

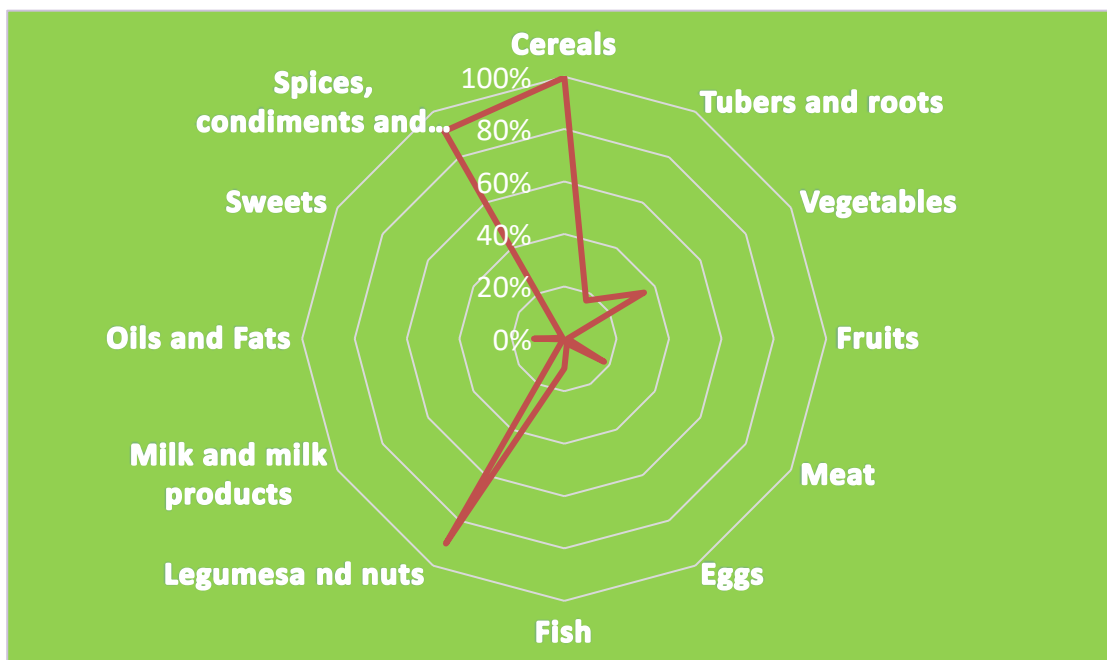
Sesame Business Network Support Programme



Sesame
Business
Network
Ethiopia

Nutrition Baseline Survey Report 2018

Dietary Diversity in Sesame Dominated Production Zones of Northwest Ethiopia



Food Consumption Pattern

October, 2018
Benefit-SBN (Sesame Business Network) Ethiopia

About the Sesame Business Network (SBN) Ethiopia

The SBN is a largely informal innovation network that is driven by local entrepreneurs and other stakeholders to work towards more competitive, sustainable sesame sector development for farmers' income improvement and spill-over effects. The SBN and its support project-Benefit-SBN are driven by entrepreneurs and stakeholders at different levels who work together to realize their individual and common economic goals.

SBN is built around 13 woredas (districts)/151 kebeles (wards) in Amhara and Tigray in northwest Ethiopia. The woredas are: Kafta Humera, Wolkait, Tsegede, Tselemti, Asgede Tsimbilila and Taytay Adyabo (Tigray) and Quara, Metema, Tach Armachiho, Mirab Armachiho, Tegede, Belessa and Jawi (Amhara).

Benefit-SBN support project provides various support facilities making a consolidated effort towards ensuring that stakeholders of the SBN jointly develop for improved value chain performance and farmer benefits.

Hosted by the Amhara Region Agricultural Research Institute (ARARI) and Tigray Agricultural Research Institute (TARI) at Gondar ARC and Humera ARC respectively, an interdisciplinary team of agronomists, economists and communication and extension professional coordinate and implement Benefit-SBN. Included in the team are advisors from the Wageningen UR Center for Development Innovation (CDI) who provide both administrative and programmatic support to the project.

Contact: sbnethiopia@gmail.com

More information: www.sbnethiopia.org

Partners of the Benefit-SBN



Nutrition Baseline Survey Report

Dietary Diversity in Sesame Dominated Production Zones of Northwest Ethiopia

**October, 2018
Benefit-SBN (Sesame Business Network) Ethiopia**

Table of contents

| | |
|---|-----------|
| About the Sesame Business Network (SBN) Ethiopia | 2 |
| 1. Introduction..... | 5 |
| Objectives..... | 6 |
| 2. Methodology | 7 |
| Study area | 7 |
| Sampling..... | 7 |
| Data collection method..... | 8 |
| Method of data analysis..... | 8 |
| 3. Findings | 9 |
| Socio-demographic characteristics | 9 |
| Crop production | 10 |
| Crop use, Storage and Processing | 11 |
| Food shortage of different crop types | 11 |
| Awareness of respondents about (under) nutrition | 13 |
| Nutrition Extension Services | 13 |
| Household Dietary Diversity Score (HDDS) | 14 |
| 4. Summary and conclusion | 16 |
| 5. REFERENCES..... | 18 |
| 6. Annexes | 19 |

Table

| | |
|--|----|
| Table 1 Socio-economic characteristics of respondent households | 9 |
| Table 2 Main sources of income for respondent households..... | 10 |
| Table 3 The main use of growing crops and rearing animals by respondent households | 11 |
| Table 4 Parameters used by respondents to identify a person with (under)nutrition | 13 |
| Table 5 Nutrition extension service provision to respondent households | 13 |

Figures

| | |
|--|----|
| Figure 1 Map of Amhara region and Metema woreda | 7 |
| Figure 2 Crops and animal production by respondent households | 10 |
| Figure 3 Reasons why respondent households do not have a home garden | 11 |
| Figure 4 Accessibility and affordability of different food types by respondent households | 12 |
| Figure 5 Months of the year when respondent households face shortage of specific food types..... | 12 |
| Figure 6 Food types most commonly consumed by respondent households | 14 |
| Figure 7 Dietary Diversity Score of respondent households..... | 15 |
| Figure 8 Crop types produced by respondent households | 19 |
| Figure 9 Livestock production by respondent households | 19 |
| Figure 10 Use of input for different crops..... | 20 |
| Figure 11 Shortage of different food types and months of the year respondent households face shortage..... | 20 |

1. Introduction

The development agenda on nutrition is gradually shifting from examining nutrition from a purely quantitative perspective towards dietary diversity. The concept of hidden hunger is created through this transition to describe a situation where calorie intake, weight and height are within the norms, but there is a serious shortage of fundamental macro- and micronutrients (Muthayya et al., 2013). This usually happens when diets mainly consist of starchy staples and not enough nutrient-rich foods such as fruits, vegetables, legumes, and animal-source foods. A varied, nutritional and balanced diet prevents the lack or excess of nutrients in the diet and reduces the malnutrition rates in the population. However, malnutrition is still high in rural populations and they have higher risk of food and nutritional insecurity. A household has food security when they have access throughout the year to the quantity and variety of safe foods that its members require to lead an active and healthy life (FAO, 1996). In the contrast nutrition security exists when, in addition to having access to healthy and balanced diet, people also have access to adequate caregiving practices and to a safe and clean environment that allows them to stay healthy and utilize the foods they eat effectively.

The Ethiopian National Food Consumption Survey (NFCS, 2013), conducted using individual-level 24-hour dietary recall data among women and young children identified an encouraging reduction of malnutrition among children. Stunting, underweight and wasting were reduced from 58% to 44%, 41% to 29%, and 12% to 10%, respectively between the periods of 2000 to 2011. However, malnutrition is still a public health problem and remains a concern within the country's rapid economic development (NFCS, 2013). The highest prevalence of food energy deficient households is found in Addis Ababa (50%), Amhara (49%), and Tigray (42%).

Most farm households in the sesame production zones of Northwest Ethiopia have very limited culture of planting and consuming leafy vegetables, roots, tubers, and fruits. It is mainly due to the arid nature of the area and scarcity of water during dry season. Therefore, households in these areas mainly consume cereal dominated foods, Injera (pan cake) made of flour mixed with sorghum and teff topped with sauce made mainly from field pea flour (shiro); and sometimes supplemented with animal products. Therefore, the lack of diversity in meals specifically vegetables and fruits which are rich in vital nutrients, vitamins and minerals is anticipated to lead to unrecognized malnutrition. Malnutrition is a serious, but common, health problem that occurs when the diet does not contain the right amount of nutrients in the right proportion even in a society eating three or more meals a day.

Many agricultural programs are not originally designed to affect nutrition but have a great potential to do so (Ruel & Alderman, 2013). It is difficult to deny the power of agriculture to affect smallholders' food security by influencing the availability and access to foods to create diverse diets and incomes

(Herforth et al, 2012). Therefore, the Benefit-SBN project with its partners conducted nutritional status and food security survey of households living in north west Ethiopia feeding predominantly on sorghum based food products.

Objectives

The main objective of the survey is to investigate the food consumption pattern of households in order to provide evidence-based information for planning and implementation of support activities which will contribute for the improvement fo food and nutrition security in SBN woredas.

Specific objectives include:

- Generating preliminary baseline information on food consumption patterns of households & labourers;
- Identify dietary and knowledge gaps (demography, geography, socioeconomic status);
- Explore possibilities of growing and consuming alternative nutrient dense crops/foods;

2. Methodology

The study adopted a cross-sectional descriptive survey design and conducted in July 2018 at Metema woreda Gendawuha Birshign and Mender6,7,8 kebeles.

Study area

Metema wereda is geographically located between 12°39' and 12°45'N, and 36°17' and 36°48'E. It covers an area of 399, 500 ha and its altitude ranges from 550 m to 1608 masl. The area receives a uni-modal rainfall, of ca 955 mm, from June to September. The annual mean minimum and maximum temperatures are 19.1°C and 35.6°C, respectively. The economy of Metema wereda depends predominantly on agricultural production. Settlers and commercial framers in the District extensively cultivate sesame, cotton and sorghum and raise goats and cattle. Agriculture is expanding and the area is growing in economic importance. Three crops (sesame, sorghum, cotton) comprise about 90% of the cultivated area in the district and are the major cash crops. Maize, tef, and finger millet are some of the food crops grown for home consumption (SBN primary baseline survey, 2015).

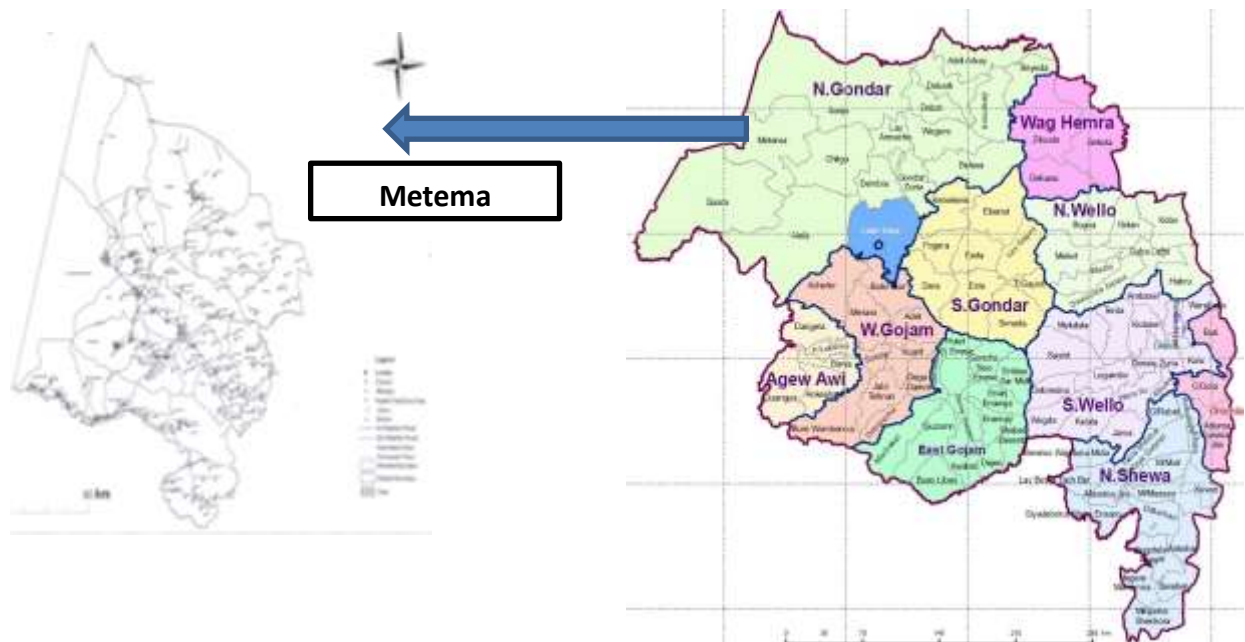


Figure 1 Map of Amhara region and Metema woreda

Sampling

The study used a multistage sampling procedure to select 71 sample households involving a combination of purposive and random sampling. Metema woreda was selected purposively because it is one of the support project woredas, there are both household types (small and large scale farmers) and the kebeles were selected because the home garden pilot was intended to be implemented by Benefit-SBN in these two kebeles. Participants households were selected randomly from sampling of farm households living in the two kebeles. The sampling frame for this study was obtained from the selected sample kebeles agriculture offices.

Data collection method

The study was conducted based on the data that were obtained through a farm household survey administered to 71 sample farm household heads drawn through multistage sampling technique. The data used for this study were derived from both primary and secondary sources. Primary data were collected through household questionnaire, focus group discussions, and personal field observations, while secondary data were collected from relevant local authority reports, books, and journals. Before conducting the actual survey, the questionnaire was pre-tested as a pilot survey in the sample villages. Accordingly, necessary adjustments were made based on inputs obtained during pre-test responses from farmers to ensure reliability and validity of the questionnaire.

A 24-hour dietary recall was conducted for seven consecutive days to obtain food groups information of respondent households consumed. A 24 dietary recall on food information was also collected from daily laborers working in the sesame sector. For the daily laborers because of their mobility it was difficult to collect the information for more days so it was only a 24 hour information.

Method of data analysis

Questionnaire data, which is gathered from respondents, was quantitatively analyzed, summarized, and presented in tables, graphs, and percentages.

Dietary Diversity Score (DDS) was used to analyze the collected data. DDS was used because it can serve as a proxy measure of the nutritional quality of the diet as a variety of foods in the diet and it can also be used as a proxy measure for the access dimension of household food security (WHO, 2015).

A descriptive statistics was used to analyze and present the result.

3. Findings

Socio-demographic characteristics

Respondents were from Metema woreda two kebeles (Gendawuha Birshign:41 (57.7%) and Mender6,7,8: 30 (42.3%)). The age of half of the respondents varies between 36-60 (50.7%) years with average age being 38.27 years. The heads of household have a low level of education (57.7% can't read and write and 42.3% of basic education). With regards to the household economy, more than 90% depend on farming for household income, and none of them are regular employee and they don't also get any remittance.

Table 1 Socio-economic characteristics of respondent households

| Parameters | Responses | Frequency | Percent |
|--|------------------------------|-----------|---------|
| Educational status | Do not read and write | 41 | 57.7 |
| | Able to read and write | 30 | 42.3 |
| Age group | 31 - 45 | 20 | 28.2 |
| | 46-60 | 36 | 50.7 |
| | >61 | 15 | 21.1 |
| Marital status | Married | 63 | 88.7 |
| | widowed | 5 | 7 |
| | Divorced or separated | 2 | 2.8 |
| | single | 1 | 1.4 |
| Do you have a home garden | No | 19 | 26.8 |
| | Yes | 52 | 73.2 |
| When do you perform home gardening? | Only during the rainy season | 50 | 70.4 |
| | Only during the dry season | 1 | 1.4 |
| | Year-round | 2 | 2.8 |

| Parameters | N | Minimum | Maximum | Mean | Std. Deviation | |
|---|-----------|---------|---------|--------|----------------|---------|
| Farm experience (years) | 71 | 0 | 46 | 22.04 | 10.694 | |
| Age (years) | 71 | 17 | 65 | 38.27 | 10.169 | |
| Permanent family size | 71 | 0 | 10 | 4.49 | 2.035 | |
| Cultivated (ha) | 71 | 1.5 | 13 | 5.27 | 2.72 | |
| | Own | 71 | 0 | 10 | 4.06 | 3.12 |
| | Rented in | 70 | 0 | 5.5 | 1.23 | 1.53 |
| | Shared in | 70 | 0 | 0.25 | 0.0036 | 0.02988 |
| Shared out | 70 | 0 | 4 | 0.1 | 0.515 | |
| Size of the home garden in m² | 52 | 50 | 3000 | 828.67 | 778.294 | |

With regards to the household economy, more than 90% depend on farming for household income, and none of them are regular employee and they don't also get any remittance.

Table 2 Main sources of income for respondent households

| Sources of income | Total N | Yes | | No | |
|---|---------|-----|-------|----|--------|
| | | N | % | N | % |
| Sale of own produced grains/crops or vegetables/fruits | 71 | 69 | 97.2% | 2 | 2.8% |
| Sale own produced animals or animal products | 71 | 64 | 90.1% | 7 | 9.9% |
| Sale of own produced or gathered goods/crafts | 70 | 4 | 5.7% | 66 | 94.3% |
| Casual labor/temporary salary | 70 | 6 | 8.6% | 64 | 91.4% |
| Petty trade / small business (mini shops, local drinks) | 70 | 5 | 7.1% | 65 | 92.9% |
| Employment/ regular salary | 70 | 0 | 0.0% | 70 | 100.0% |
| Remittances from relatives/husband/wife/children | 70 | 0 | 0.0% | 70 | 100.0% |
| Renting farm land to others | 70 | 3 | 4.3% | 67 | 95.7% |
| Other | 16 | 4 | 25.0% | 12 | 75.0% |

Crop production

All respondents reported that they have land with average land holding size of 5.27 ha and produce only 4 types of crops. 73.2 % of the respondents indicated that they have a home garden which is 828.67m² on average but more than 70% of the respondents revealed that they produce in the home garden only during the rainy season. More than 60% of the respondent households do have animal herds, less than 20% of the respondent households produce vegetable and less than 10% of them planted any fruit trees.

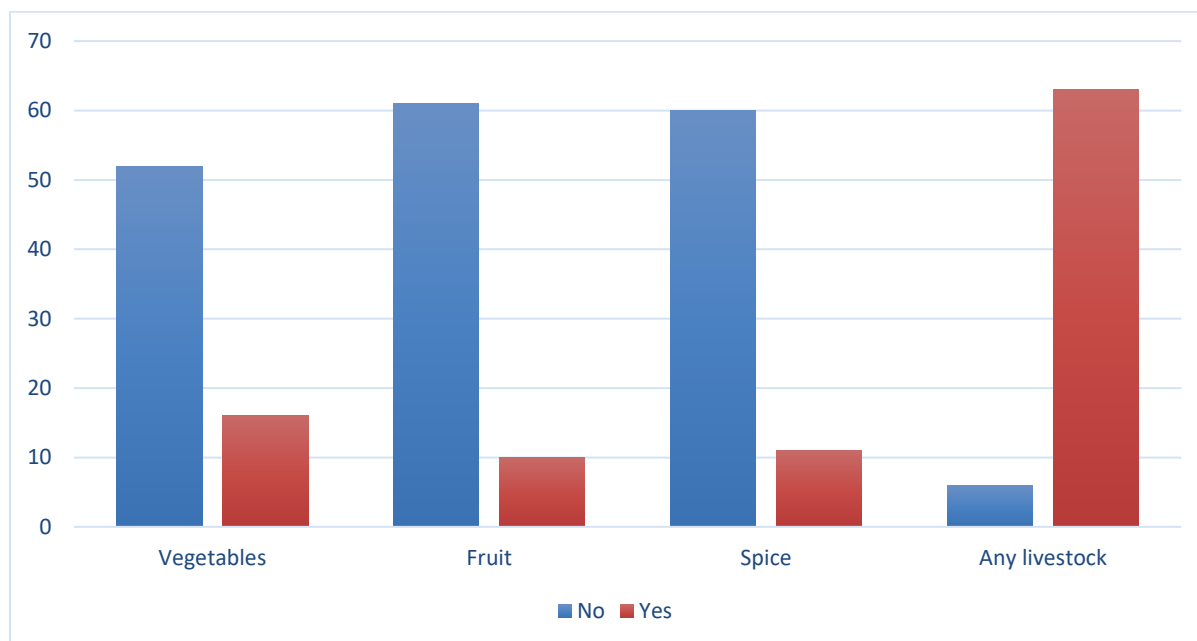


Figure 2 Crops and animal production by respondent households

Of the respondents in the surveyed area 26.8% don't have a home garden plot. They were asked why they don't have a home garden and 68% of them it is because they lack the basic knowledge about home gardening, 89.5 of them said the have time constraint to do home gardening and lack of access to input and water source were the main reasons for not having a home garden by respondents.

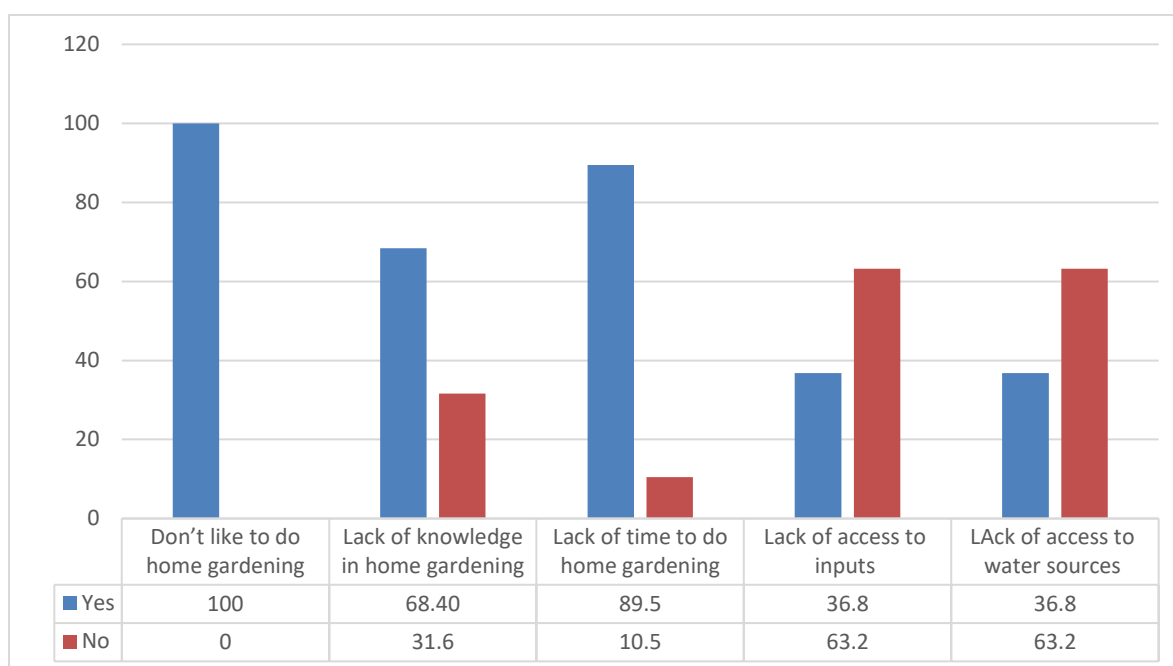


Figure 3 Reasons why respondent households do not have a home garden

Crop use, Storage and Processing

Most of the respondent households produce field crops both for mainly for own consumption and for sale. Only limited number of farmers in the study area produce vegetables which they use it mainly for home consumption. During focused group discussion, participants said that those who produce vegetables do not producing surplus but because of the perishability of the commodity they immediately sell to the market.

In the areas surveyed, some forms of post-harvest processes are used and the practice is equally prevalent in survey groups. However, a number of farmers responded as not going through any postharvest activities. Drying, cleaning, sorting and grading are the most prominent post-harvest activities. It might be related with the low production of especially perishable crops like vegetables and also limited post-processing knowledge farmers have.

Table 3 The main use of growing crops and rearing animals by respondent households

| What is the main use of | Own consumption | | For sale | | Both | |
|---------------------------|-----------------|-------|----------|-------|------|-------|
| | N | N % | N | N % | N | N % |
| Growing crops | 10 | 14.3% | 13 | 18.6% | 47 | 67.1% |
| Growing vegetables | 11 | 52.4% | 2 | 9.5% | 8 | 38.1% |
| Growing fruits | 2 | 33.3% | 1 | 16.7% | 3 | 50.0% |
| Rearing of animals | 35 | 56.5% | 0 | 0.0% | 26 | 41.9% |

Food shortage of different crop types

Most of the time on the issues of food security in Ethiopia are very general and consider the problem either from national or regional points of view. Sesame growing woredas in the lowland of Northwest Ethiopia are generally considered food secured and there is no ample information about the status of food security in SBN woredas. Though the aim of this survey was not assessing food security but it has

been tried the major problems related to food accessibility, affordability and months of the year which some food items get short in some farm households.

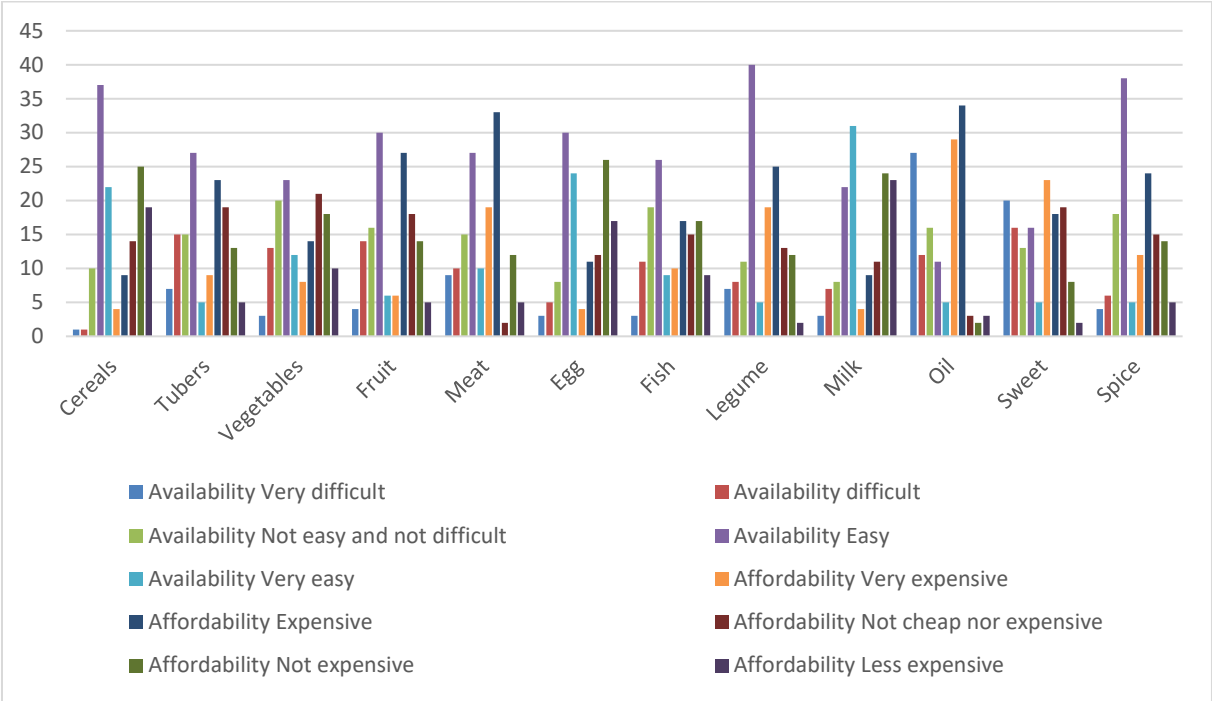


Figure 4 Accessibility and affordability of different food types by respondent households

Most of the respondents reported that for most the crop types availability is not an issue but affordability is their problem. During the FGD participants indicated that they face scarcity of supply of some crop types like vegetable, fruits and milk. They face food shortage especially from July to end of September or until harvest of the next production. 45.8 percent of households in Ethiopia reported some kind of food shortage in the year of 2013/2014, specifically in the months of May to September (Central Statistical Agency and The World Bank, 2015).

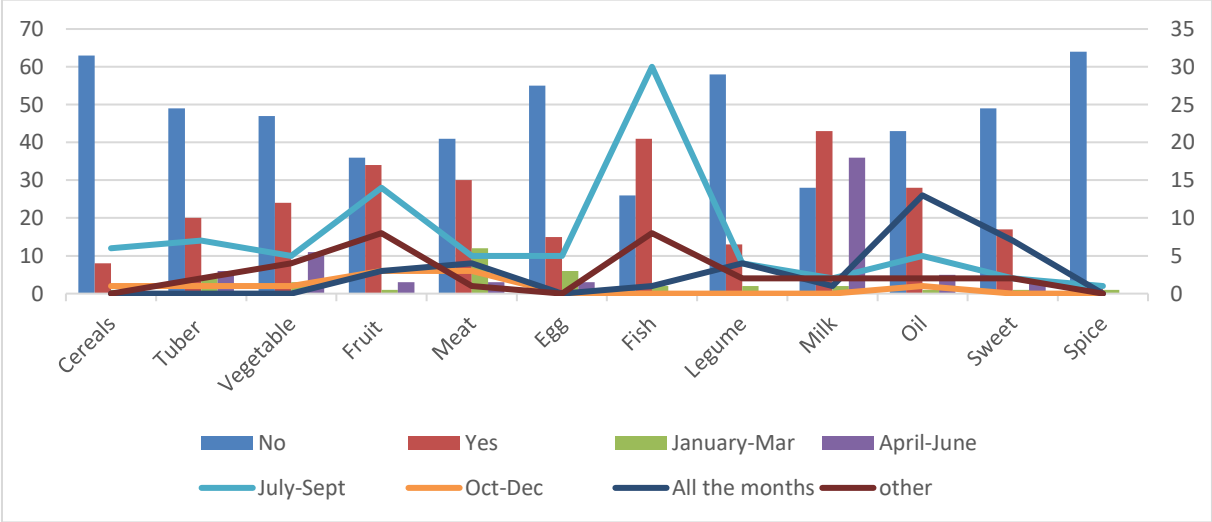


Figure 5 Months of the year when respondent households face shortage of specific food types

Awareness of respondents about (under) nutrition

Though there is understanding amongst respondents about (under) nutrition levels of awareness can be considered limited. There are substantial differences in perceptions among respondents, for instance 52.9% mentioned stunting as a major nutrition problem, while more than 47% of didn't perceived malnutrition as a major cause for stunting. Respondents were questioned what are the main reasons why people are malnourished and it was found that 52.9% of the respondents do not relate malnutrition with quality of food.

Table 4 Parameters used by respondents to identify a person with (under)nutrition

| How do you identify if a person is (under)nutrition | No | | Yes | |
|---|----|-------|-----|-------|
| | N | % | N | % |
| Lack of energy/weakness: cannot work, study or play as normal | 14 | 20.0% | 56 | 80.0% |
| Weakness of the immune system (becomes ill easily or becomes seriously ill) | 27 | 38.6% | 43 | 61.4% |
| Loss of weight/thinness | 17 | 24.6% | 52 | 75.4% |
| Children do not grow as they should (growth faltering/stunting) | 33 | 52.4% | 30 | 47.6% |
| What are the reasons why people are malnourished? | | | | |
| Not getting enough and varied food | 12 | 17.4% | 57 | 82.6% |
| Food does not contain enough nutrients (minerals and vitamins) | 36 | 52.9% | 32 | 47.1% |
| Disease/ill and not eating food | 15 | 22.1% | 53 | 77.9% |

Nutrition Extension Services

Adequate and proper nutrition is an important aspect of a healthy lifestyle. Therefore, it has paramount importance to create and promote awareness of the nutrients contained in foods and their benefits. Thus, given the roles played by nutrients in promoting health and optimal functioning in humans, counseling and education about diet and nutrition need to be made a priority by all relevant stakeholders. Around 70% of the respondents said that they get nutrition extension service mainly from the health extension worker at kebele level. The role of agricultural development agents regarding nutrition extension seems very limited (only 28.2%) according to survey participants.

Table 5 Nutrition extension service provision to respondent households

| Extension services and sources | | N | % |
|---|-------|----|------|
| Do you get extension services | No | 22 | 31.0 |
| | Yes | 49 | 69.0 |
| From whom you get the service | | | |
| Health extension worker | No | 20 | 28.2 |
| | Yes | 49 | 69.0 |
| Agricultural extension service (development agents) | No | 54 | 76.1 |
| | Yes | 14 | 19.7 |
| | Total | 68 | 95.8 |
| Do you participated in any cooking demo | No | 48 | 67.6 |
| | Yes | 22 | 31.0 |

Household Dietary Diversity Score (HDDS)

The household nutrition status was assessed using the HDDS which is developed by United Nations World Food Programme. It is the count of the number of nutritional food groups consumed by a household in a reference period, in our case for seven consecutive days (Swindale et al, 2006). A scale of twelve food groups was used in assessing the dietary diversity of the respondents: a) cereals, b) roots and tubers, c) pulses and nuts, d) vegetables, e) fruit, f) meat, g) eggs, h) fish, i) milk and dairy products, j) oil and fats, k) spice and condiments, and l) sweets. The most consumed food groups by the households were: cereals (100%); pulses or nuts (90.0%); spices (91%); vegetables (35%), tuber and root crops (17%); and oils/fats (12%). WHO recommends to an individual to eat at least 400g (5 portions) of fruits and vegetables a day for healthy life, however the survey revealed that fruits were consumed the least by sesame farm households. It was also found that the average HDDS stood at the lowest HDDS tercile (3.8), what means that there is a low dietary diversity.

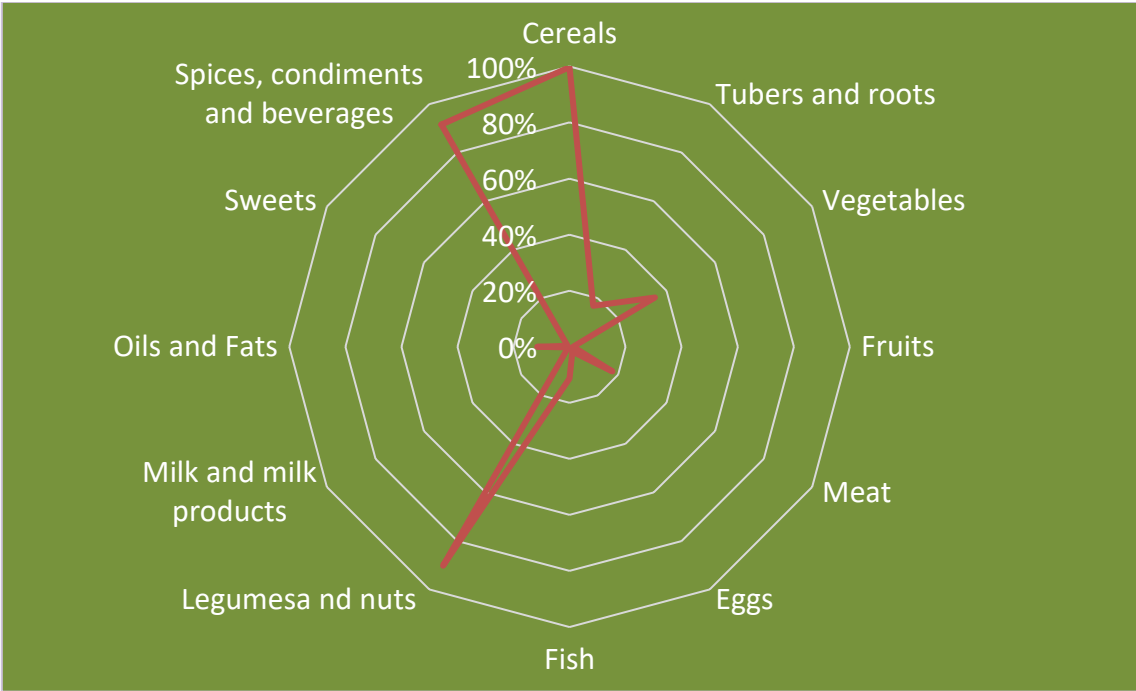


Figure 6 Food types most commonly consumed by respondent households

The household dietary diversity levels, considered as the group variable and it is divided into three categories: Low food diversity = 1; Medium food diversity = 2 and High food diversity = 3. It was found that 37% of the surveyed households consume between 0 and 3 food groups, whereas none of them consume more than 6 food groups (No HH in high DDS). Most of them (95.5%) consume less than 6 food groups.

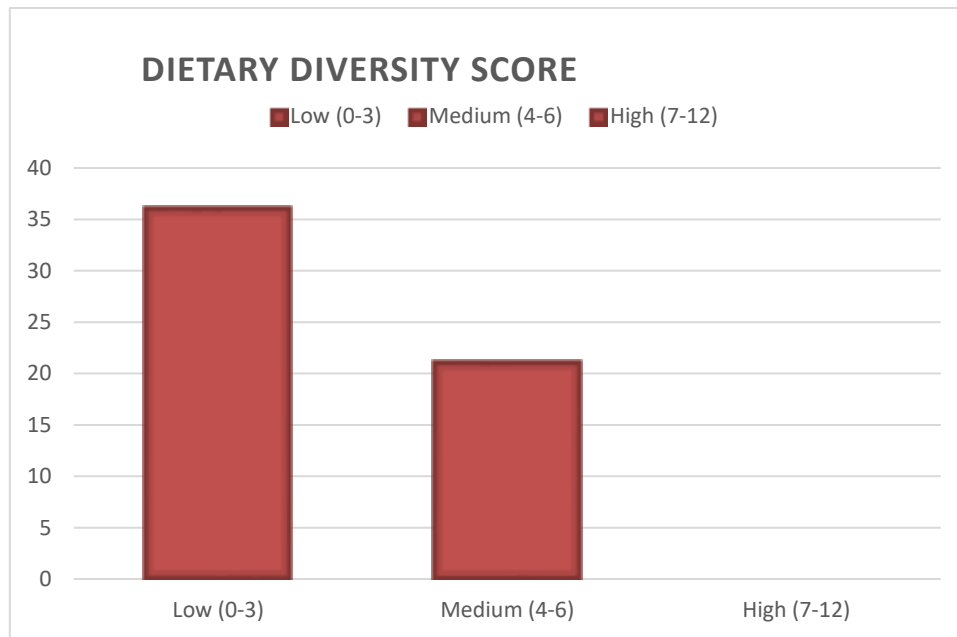


Figure 7 Dietary Diversity Score of respondent households

A 24 hours recall of laborers feed intake information was collected from 30 daily laborers at Metema and Quara woredas. Because of their mobility it was difficult to record dietary information of laborers so it was only a 24 hours recall of feed intake information that was collected. The DDS score of laborers was even low where 64% of them eat only less than 3 food groups. Nationally, 58% of households consume four or fewer out of seven food groups (Starches, Pulses Vegetables, Fruit, Meat, Oil, Sugar and Dairy), and 30% consume three or fewer. The highest percentage of households consuming three or fewer food groups (out of seven) are found in Afar (47%), SNNPR (43%), Somali (38%) and Amhara (36%). Rural households are more likely to have less diverse diets (34% consume three or fewer food groups) than urban households (16%) (Ethiopia CFSVA, 2013). In this survey it was also found that the average HDDS lies at the lowest HDDS tercile (3.5), which indicates a significantly low dietary diversity.

4. Summary and conclusion

The survey aim at estimating the dietary diversity of sesame farm households and assess associated factors for further intervention and support services. The survey indicated that sesame farmers mainly produce sesame, cotton and sorghum; sorghum being the main source of food for these farm household. Beans, vegetables and spices are used to prepare sauce (Shiro) which complement the main dishes. Small holder farmers who mainly produce few types of crops like sesame farmers in the Northwest Ethiopia have a bigger risk of suffering food and nutrition insecurity. In this survey it was also found that the average HDDS lies at the lowest HDDS tercile (3.5), which indicates a significantly low dietary diversity. The findings of the survey implies that in 2019 and possible next phase (beyond 2019) Benefit-SBN should focus on the following theme to enhance sesame farm households food security and nutrition status.

Production diversity through scaling up of rotation crops:

To sustainably provide varied food and thereby ensure nutritional food security of farm households, improving the diversity of agricultural production systems is increasingly recognized as a potential alternative (Otilia, 2017). Benefit-SBN has been promoting rotational crops (soy bean and mung bean) in the intervention woredas which is an important step for nutrition and food security of sesame farmers. The effort has to be further strengthened by adding more crop types and further scaling it up to different woredas.

Scaling up the home gardening pilot:

Home gardens are one of the world's most ancient food production sites with diverse practices (Gari, 2004; Nordic, 2005; Landauer and Brazil, 1990). When well developed, they contribute significantly to household food security by providing direct access to food that can be harvested, prepared and fed to family members. Growing diversified nutrient packed fruits and vegetables in home gardens contribute to improved nutrition of the household members (SATNET ASIA, 2014). Most importantly, home gardens generate additional income for the family through the sale of a surplus produce. It is more important in overcoming seasonal availability of foods and promotes household self-sufficiency. Thus home gardens are important to families because they provide income and sustenance throughout the year from the diversity of crops contained within them which are harvested at different times (Ogundiran, 2013). Benefit-SBN has piloted home gardening in the woreda and seen promising results. Taking into account the lessons from the piloting phase, the home gardening activity should be scale out to other woredas and kebeles.

Social and Behavioral Change Communication Strategy:

Social and Behavioral Change Communication is one of the best known strategies for improving the impact of nutrition-sensitive interventions, including agriculture, and particularly effective in improving household nutrition status. It is a behavior centered approach which facilitate adoption of improved practices by enhancing the understanding of individuals, household members and communities in general. The SBCCS strategy should be selected carefully since the method and pathway we use is dependent on knowledge, awareness, motivation to act, familiarity and habituation of individuals and communities, which are often influenced by perceptions of social norms, attitudes and beliefs (SNV, 2017). Effort has been made by Benefit-SBN so far to create awareness on preparation of different recipe from home garden crops and rotation crops. The promotion activity should be in a more organized way and scaled out in other woredas. The support programme should design a SBCC to bring about the desired behavioral change related to nutrition in SBN woredas.

5. References

- Central Statistical Agency (CSA), 2014. Ethiopia Comprehensive Food Security and Vulnerability Analysis (CFSVA, March 2014. CSA and World Food Program (WFP)
- Central Statistical Agency and The World Bank. (2015). Ethiopia Socioeconomic Survey (ESS) - 2013/14.
- Ethiopia National Food Consumption Survey 2013. Ethiopian Public Health Institute. Addis Ababa, Ethiopia August, 2013, www.eph.gov.et.
- FAO, 2008. Promoting better nutrition through school gardening. North Shoa and southern Tigray food security project funded by Belgium and Spain. BSF/FAO newsletter, issue 8, October 2008.
- Landauer K. and Brazil M. (eds.) 1985. Tropical Home Gardens. Selected papers from an international workshop at the Institute of Ecology, Padjadjaran University, Indonesia, December 1985, United Nations University Press, Japan.
- Ogundiran O. Adekunle, 2013. The Role of Home Gardens in Household Food Security in Eastern Cape: A Case Study of Three Villages in Nkonkobe Municipality. *Journal of Agricultural Science*; Vol. 5, No. 10; 2013 ISSN 1916-9752, E-ISSN 1916-9760; Published by Canadian Center of Science and Education. Available at: www.ccsenet.org/ doi:10.5539/jas.v5n10p67 URL: <http://dx.doi.org/10.5539/jas.v5n10p67>.
- Otilia Vanessa Cordero-Ahiman, Eduardo Santellano-Estrada, Alberto Garrido, and Alberto Garrido, "Dietary Diversity in Rural Households: The Case of Indigenous Communities in Sierra Tarahumara, Mexico." *Journal of Food and Nutrition Research*, vol. 5, no. 2 (2017).
- Sesame Business Network (SBN) Support Programme (2015). Metema woreda primary baseline survey report. Unpublished.
- SNV, KIT, CDI, SDC, 2017. Triggering for positive behaviour change in nutrition- Insights gained from Sustainable Nutrition for All in Uganda and Zambia. Technical Brief No. 2. SNV Netherlands Development Organisation, The Hague, The Netherlands. Retrived from: http://www.snv.org/public/cms/sites/default/files/explore/download/sn4a_technical_paper_no_2_-_triggering_0.pdf. At November 02, 2018.
- Swindale, A., and Bilinsky, P., "Household Dietary Diversity Score (HDDS) for measurement of household food access: Indicator guide," Food and Nutrition Technical Assistance Project, Academy for educational Development, 11. 2006.
- The Network for Knowledge Transfer on Sustainable Agricultural Technologies and Improved Market Linkages in South and Southeast Asia (SATNET Asia), 2014. Improving Food and Nutrition Security through Home Gardens. "Training Report". National Agriculture and Forestry Research Institute (NAFRI), Ministry of Agriculture and Forestry Vientiane, Lao PDR, 28 April –2 May 2014.
- United Nation Food and Agriculture committee on world food security, part 1, 1996. World Health Organization (WHO), "Healthy diet," 2015. Retrived from: <http://www.who.int/mediacentre/factsheets/fs394/en/> (Accessed September 2018).

6. Annexes

| Do you grow | No | | Yes | |
|---------------------|----|--------|-----|-------|
| | N | % | N | % |
| Field crops | | | | |
| Sesame | 5 | 7.0% | 66 | 93.0% |
| Sorghum | 7 | 9.9% | 64 | 90.1% |
| Cotton | 42 | 59.2% | 29 | 40.8% |
| Maize | 13 | 18.3% | 58 | 81.7% |
| Finger millet | 65 | 91.5% | 6 | 8.5% |
| Teff | 31 | 43.7% | 40 | 56.3% |
| Soy bean | 70 | 98.6% | 1 | 1.4% |
| Mung bean | 70 | 98.6% | 1 | 1.4% |
| Vegetables | | | | |
| Tomatoes | 57 | 81.4% | 13 | 18.6% |
| Onions | 66 | 94.3% | 4 | 5.7% |
| Carrots | 69 | 98.6% | 1 | 1.4% |
| Lettuce/Swiss chard | 61 | 87.1% | 9 | 12.9% |
| Cabbage | 66 | 94.3% | 4 | 5.7% |
| Green pepper | 61 | 87.1% | 9 | 12.9% |
| Beet root | 70 | 100.0% | 0 | 0.0% |
| Garlic | 70 | 100.0% | 0 | 0.0% |
| Fruit crops | | | | |
| Mango | 65 | 91.5% | 6 | 8.5% |
| Lemon | 66 | 93.0% | 5 | 7.0% |
| Orange | 66 | 93.0% | 5 | 7.0% |
| Papaya | 66 | 93.0% | 5 | 7.0% |
| Banana | 69 | 97.2% | 2 | 2.8% |
| Guava | 71 | 100.0% | 0 | 0.0% |
| Spices | 60 | 84.5% | 11 | 15.5% |

Figure 8 Crop types produced by respondent households

| Do you have | No | | Yes | |
|------------------------|----|-------|-----|-------|
| | N | % | N | % |
| Shoat (sheep and goat) | 36 | 51.4% | 34 | 48.6% |
| Cattle (cows) | 10 | 14.3% | 60 | 85.7% |
| Poultry (chicken) | 15 | 21.4% | 55 | 78.6% |
| Other | 23 | 65.7% | 12 | 34.3% |

Figure 9 Livestock production by respondent households

| Input use | No | | Yes | |
|-------------------------------|----|--------|-----|-------|
| | N | N % | N | N % |
| Did you use fertilizer | | | | |
| Sesame | 67 | 94.4% | 4 | 5.6% |
| Sorghum | 64 | 90.1% | 7 | 9.9% |
| Cotton | 59 | 83.1% | 12 | 16.9% |
| Maize | 65 | 91.5% | 6 | 8.5% |
| Finger millet | 68 | 97.1% | 2 | 2.9% |
| Teff | 58 | 82.9% | 12 | 17.1% |
| Soy bean | 70 | 100.0% | 0 | 0.0% |
| Mung bean | 70 | 100.0% | 0 | 0.0% |
| Did you use chemical | | | | |
| Sesame | 33 | 46.5% | 38 | 53.5% |
| Sorghum | 19 | 26.8% | 52 | 73.2% |
| Cotton | 49 | 69.0% | 22 | 31.0% |
| Maize | 63 | 88.7% | 8 | 11.3% |
| Finger millet | 66 | 94.3% | 4 | 5.7% |
| Teff | 40 | 58.0% | 29 | 42.0% |
| Soy bean | 68 | 97.1% | 2 | 2.9% |
| Mung bean | 70 | 100.0% | 0 | 0.0% |

Figure 10 Use of input for different crops

| Do you face shortage of | No | | Yes | | Which months of the year | | | | | | | | | | | |
|-------------------------|----|-------|-----|-------|--------------------------|-------|------------|-------|-----------|-------|---------|-------|----------------|-------|-------|-------|
| | | | | | January-Mar | | April-June | | July-Sept | | Oct-Dec | | All the months | | other | |
| | N | % | N | % | N | % | N | % | N | % | N | % | N | % | N | % |
| Cereals | 63 | 88.7% | 8 | 11.3% | 1 | 12.5% | 0 | 0.0% | 6 | 75.0% | 1 | 12.5% | 0 | 0.0% | 0 | 0.0% |
| Tuber | 49 | 71.0% | 20 | 29.0% | 4 | 20.0% | 6 | 30.0% | 7 | 35.0% | 1 | 5.0% | 0 | 0.0% | 2 | 10.0% |
| Vegetable | 47 | 66.2% | 24 | 33.8% | 3 | 12.5% | 11 | 45.8% | 5 | 20.8% | 1 | 4.2% | 0 | 0.0% | 4 | 16.7% |
| Fruit | 36 | 51.4% | 34 | 48.6% | 1 | 3.1% | 3 | 9.4% | 14 | 43.8% | 3 | 9.4% | 3 | 9.4% | 8 | 25.0% |
| Meat | 41 | 57.7% | 30 | 42.3% | 12 | 42.9% | 3 | 10.7% | 5 | 17.9% | 3 | 10.7% | 4 | 14.3% | 1 | 3.6% |
| Egg | 55 | 78.6% | 15 | 21.4% | 6 | 42.9% | 3 | 21.4% | 5 | 35.7% | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| Fish | 26 | 38.8% | 41 | 61.2% | 2 | 4.9% | 0 | 0.0% | 30 | 73.2% | 0 | 0.0% | 1 | 2.4% | 8 | 19.5% |
| Legume | 58 | 81.7% | 13 | 18.3% | 2 | 16.7% | 0 | 0.0% | 4 | 33.3% | 0 | 0.0% | 4 | 33.3% | 2 | 16.7% |
| Milk | 28 | 39.4% | 43 | 60.6% | 2 | 4.7% | 36 | 83.7% | 2 | 4.7% | 0 | 0.0% | 1 | 2.3% | 2 | 4.7% |
| Oil | 43 | 60.6% | 28 | 39.4% | 1 | 3.7% | 5 | 18.5% | 5 | 18.5% | 1 | 3.7% | 13 | 48.1% | 2 | 7.4% |
| Sweet | 49 | 74.2% | 17 | 25.8% | 1 | 6.7% | 3 | 20.0% | 2 | 13.3% | 0 | 0.0% | 7 | 46.7% | 2 | 13.3% |
| Spice | 64 | 97.0% | 2 | 3.0% | 1 | 50.0% | 0 | 0.0% | 1 | 50.0% | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |

Figure 11 Shortage of different food types and months of the year respondent households face shortage