Mothers' and Children's Diet Diversity Score in 10 CANAG Intervention woredas of Ethiopia

CANAG

CASCAPE-Nutrition and Gender Project

DDS survey_ National Synthesis report

Baseline and End line

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Abstract

This paper examines CANAG project's outcome in contributing to mothers' and children's diet diversity score (DDS) in its twenty kebeles of ten (10) intervention woredas located in five university clusters of Ethiopia. The study used cross-sectional data collected from a total 400 smallholder farm households. The survey is powered to detect differences in the overall base line and end line DDS status of the stated subjects. In order to see the mean difference between the baseline and end line DDS values, a paired sample (dependent) t-test is run in addition to descriptive statistics. The result showed that mothers' proportional consumption of different food groups has significantly increased compared to its baseline status. This is especially in the major area of the project's intervention areas of home garden based food groups consumption such as vitamin "A" rich fruits and vegetables (increased by 58%), dark green leafy vegetables (increased by 19%), other vegetables (increased by 23%), other fruits (increased by 10.7%) and consumption of egg (increased by 156%). This increase in proportion of mothers' consumption of different food groups, contributed to significant difference in the status of mothers' national DDS (baseline and end line): the result from the pre-intervention (baseline) M=3.64, SD=1.37 and end line (post-intervention) M=4.05, SD=1.57. The figure shows that the mean difference has improved by 0.41 (SD=2.1).This improvement is statistically significant at t(399)= 3.91, P<.001. Besides, the dietary adequacy of mothers has increased from its status (23%) during the base line to (33.8%) during the end line. This emphasis that the project was of real value to the beneficiaries in helping them diversify their diet. With regards to outcome of the project's intervention in improving children's proportional consumption of different food groups, children's consumption of Vitamin "A" rich fruits and vegetables has showed good improvement with an increase of 64.7%. Children's consumption of the remaining two food groups, namely Legumes nuts and seeds, and meat poultry and fish, increased by 30% and 28% respectively. As the project primarily intervened in production and consumption of home garden vegetables and fruits along with poultry for egg consumption; the study found out that the intervention areas have recorded good outcome in line with contributing to diversifying dietary habit of the target children. There is a difference between children's national DDS mean difference (baseline and end line): the result from the pre-intervention (baseline) M=3.17, SD=1.23 and end line (post-test) M=3.23, SD=1.54. This shows that the mean difference has improved by 0.05 (SD=2.03). This improvement is statistically ***insignificant*** *at t(399)= 0.54, P=.59. It is also found that child dietary diversity adequacy status has slightly increased from 40% during the baseline to 43% during the end line. Children's dietary inadequacy that was 77% has decreased to 57%. This is good improvement. This shows that, in similar future interventions to increase diet diversity, concerned governmental bodies need to focus more on child dietary diversity improvement through effective mothers' Social Behavioural Change and Communications (SBCC) training, which at the same time may also help mothers to improve to diversity their diet. We conclude that CANAG, being a pilot project, has achieved its objectives and the outcomes to increase dietary adequacy of both mothers and children. This is encouraging and calls for consolidated action for wider impact.*

1. Introduction

The project CANAG (CASCAPE Nutrition and Gender) was started in 2018, to support the nutrition and gender component of the BENEFIT-CASCAPE programme. The project has sought to contribute to improving the diets of women and children. BENEFIT-CASCAPE is one of the programmes under the BENEFIT (Bilateral Ethiopia Netherlands Effort for Food, Income and Trade) partnership, which is funded by the Embassy of the Kingdom of the Netherlands and aims to support the Ethiopian government to increase agricultural productivity in a sustainable way in order to enhance agricultural growth and to achieve food security.

The project CANAG contributed to improve the dietary diversity of women of reproductive age and young children (6-23 months) in selected Woredas of the five Ethiopian university clusters (Hawassa University, Jima University, Addis Ababa University, Bahir Dar University and Mekele University). CANAG generally worked to reach the targets through home gardening, nutrition education, cooking and preservation of foods and introduction of labor saving technologies. To assess the project's outcome on dietary diversity of the project participants, three dietary diversity surveys were carried out. Dietary diversity is a measure of how many food groups are consumed by an individual in a 24 hour period, based on evidence that those who consume more diverse diets are more likely to be able to meet their nutrient needs. To understand the outcome of the project on the participants dietary diversity, three rounds of dietary diversity surveys (DDS) were carried out: one in August 2019 (rainy season), one in February 2020 (dry season), and finally an end line survey in October 2020 (end of the rainy season). As different seasons are unlikely to compare, this report focussed on comparison of the two similar rainy season DDS status (2019 and 2020 rainy seasons) on similar beneficiaries. The report presents outcome of the project on beneficiary DDS based on baseline and end line data. The aim of both baseline and end line surveys was to determine dietary diversity score and dietary diversity adequacy level of women of reproductive age and their young children. The project focused on this group because they are most susceptible to malnutrition and therefore they have higher nutritional needs.

Measuring of Dietary Diversity

Dietary Diversity is defined as the number of different foods or food groups consumed over a given reference period (FAO, 2007). Increasing the variety of foods and food groups in the diet helps to ensure adequate intake of essential nutrients and promotes good health and physical and mental development (Becquey and Martin, 2009).

Dietary Diversity Score is a raw numerical score used to assess dietary diversity based on a simple count of the number of food groups represented in a full listing of the foods and drinks consumed over a given reference period (usually the previous 24 hours).

Minimum Dietary Diversity for Women (MDD-W)

Minimum Dietary Diversity for Women (MDD-W) is a dietary diversity indicator used to assess the micronutrient adequacy of women of women's diets (FAO, 2016).

It is based on ten food groups:

1. Grains, white roots & tubers	6. Eggs
2. Pulses (beans, peas and lentils)	7. Dark green leafy vegetables
3. Nuts and seeds	8. Other vitamin A-rich fruits & vegetables
4. Dairy	9. Other vegetables
5. Flash foods flesh foods (meat, fish, poultry & organ meats)	10. Other fruits

While there is no established cut-off for overall dietary diversity, a cut-off of 5 has been established for MDDS-W, based on research from multiple countries showing that women who consume foods from at least 5 food groups a day are more likely to have a diet adequate in macro and micronutrients.

Minimum Dietary Diversity for Infant and Young Children (MDD-IYC)

The minimum dietary diversity (MDD) score for children 6-23 months old is an indicator used to assess diet diversity as part of infant and young child feeding (IYCF) practices among children 6-23 months old (WHO, 2008) and it is based on 7 food groups. The cut-off for the minimum dietary diversity for infants and young children is 4 out of 7 food groups. The seven food groups are described as follows:

1. Grains, white roots & tubers	5. Eggs
2. legumes and nuts	6. Vitamin A-rich fruits & vegetables
3. Dairy	7. Other fruits and vegetables
4. flesh foods (meat, fish, poultry & organ meats)	

The MDD-IYC is also 5.

2. Objectives of the survey

The objectives of this study are to:

- Determine dietary diversity score for women of reproductive age and children 6-23 months (in both baseline and end line surveys and see comparative differences of results in both surveys).
- Determine the impact of the CANAG project on the diet diversity of beneficiaries.

3. Methodology

3.1. Study design

A community based cross-sectional study was used in this survey. It is a type of research design in which data are collected from individuals at single point in time/ not time series data over months or years/.

3.2. Study Population

The study population were mothers and children of 6-23 month old in the selected woredas and kebeles of CANAG intervention areas.

3.3. Sample size calculation

The sample size of the study was calculated using single population proportion formula.

$$n = \frac{(z_{\propto/2})^2 p(1-p)}{m^2}$$

Assumptions:

- n = Required sample size
- $z_{\propto/2}$ = Confidence level at 95 %, (standard value of 1.96)
- P = Proportion of Minimum Dietary Diversity Score (50%)
- m = Margin of error as 5 % (standard value of 0.05)

$$n = \frac{(z_{\propto/2})^2 p(1-p)}{m^2} = \frac{(1.96)^2 0.5(0.5)}{(0.05)^2} = \frac{0.0196}{0.0025} = 384 = 400$$

Hence, a sample of 400 respondents was used for this study.

3.4. Sampling method and procedures

→ Using simple random sampling technique, the basic sampling unit were selected from all eligible households living in the selected kebeles. Sample frame (List of households/mothers and children with age of 6-23 months) were obtained from kebele health posts.

→ In each survey, the sample size (400 households) were considered all across the five clusters with eighty informants per cluster. This means that the survey is powered to detect differences in the overall base line and end line.

→ The surveys were conducted in 20 CANAG intervention kebeles of the 10 woredas (2 kebele from each woreda.

→ In each kebele 20 eligible households (children aged 6-23 months and their mothers) were selected in each survey.

→ The surveys were conducted in those households for both mothers of 6-23 months age and their children.

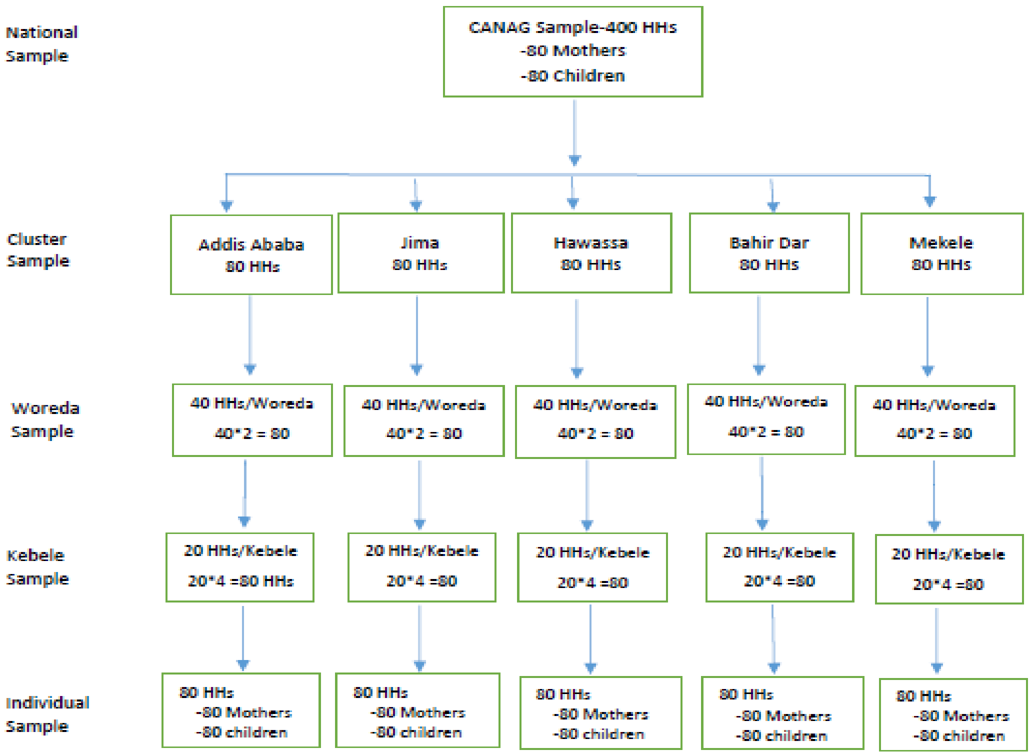

Figure 1: Schematic presentation of sampling procedure

3.5. Study area

In both the baseline and end line surveys, the study area consisted of 20 kebeles from 10 CANAG Woredas across the five 5 university clusters.

Figure *2: Study area (project intervention woredas)*

3.6. Inclusion and Exclusion Criteria

3.6.1. Inclusion Criteria

- CANAG intervention woredas and kebeles
- Households with 6-23 months age children and their mothers
- The caregiver who feeds the child (most probably mother) should be present at time of the interview.

3.6.2. Exclusion Criteria

- Mother of children 6-23 month age and who were sick & haven't normal appetite in the past 24 hrs.
- Children 6-23 months who were sick and did not have a normal appetite in the last 24 hrs.

- If there is a holiday or special event in the household which changed food intake in the past 24hrs (regular fasting days are not seen as a change of food intake but rather part of the overall dietary pattern).
- The mother/caregiver is not present in the household.

3.7. Data collection methods

In both surveys, primary data (quantitative) were collected from the study unit at household level using structured questionnaire interview techniques. Data was collected using mobile data collection software ODK Collect.

- Minimum Dietary Diversity for Women/MDD-W/ based on 10 food groups (FAO, 2016).
- Minimum Dietary Diversity for children/MDD-IYC/ based on 7 food groups (WHO, 2008) data were collected using 24-hour dietary recall method.

3.8. Data Management

Data entry

- Data is automatically entered at field level since the survey uses mobile data collection software ODK Collect.

Data analysis

- The collected data was downloaded from ODK tool box in the excel sheet version. The data in excel is checked, cleaned, coded and again exported to SPSS for analysis. The data is analysed using SPSS and summarized using descriptive statistics such as frequencies, percentages, means and standard deviation. In addition to descriptive statistics, paired sample (dependent) t-test is also run to see mean difference.

4. Results

4.1. General characteristics of the respondents

A total of 400 households participated in the baseline and end line surveys (see fig.1) above for more details. Except for a few households who were unavailable during the end line survey, in both baseline and end line surveys data were collected from almost the same households. It is found out that 90% of household heads during the baseline study and 93% of household heads during the end line study were male headed households. With regards to the pregnancy status of the women it is found that 93% of women (372) at the baseline survey and 89% (356) of them were not pregnant. On the other hand, only small proportion counted to 6% (23) of women at the baseline survey and 11% (44) of the women indicated that they were pregnant at the time of the survey. The study identified that 94% (376) of the women during the baseline survey and 75% (301) of the women during the end line survey were lactating mothers.

In line with respondents ability to read and write, about 49.3% of respondent mothers both during the baseline and end line survey time indicated that, they were not able to read. With regards to their educational level 1.8% (7) during the base line and 20.3% (81) during the end line attended informal school. On the other hand, 14.0% (56) during the baseline and 15.3% (61) attended primary school grade 1-4. 22.5% (90) during the base line and 22.8% (91) during the end line were found to attend grade 5-8. Number of respondents who are found to attend grade 9-12 were also 11.8%(47) during the baseline and 9.5% (38) during the end line. It is also found out that, there are respondent farmers who have also attended tertiary education 0.8%(3) during the baseline and 1.0% (4) during the end line. T

With regards to marital status of respondents 94.5% (378) during the baseline and 94.0% (376) during the end line were married; 3.5%(14) during the base line and 3.0%(12) during the end line were divorced. On the other hand 1.0% (4) during the base line and 1.3% (5) during the end line were found single. It also found out that 1.0%(4) during the base line and 1.8% (7) during the end line were widowed. In line with household headship, it is found out that 9.0%(36) during the base line and 5%(20) during the end line were woman headed. On the other hand; 89.8% (359) during the base line and 93.8% (375) during the end line were male headed. It is also found that 1.3% (5) during the base line and 1.0% (4) during the end line were headed by another woman. This means that there is no difference in demographics and socio-economic characteristics of the households between base line and end line.

Table 1: Demographic and partial socio-economic characteristics of respondents

Variables	Baseline		End line	
	Frequency (n=400)	(%)	Frequency (n=400)	(%)
Age of mothers(Year)				
15-19	20	5	9	2.4
20-24	91	22.8	61	15.3
25-29	111	27.8	117	28.5
30-34	86	21.5	98	24.6
35-39	70	17.5	79	19.8
40-45	19	4.8	31	7.9
46-49	2	0.5	2	0.6
Pregnancy				
Don't Know	5	1.3	-	-
No	372	93	356	89.0
Yes	23	5.8	44	11
Lactation				
No	24	6	99	24.8
Yes	376	94	301	75.3
Marital Status				
Divorced	14	3.5	12	3
Married	378	94.5	376	94
Single	4	1	5	1.3
Widowed	4	1	7	1.8
Head of Household				
Male headed	359	89.8	375	93.8
Headed by My self	36	9	20	5
Headed by another female	5	1.3	4	1
Level of Education				
Able to read				
No	197	49.3	197	49.3
Yes	203	50.7	203	50.7
Informal	7	1.8	81	20.3
Grade 1-4	56	14	61	15.3
Grade 5-8	90	22.5	91	22.8
Grade 9-12	47	11.8	38	9.5
Tertiary Education	3	0.8	4	1

4.2. Dietary Diversity of Women and Children

In this section we present the findings from the dietary diversity data gathered in the survey.

4.2.1. Mean DDS score of women and children across clusters

Among all university clusters, four clusters' mean dietary diversity score (DDS) of the mothers has increased. This means that the sum of different food groups consumed by mothers has improved compared to the baseline. In order to see the mean difference between the baseline and end line DDS values, a paired sample (dependent) t-test is run. The following discussion covers statistical test on significance level of each clusters and national level mean ($\bar{x}$) difference (baseline and end line) DDS results.

To begin with mothers cluster wide DDS; AAU, MU and HU were found to have a good mean improvement. AAU mothers' pre-intervention (baseline) M=2.76, SD=1.02 and end line (post-test) M=3.98, SD=1.74. The figures show that the mean difference has improved by 1.2 (SD=1.96). This improvement is statistically significant at t(79)= 5.52, P<.001. When we look at MU, the result from the cluster mothers' pre-intervention (baseline) was M=3.55, SD=1.16 and end line (post-test) M=4.31, SD=1.49. The figure shows that, the mean difference has improved by 0.76 (SD=1.73). This improvement is statistically significant at t(79)= 3.94, P<.001. The result from HU cluster mothers' pre-intervention (baseline) M=3.76, SD=0.9 and end line (post-test) M=4.04, SD=0.99. The figure shows that the mean difference has improved by 0.27 (SD=1.22). This improvement is statistically slightly significant at t(79)= 2.01, P=.048. In line with BDU, mothers' pre-intervention (baseline) mean (M) =3.31, SD=1.27 and end line (post-test) M=3.38, SD=1.21. The figure shows that the mean difference has improved by 0.06 (SD=1.73). This mean difference is statistically insignificant at t(79)= 0.32, P=.749. The last cluster with least mean difference is JU. Here, mothers' pre-intervention (baseline) mean (M) =4.8, SD=1.55 and end line (post-test) M=4.55, SD=1.99. The figure shows that, the mean difference has declined by 0.25 (SD=2.36). This mean difference is statistically insignificant at t(79)= 0.94, P=.35, but note that the baseline mean was very high already.

But when we see significance status of mothers' national DDS mean difference (baseline and end line), the result from the pre-intervention (baseline) M=3.64, SD=1.37 and end line (post-test) M=4.05, SD=1.57. The figure shows that the mean difference has improved by 0.41 (SD=2.1). This improvement is statistically significant at t(399)= 3.91, P<.001.

With regards to children's DDS mean ($\bar{x}$) difference, MU children's pre-intervention (baseline) M=3.03, SD=1.4 and end line (post-test) M=3.53, SD=1.26. The figures show that the mean difference has improved by 0.5 (SD=1.87). This improvement is statistically significant at t(79)= 2.39, P=.02. When we see AAU, the result from the cluster children's pre-intervention (baseline) M=3.08, SD=1.00 and end line (post-test) M=3.09, SD=1.85. The figure shows that the mean difference has slightly improved by 0.013 (SD=2.27). This improvement is statistically insignificant at t(79)= 0.05, P=.961. In line with BDU, the result from the cluster children's pre-intervention (baseline) M=2.85, SD=1.20 and end line (post-test) M=2.83, SD=1.44. This figure shows that the mean difference has declined by 0.02 (SD=2.01). This difference is statistically insignificant at t(79)= 0.11, P=.91. With regards to JU, the result from the cluster children's pre-intervention (baseline) M=3.53, SD=1.46 and end line (post-test) M=3.31, SD=1.81. The figure shows that the mean difference has declined by 0.23(SD=2.18). This difference is statistically insignificant at t(79)= 0.92, P=.36. The result from HU cluster children's pre-intervention (baseline) M=3.35, SD=0.93 and end line (post-test) M=3.36, SD=1.18. The figure shows that, the mean difference has slightly improved by 0.01 (SD=1.53). This improvement is statistically insignificant at t(79)= 0.07, P=.94.

But when we see the significance status of children's national DDS mean difference (baseline and end line); the result from the pre-intervention (baseline) M=3.17, SD=1.23 and end line (post-test) M=3.23, SD=1.54. The figure shows that, the mean difference has improved by 0.05 (SD=2.03).This improvement is statistically insignificant at t(399)= 0.54, P=.59. This shows that future nutrition efforts in the target areas may need to focus more on child dietary diversity improvement through effective mothers' Social Behaviour Change Communication (SBCC) which at the same time may also help mothers for more improvement in their diet (see Table 2).

Table 2: Mean DDS score of women and children across clusters together with significance test

Clusters	**Mean DDS- Mothers**					**Mean DDS- Children**			
	Base line	**End line**	**$\bar{x}$ difference**	**t-stat**		**Base line**	**End line**	**$\bar{x}$ difference**	**t-stat**
AAU	2.76(1.02)	3.98 (1.74)	+1.2	5.52		3.08(1.00)	3.09(1.85)	0.013	0.05
MU	3.55(1.16)	4.31 (1.49)	+0.76	3.94		3.03(1.4)	3.53(1.26)	0.5	2.39
HU	3.76(0.9)	4.04 (0.99)	+0.27	2.01		3.35(0.93)	3.36(1.18)	0.01	0.07
BDU	3.31(1.27)	3.38 (1.21)	+0.06	0.32		2.85(1.20)	2.83(1.44)	-0.02	0.11
JU	4.8(1.55)	4.55 (1.99)	-0.25	0.94		3.54(1.46)	3.31(1.81)	-0.03	0.92
Average/CANAG Total/	**3.64(1.37)**	**4.05(1.57)**	**+0.41**	**3.91**		**3.17(1.23)**	**3.23(1.54)**	**0.05**	**0.54**

4.2.2. Proportion of mothers consuming foods from various food groups yesterday

All (100%) of surveyed women in both baseline and end line study sessions were found to consume staple foods (grains, white roots and tubers, and plantains groups like teff, maize, wheat, potato) in the previous 24 hours. Although consumption of animal source foods was not common, some of them have shown progress compared to the baseline. For instance, consumption of egg which was only 7% during the baseline has increased to 19% (an increase by 156%). Such level of egg consumption recorded can be due to the project's intervention in poultry production in certain regions *(see Figure 3).*

Among these, mothers' comparative consumption status of eggs and vitamin "A" rich fruits and vegetables recorded high level of increase compared to its status during the base line (an increase of 156% and 58%) respectively. In addition, mothers' comparative consumption status of other vegetables, dark green leafy vegetables and other fruits have also shown increase (23%, 19%, and 11%) respectively. As a pilot project that is working on contributing to dietary diversity, basically focusing on home garden production, this is encouraging. Interestingly, we did not see increased consumption of each food group. The endline found decreased consumption of both meat, from 14% to 9%, and nuts and seeds from 7%-6%. As it is not our area of intervention, the reason for the decrease needs further study *(see Figure 3).*

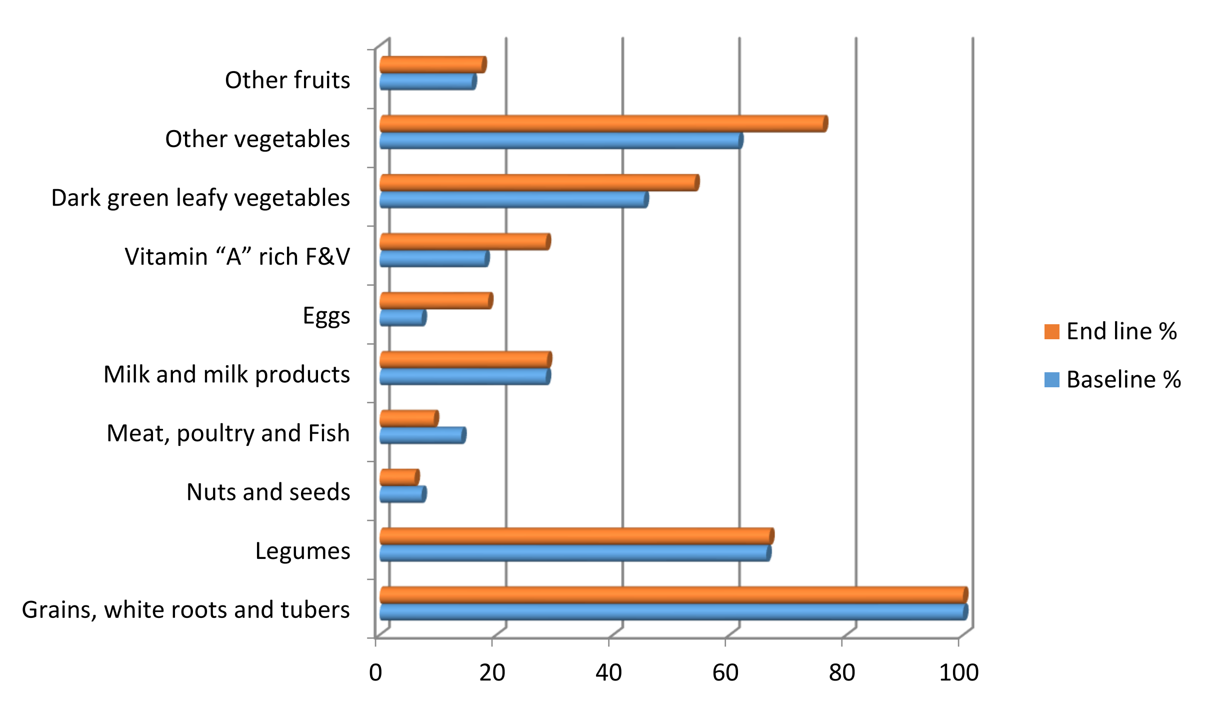

Fig. 3: Proportion of mothers consuming foods from various food groups yesterday

4.2.3. Consumption of different food groups by women across clusters

In addition to the above general proportion of mothers' consumption of different food groups, it would also be good to see specific cluster's mothers consumption status of different food groups with its comparative base line against end line value (see Table 3). Here, mothers' consumption status of grains white roots and tubers is found out to be constant as high as it was compared with the baseline (100%) across all clusters. That is basically due to the fact that, there is long lived diet culture in Ethiopia which dominates consumption of grains. Mothers' consumption of flesh food is low across all the clusters. As indicated in the foot note[1] below: Jimma university had difficulties collecting baseline data on meat consumption (flesh meat, organ meat, poultry and fish). There was a festivity in the area and a week gap was assumed to be ideal time to collect the data. Although that time gap was assumed to have the society in the normal meat diet trend, the data were found to have been heavily inflated. As it does not represent the real meat diet culture of the society, base line survey result; which is appropriate for the area is considered for both base line and end line. It is good to note here that, we were not specifically promoting meat consumption in the project.

Three clusters, AAU, HU and MU, showed improvement in mothers consumption of vitamin "A" rich fruits and vegetables. To see the three clusters specifically, AAU cluster showed an increase from 3% during the baseline increased to 31% during the end line. This is an increase of 1140%. This is very encouraging. Hawassa university cluster showed an increase of 8% to 25%; 233% increase. The third cluster, Mekele university cluster, based women beneficiaries' consumption of vitamin "A" rich fruits and vegetables is found to increase from 19% to 29%; 53% increase. As a pilot project, these figures are encouraging that calls for consolidated action for wider impact. However, Bahir Dar and Jimma university cluster beneficiary mothers' consumption of vitamin "A" rich fruits and vegetables decreased.

Table 3: Proportion of mothers consumed different food groups by cluster

Food Groups	Women consumed different food groups yesterday (%)									
	JU		MU		HU		AAU		BDU	
	Base line	End line	Base line	End line	Base line	End line	Base line	End line	Base line	End line
Grains, white roots & tubers	100	100	100	100	100	100	100	100	100	98.8
Legumes	57.5	65	72.5	93.8	25	31.3	68.8	65	82.5	80.1
Nuts and seeds	8.8	7.5	6.3	13.8	0	0	1.3	5	2.5	3.8
Meat, poultry, and fish	3.8 [1]	3.8	8.8	7.5	5	7.5	6.3	13.8	6.3	15.1
Milk and milk products	13.8	16.3	37.5	30	67.5	58.8	25	22.5	11.3	16.3
Egg	17.5	23.8	21.3	33.8	3.8	2.5	2.5	23.8	6.3	11.3
Vitamin A rich F & V	37.5	36.3	18.8	28.7	7.5	25	2.5	31.3	23.8	21.3
Dark green leafy vegetable	38.8	56.3	3.8	30	80	90	57.5	66.3	46.3	27.5
Other vegetable	38.8	90	56.3	82.5	73.8	86.3	10	56.3	48.8	65
Other fruit	38.8	56.3	5	11.3	13.8	2.5	2.5	13.8	3.8	3.8

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With regards to cluster wide mothers' consumption of dark green leafy vegetables, four clusters have shown improvement. However, in Bahir Dar university cluster, consumption of dark green leafy vegetables decreased by 40%. The reason for BDU's decrease in mothers consumption of dark green leafy vegetables was due to the fact that the cluster had not started harvesting from the home garden yet at the time of end line data collection. To specifically look at the four clusters that showed good improvement: JU has increased from 39% to 90% (131% increase); MU increased from 4% during the baseline to 30% (689% increase); HU from 80% during the baseline to 90% (13% increase); AAU from 58% during the baseline to 66% (15% increase). In line with mothers' consumption of other vegetables, all clusters showed good improvement with maximum of 463% increase by AAU (from 10% during the base line to 56% during the end line) and minimum increase recorded by HU 17% (from 74% during the baseline to 86% during the end line) The remaining three clusters showed the following results: JU 132% increase, MU 47% increase and BDU 33% increase compared to the baseline mothers' consumption status of other vegetables.

Three clusters have shown good improvement in terms of maternal fruit consumption. Here, JU which showed an increase from 39% during the baseline to 56% (45% increase), MU which was 5% during the base line has increased to 11% during the end line (126% increase) and AAU which was 3% during the base line has increased to 14% (452%). In BDU, fruit consumption remained constant (4% during both baseline and end line); MU and in HU mothers' consumption of other fruits has decreased by -81% (from 14% during the baseline to 3% during the end line).

4.2.4. Proportion of children consuming foods from various food groups yesterday

[1] *Note- For Jimma university cluster (JUC) mothers' meat consumption; the same figure was used for the baseline and endline. Figure from the endline data collection of the cluster is considered for the baseline due to unexpected long impacts of a festivity on meat consumption in the baseline data collection, in which base line data was collected a week after area limited festivity. Although the community was assumed to be back to normal meat consumption trend after a week; the data collected after a week is found to be heavily inflated. We did not promote any activities around animal source foods in the area(JU) so that, our intervention does not have an impact on meat/ poultry/ fish consumption. It is with this notion that, the endline figure is used for both.*

In line with proportion of children consuming foods from various food groups, all the seven food groups have shown good improvement compared to the baseline survey time. To specifically see: children's consumption of staple foods (grains, white roots and tubers, and plantains groups, like teff, maize, wheat, potato) was found to increase by 5.6% (from the baseline figure that was 94.5% to 99.8%). Among all the seven food groups, consumption of eggs was found to have highest increase (an increase of 83.4%); baseline finding (24.8%) compared with end line finding (45.5%). Next to egg, children's consumption of other fruits and vegetables showed higher increase level (an increase of 69.5%); baseline finding (39.8%) compared with end line finding (67.5%) Not far from other fruits and vegetables, children's consumption of vitamin "A" rich fruits and vegetables has also showed good improvement (an increase of 64.7%); baseline finding (34%) compared with end line finding (56%). Among the seven food groups, the least increase was found to be consumption of milk and milk products; although it has increased, it only increased by (a slight increase of 0.44%). Children's consumption of the remaining two food groups, namely legumes nuts and seeds, and meat poultry and fish increased by 30% and 28% respectively (see Figure 4).

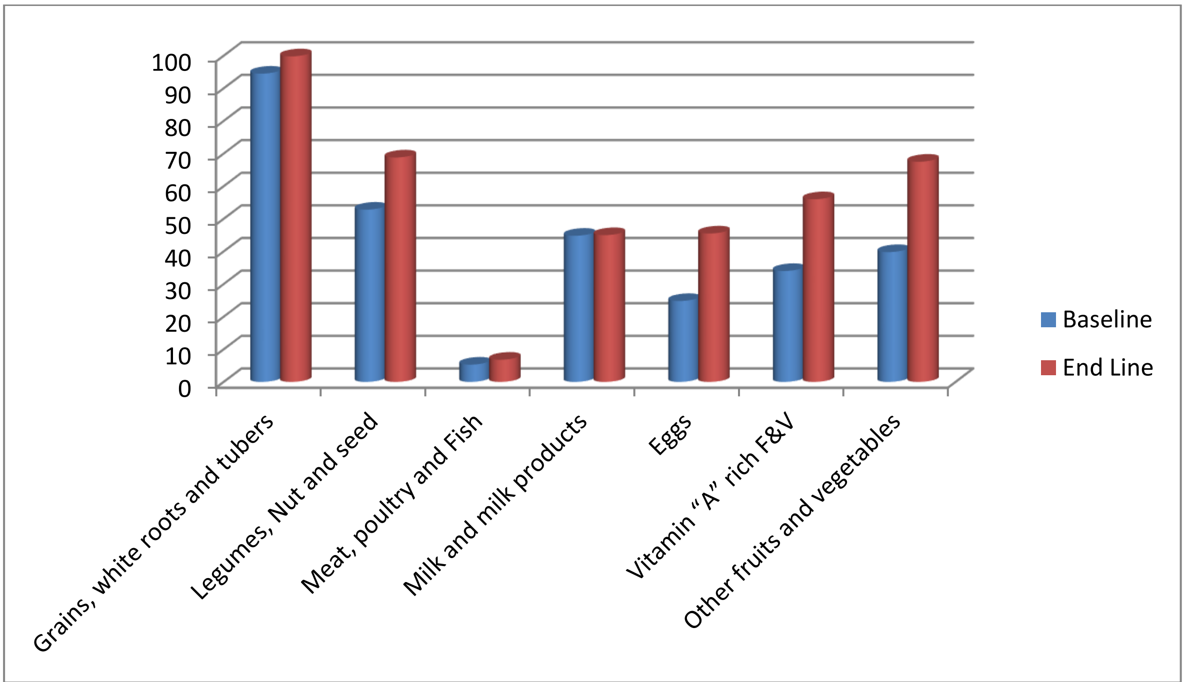


Fig. 4: Proportion (%) of children consuming foods from various food groups yesterday (Baseline compared with end line survey result)

4.2.5. Consumption of different food groups by children across clusters

Cluster based proportion of children's consumption of different food groups stated below would give more specific information than the general proportional analysis discussed above. As CANAG is engaged basically on home garden production and promotion, we first compare children's consumption status of vitamin "A" rich fruits and vegetables. All clusters showed improvement of children's consumption of fruits and vegetabeles (JU 92.7%, MU 76%, BDU 20.9%, AAU 12.7%, HU 7.8%). Although there is remarkable variance among the clusters, the good point is that at all clusters children's consumption of vitamin "A" rich fruits and vegetables has increased compared to the baseline. With regards to children's consumption of other fruits and vegetables also, all cluster showed good improvement with maximum increase recorded in AAU by 320%, followed by BDU with 118.6%. The remaining three clusters have also showed an increase: HU 59%, JU 39%, MU 31% compared with the baseline result.

It is also found out that, children's consumption of grains, white roots and tubers has increased across all the clusters. Except for BDU (99%), all the other clusters recorded consumption of the same at 100% during the end line. Children's consumption of legumes and nuts has also recorded positive across the clusters at different level of increase. With HU having the highest increase by 476%, the remaining recorded almost similar level of increase (MU 28%, AAU 21%, BDU 15%, JU 11%).

Among the five university clusters, HU and BDU showed increase in all food groups' category of children's proportional consumption of different food groups compared to base line finding. The remaining three clusters showed certain decrease in proportion of children's consumption of different food groups. Among these, AAU showed -17% decreases in milk and milk products. JU showed decrease in consumption of meat and milk (-60 and -11%) respectively. It is HU that showed decrease in three food groups namely; meat, milk and egg (-100, -5, -27%) respectively (see Table 4).

Table 4: Proportion of children consumed different food groups by cluster

Food Groups	Children consumed different food groups yesterday (%)									
	JU		MU		HU		AAU		BDU	
	Base line	End line	Base line	End line	Base line	End line	Base line	End line	Base line	End line
Grains, white roots & tubers	95.0	100	90.0	100	95.0	100	98.8	100	93.8	98.8
Legumes and Nuts	58.8	65.0	72.5	93.0	6.3	36.3	58.8	71.3	67.5	77.5
Meat, poultry, and fish	12.5	5.0	3.8	13.8	2.5	0	5.0	7.5	2.5	8.8
Milk and milk products	43.8	38.8	37.5	41.3	70.0	66.3	51.3	42.5	21.3	36.3
Eggs	26.3	51.2	21.3	70.0	32.5	23.8	22.5	36.3	21.3	46.3
Vitamin A rich F & V	27.5	53	21.3	37.5	80.0	86.3	58.8	66.3	30.0	36.3
Other Fruit and vegetable	55.0	76.3	56.3	73.8	48.8	77.5	12.5	52.5	26.3	57.5

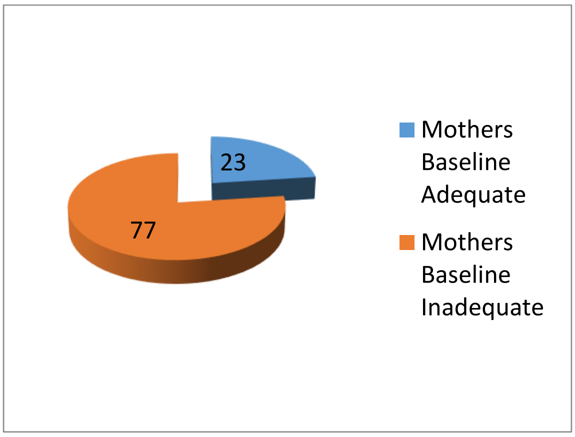
4.2.6. Dietary Diversity Adequacy: mothers and children

In line with the adequacy level of food groups consumed by mothers, the study showed that, mothers' dietary diversity adequacy status during the baseline study was only 23% indicating that their dietary diversity is largely inadequate (77%). The study after a year during the end line survey indicated that, mothers' dietary diversity adequacy increased from 23% to 34%. This shows that, intervention of the project was of real importance in contributing to increasing adequacy level of diet diversity. Although the dietary diversity adequacy level of mothers have shown improvement, end line study showed that, there still remain more works to be done as the inadequacy level still is 66%.

On the other hand, child dietary diversity adequacy status is found out to increase from 39.8% during the baseline to 43% during the end line. Children's dietary inadequacy that was 60.2% is has decreased to 57%.

Mothers' Dietary Diversity Adequacy status

Base line ***End line***



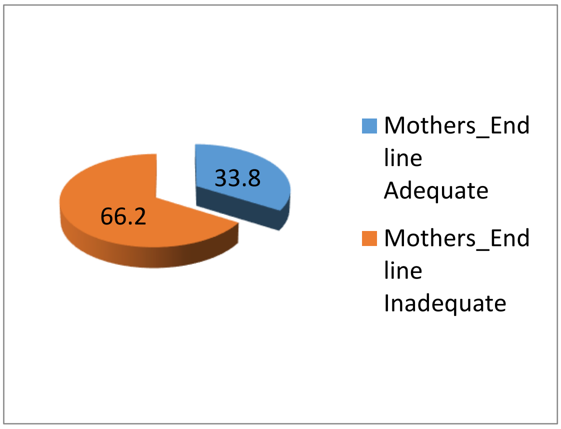
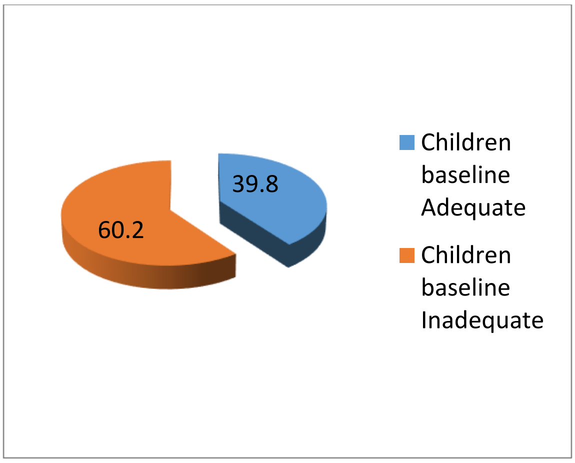


Fig. 4&5: Mothers' dietary Diversity Adequacy status (Left_ Baseline and Right_ Endline)

Children's Dietary Diversity Adequacy status

Base line ***End line***



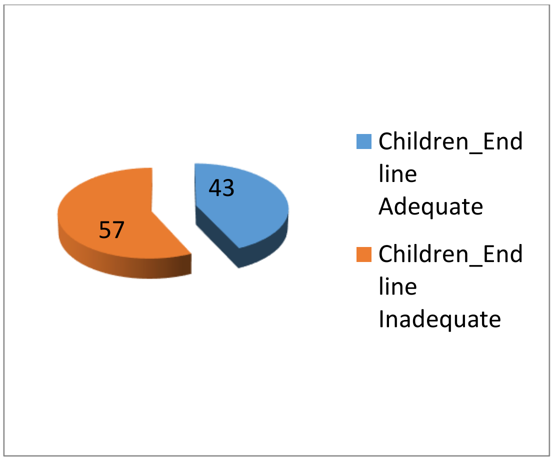


Fig. 6&7: Children's dietary Diversity Adequacy status (Left_ Baseline and Right_ Endline)

5. Conclusions and recommendations

The CANAG project aimed to increase the diet diversity of mothers and young children (6-23 months) by SBCC and encouraging growing fruits and vegetables in home gardens. In general, as this synthesis report dealt with both the base line and the end line DDS survey findings in the CANAG project. In this way we determine the outcome of the CANAG's intervention by comparing the baseline DDS survey findings with an end line DDS survey.

Given the result of the end line survey, mothers' proportional consumption of different food groups is found out to have statistically significantly increased compared to its baseline status. This is especially in the major area of the project's intervention areas of home garden based food groups consumption such as vitamin "A" rich fruits and vegetables (increased by 58%), dark green leafy vegetables (increased by 19%), other vegetables (increased by 23%), other fruits (increased by 11%) and consumption of egg (increased by 156%).

This increase in proportion of mothers' consumption of different food groups contributed to the improvement in the national mothers' dietary diversity score mean difference. We find a significance status of mothers' mean national DDS difference (baseline and end line), as a result from the pre-intervention (baseline) $M=3.64$, $SD=1.37$ and end line (post-test) $M=4.05$, $SD=1.57$. The figure shows that the mean difference has improved by 0.41 ($SD=2.1$).This improvement is statistically very significant at $t(399)= 3.91$, $P<.001$.

Also, the dietary adequacy of mothers has increased from its status (23%) during the base line to (33.8%) during the end line. All of this can be a proof that the project was of real value to the beneficiaries in helping them to diversify their diet and increase in the adequacy of their dietary diversity.

With regards to the outcome of the project's intervention in improving children's proportional consumption of different food groups, it is found out that consumption of eggs was found highest with an increase of 83% at the end line compared to the base line. This is not in line with the CANAG project since only in two clusters, poulets were distributed to a comparative small number of beneficiaries. Next to egg, children's consumption of other fruits and vegetables showed higher increase (70%). In the same manner, children's consumption of Vitamin"A" rich fruits and vegetables has also showed good improvement with an increase of 65%. Children's consumption of the remaining two food groups, namely Legumes nuts and seeds, and meat poultry and fish, increased by 30% and 28% respectively. As the project primarily intervened in production and consumption of home garden vegetables and fruits along with poultry for egg consumption, the study showed that the intervention areas have recorded good outcome in line with contributing to diversifying dietary habit of the targeted children.

In line with cluster based proportion of children's consumption of different food groups, it is found out that children's consumption status of Vitamin "A" rich fruits and vegetables in all clusters have shown improvement. The improvement is actually at different levels (JU+93%, MU+76%,BDU+21%, AAU +13%, HU+8%). Although there is remarkable variance among the clusters, the good point is that all clusters children's consumption of Vitamin "A" rich fruits and vegetables has increased compared to the baseline. With regards to children's consumption of other fruits and vegetables, all cluster showed good improvement with maximum increase recorded in AAU by +320%, followed by BDU +119%. The remaining three clusters have also showed an increase which is lower than the two clusters above; HU+59%, JU +39%, MU+31% compared with the baseline result.

When we see children's dietary diversity score, three clusters out of five succeeded in improving children's dietary diversity score; namely AAU, MU and HU. But in the two clusters JU and BDU, children's DDS score is found to decrease. Significance status of children's national DDS mean difference (baseline and end line) showed a value from the pre-intervention (baseline) M=3.17, SD=1.23 and end line (post-test) M=3.23, SD=1.54. The figure shows that the mean difference has improved by 0.05 (SD=2.03).This improvement is statistically insignificant at t(399)= 0.54, P=.59. It is also found that child dietary diversity adequacy status has increased from 40% during the baseline to 43% during the end line. Children's dietary inadequacy that was 77% is managed to decrease to 57%. This is a good improvement.

The figures show that the project may need to focus more on child dietary diversity improvement through effective mothers' Social Behavioural Change and Communications (SBCC) which at the same time may also help mothers for more improvement.

Hence, CANAG being a pilot project has achieved its objectives. The outcomes show an increased dietary diversity of the beneficiaries and an increased dietary adequacy of both mothers and children. These results are encouraging which also calls for consolidated action for wider impact.

On the basis of results of the study, recommendations are suggested to MoA and other Development Agents (donors and related projects) for future action (intervention in NSA activities, research and policy dialogue). It is therefore recommended that:

- Dietary diversity of children needs to be given more attention. Findings of the study shows that the diet diversity increased after project intervention significantly. This demands more coordinated work, as Children's dietary inadequacy level is too high.
- To increase diet diversity of young children, mothers' dietary diversity also need attention. In this study we see that when the diet diversity of the mothers increase, the childrens diet diversity increases too.
- Consolidated use of Social Behavioural Change Communication (SBCC) is recommended as it plays a critical role in addressing nutrition-specific and nutrition-sensitive interventions.

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