention 72: 330-340, 2014.

[23] Berhane, G., McBride, L., Hirfrfort, K. T., and Tamiru, Senshaw, "Patterns in food grain consumption and calorie intake." *Food and agriculture in Ethiopia: Progress and Policy Challenges*, 190-216, 2012.

[24] Gebrehiwot, Tagel, "Rural Food Security in Tigray, Ethiopia: Policy Impact Evaluation." 2008. MSc Thesis. International Institute for Geo-information Science and Earth Observation, Enschede. Netherlands

[25] Parappurathu, A. Kumar M.C.S. Bantilan and P.K. Joshi, "Food consumption Pattern and dietary diversity in Eastern India: Evidence from Village level (VLS)." *Food Security, Springer* (7) pp 1031-1042, 2015.

[26] Block, S. A., "Maternal nutrition knowledge and the demand for micronutrient-rich foods: Evidence from Indonesia." *Journal of Development Studies*, *40*(6), 82-105, 2004

[27] Smith, L.C., "Understanding the cause of food insecurity in Sub Saharan Africa: Do the determinants of diet quantity and quality differ?" .2004. Mimeo. International Food Policy Research Institute, Washington D.C.

[28] Mbwana, A., Joyce Kinabo1, Christine Lambert and Hans K. Biesalski., "Determinants of household dietary practices in rural Tanzania: Implications for nutrition interventions." *Journal of Cogent food and agriculture.* 2016. http://dx.doi.org/10.1080/23311932.2016.1224046

[29] Liu, J., Shively, G.E., and Binkley, J.K., "Access to variety contributes to dietary diversity in China." Food Policy, 49(2014), 323–331, 2014.

[30] Jones, A.D., Shrinivas, A., and Bezener-Kerr, R. Kerr, R., "Farm production diversity is associated with greater household dietary diversity in Malawi: Findings from nationally representative data." *Journal food policy*, Vol. 46, pp 1-12. 2014.

[31] Babatunde, R.O., Owotoki, G.M., Heidhues, F. and Buchendrieder, G., "Vulnerability and Food insecurity differentials among male and female headed farming households in Nigeria." *Pakistan Journal of Social Sciences*, Vol. 4, pp. 414-418, 2007.

[32] Degye G, Belay K, and Mengistu K., "Measuring diet quantity and quality dimensions of food security in rural Ethiopia."; *Journal of Development and Agricultural Economics*; 5: 174-85, 2013.

[33] Anduamlak Assaye, "Determinants of rural household dietary diversity the case of Bambasi district, Benishangul Gumuz region, Ethiopia.".2018. MSc thesis (in Rural Development) Haramaya University, 2018. (unpublished thesis).