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Home-Garden Production and Women Dietary Diversity: An Experience from Success of Micro-Intervention in Boru Meda Kebele, Ethiopia

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ABSTRACT

Background: In order to combat malnutrition and micronutrient deficiencies, Nutrition Sensitive Agriculture (NSA) gives nutrient-dense foods, dietary diversity, and food fortification the highest priority. This micro-intervention project's goal is to increase home-gardening system's contribution to raising women's dietary diversity score (WDDS) by diversifying family farming practices. **Methods:** In Ethiopia's Boru-Meda Kebele, The authors applied the intervention to 40 specifically chosen female beneficiaries between the ages of 15 and 49. FAO's standardized questionnaire was used as a tool to conduct an initial and end-line dietary diversity survey by giving careful consideration to cultural and religious elements. The qualitative information was also gathered using case studies, key informant interviews, and focus group discussions. **Results:** The local population's diet was dominated by staple cereal crops, and women were less knowledgeable about home gardening and diverse diets. Before intervention, the average number of food groups produced and consumed was 2.63±1.00 and 3.68±1.16 respectively. The intervention enhanced the WDDS to 6.13±0.76, and the production diversity to 5.63±0.90. The intervention changed the community's consumption and production patterns, especially among women. **Conclusion:** Home-garden agriculture helps to increase WDDS. As a result, development partners must concentrate on farming system diversification by increasing the accessibility of vegetable seeds and educating local farmers about the contribution of diversified vegetable production and consumption. Strengthening the cooperation among stakeholders and maintaining monitoring of activities should also be given due emphasis.

Keywords: *Dietary diversity; Diversified production; Home garden agriculture; Nutrition sensitive agriculture; Women dietary diversity*

Introduction

The long-standing global development objective has been to increase immunity and decrease illnesses through proper diet (Marzban *et al.*, 2022) . Still, one of the biggest problems in the world is finding enough nutritious, secure, and quality food for everyone (Fanzo *et al.*, 2013). Globally, 815 million people are chronically undernourished, 155 million children under five are stunted, 52 million children are wasted, and roughly 2 billion people endure micronutrient

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malnutrition (IFPRI, 2017). In many poor countries, undernutrition and micronutrient deficiencies continue to be serious issues (Mbwana and Yildiz, 2020, Ochieng *et al.*, 2017, Sekabira and Nalunga, 2020, Sibhatu *et al.*, 2015).

Smallholder farmers' ability to produce crops has an impact on the diversity of their diets and their economic situation (Fitch *et al.*, 2015) . Due to the numerous ways in which it can affect the underlying factors determining nutrition outcomes, the sector has a direct connection to nutrition (Ruel *et al.*, 2018). It provides food, nutrients, and revenue, and it also has a direct impact on food prices (Malapit *et al.*, 2013, Wordofa *et al.*, 2020). A rising number of governments, donor organizations, and development organizations are dedicated to helping the industry to support nutrition-sensitive agriculture and make it more prevalent (Malapit *et al.*, 2013, Ruel *et al.*, 2018). Because smallholder farmers heavily rely on self-cultivated crops for consumption, diverse food production enhances the variety of the household diet (Dupouy and Gurinovic, 2020, Harris-Fry *et al.*, 2020, Melby *et al.*, 2020, Sariyev *et al.*, 2020).

Nutritionists frequently emphasize home-garden agriculture as the primary means of improving household food security and nutritional status, particularly for the underprivileged in developing nations (Chegere and Stage, 2020). The diversity of food production, household income, the proportion of household spending on food, and literacy rate all affect dietary diversity. Inadequate birth rates, big families, and food insecurity are all correlated with low dietary diversification (Mulatu *et al.*, 2021).

Ethiopia's agricultural production is dominated by root crops and staple cereals, and lacks diversification in terms of dietary composition (Ministry of Agriculture and Natural Resource (MoANR) and Ministry of Livestock and Fisheries (MoLF), 2016). Depending on people's place of living and financial level, the average nutrient consumption in the nation varies (Mekonnen *et al.*, 2020). The production of smallholder farmers in Ethiopia, especially in rural areas, determines how much they consume. One of the numerous methods to increase dietary diversity for women and children is to increase agricultural production and productivity, especially by diversifying home gardening. Due to the physiological requirements of pregnancy and lactation, women of reproductive age (15-49 years old) are frequently nutritionally sensitive (FAO and FHI360, 2016). Recent studies on the effects of NSA programs and other agricultural investments on nutrition yielded a wealth of data. However, there are still substantial gaps in the documentation of the sustainability, scale-up possibilities and difficulties, and comprehension of its significance for Women Dietary Diversity (WDD) and nutrition security (Ruel *et al.*, 2018).

Diverse production may have a good impact on dietary diversity of women, according to the hypothesis of this study, which was formed after a comprehensive examination of the relevant literature and an analysis of the current local situation. Examining how diverse home-garden agriculture contributes to the dietary variety of women in Boru Meda Kebele, Ethiopia was the goal of this intervention. The study significantly advances lessons for development practitioners on the achievements and intervention tactics of varied home garden agriculture for sustainable dietary diversity of women in other similar agro-ecologies.

Materials and Methods

In Ethiopia's Boru-meda Kebele, researchers put the project into action. It is located 10 kilometres north of Dessie City's centre. It was chosen at random from among the city's six rural Kebeles. A total of 40 sample households were chosen proactively using three fundamental inclusion criteria. Mothers of 15-49 age were in the first category. The availability of resources for home garden agriculture production (such as land, labor, and water for irrigation), and the household's willingness to participate in training and carry out the micro-intervention project were the second and third target beneficiary selection factors.

Data collection and analysis

The authors put the project into effect to raise women's WDDS. In order to assess the effectiveness of intervention across different

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seasons while maintaining other factors constant, a preliminary and end line survey has been carried out at the start and end of the intervention on both harvesting and lean season. The information was gathered through a household survey with the help of a standard FAO questionnaire (FAO and FHI360, 2016), which was modified and translated into Amharic, the regional tongue. All the 10 food groups were listed on the questionnaire, and respondents were questioned about their recent 24-hour food consumption. In addition, for each consumed food products, the primary sources were categorized as purchased, produced, or gifted.

Data were carefully collected while taking into account the variables that influence dietary intake, such as culture, religion, holidays, etc. As a result, days other than Wednesday and Friday were used to collect data (when Orthodox Christians refrain from consuming animal source foods). Additionally, special occasions like religious festivals and celebrations, where a unique and varied food is presumed to be consumed, were taken into account. When mixed dishes were stated, the interviewer enquired about all the foods and the main components of the dish from the participants. They were also questioned about whether any additional food had been included in the dish. The interviewers also looked for possible food additions to drinks or in the preparation of them. The researchers investigated the meals and snacks which had not been mentioned after the participant had finished listing all the foods she had consumed. In order to account for the seasonal variation in consumption, baseline and end-line surveys were conducted. Because the community was rural and agricultural, data were gathered just before the harvest in order to be utilized as a baseline for tracking changes regarding the intervention.

In addition to the household survey, four focus group discussions were also conducted: two at the start of the intervention (one with beneficiaries and one without), and two at the conclusion of the intervention (again, one with the non-beneficiaries and the other with the beneficiaries). This was done to see how the initiative would affect the neighbourhood beyond only the recipients. Furthermore, key informant interviews with the Kebele DA, community leaders, and elders were done. Both Focus Group Discussion (FGD) and key informant interviews employed an interview guide.

The dietary diversity of women was examined using information on dietary intake collected from 24-hour recalls of women. The analysis used the number of food groups produced both before and after the intervention, together with their frequency and standard deviation. All the 10 food groups were discovered during data collection and were taken into account for calculating the mothers' dietary diversity scores in accordance with FAO guidelines. Data were presented via tables and graphics.

To analyse data, both qualitative and quantitative approaches were used. The qualitative data were analysed thematically by narrating and explaining the phenomenon under investigation. The quantitative data, on the other hand, were analysed using descriptive and inferential methods. Maximum, minimum, frequency, percentage, and mean were primarily used to describe the participants' household characteristics and their dietary scores. Furthermore, the paired samples t-test was used to determine whether or not there were statistically significant differences regarding the means of dietary diversity before and after intervention. Paired samples t-test is a statistical procedure which compares two means from two measurements of the same sample regarding two related groups of continuous dependent variables. In this case, this study includes two means (dietary diversity before and after intervention) collected from the same group of beneficiaries through baseline and end line surveys. Therefore, each beneficiary has paired means (baseline and end line means).

Results

The outcomes of the intervention are shown in this section. The mean of mother's education level was grade 2, as shown in **Table 1**. It is believed that moms' lower grade levels will have an impact

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on their food diversity awareness. Additionally, the average household had six members, which was large and had a detrimental effect on the diversity of dietary options. By increasing mothers' knowledge of nutritional diversity and creating diverse food categories, these factors support the appropriateness of the intervention.

Table 1. Demographic characteristics of beneficiaries.

Variables	Min	Max	Mean
Mothers' age	20	48	38
Family members under 5 years	0	2	0.5
Family members between 5-14 years	0	4	1
Total family size	4	10	6
Mother's education (grade) level	0	10	2
Husband's education level	0	12	5

The outcome in **Table 2** contrasts the levels of food group production and consumption before and after the intervention. Both the production and consumption of a variety of food groups underwent a considerable adjustment. Due to the increased degree of awareness, the authors also noticed a small change in the consumption and production of dairy and poultry products. Certain food groups, such as starchy staples, beans and peas, nuts and seeds, and other fruits continued to be consumed and produced as before. Consumption of other vegetables and fruits, green leafy vegetables high in vitamin A, and other vegetables increased from 37.5%, 25%, and 17.5% to 100%. Similarly, the production of other vegetables, fruits high in vitamin A, as well as other vegetables, increased from 10%, 10%, and 0% to 100%.

Local cabbage and Swiss chard were among the green leafy vegetables seed supplied during the intervention. Following the intervention, all the target recipients began growing and eating green leafy vegetables high in vitamin A. Their output and consumption both sharply grew to 100% as a result.

Additional vegetables supplied to the beneficiaries included carrot and beetroot, which were included in the category of other fruits and vegetables rich in vitamin A In the same vein, lettuce was one of the vegetables supplied to the target recipients, and was categorized under the food group of other vegetables. As a result, the distribution of various vegetables increased the number of food groups that the subjects produced and consumed.

Descriptive findings of the number of food groups produced and consumed both before and after the intervention are shown in **Table 3**. The number of food groups produced grew from one to four at minimum and from five to eight at maximum. After micro-intervention, an average of 5.63±0.90 food groups was produced, which was significantly more than the average intake of 2.63±1.05 before the intervention. Following the intervention, the minimum number of food groups consumed increased from two to five, and the maximum number of food groups consumed increased from six to eight. The minimum amount of the consumed food groups demonstrated that no one ate less than the typical amount of dietary diversity of the four food groups after the intervention. In comparison to the average consumption of 3.68±1.16 regarding food groups prior to the intervention, the average number consumed after was 6.13±0.76; this indicated that, prior to the intervention, the majority of women in the target group did not meet basic dietary diversification requirements for healthy living.

Table 4 presents inferential tests to provide evidence on the presence of a significant mean difference across different combinations. The paired samples test was conducted to determine mean difference between consumption before and after the intervention, mean difference between production and consumption after the intervention, and mean difference between production levels before and after intervention. This study indicated that there was a significant difference in mean regarding the dietary diversity of women before and after intervention (**Table 4**). Accordingly, the researchers rejected the null hypothesis and accepted the alternative hypothesis.

As it is shown in **Table 4**, the paired correlation value is positive and significant for all the

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combinations, implying that the mean value between paired samples increases proportionally and linearly. Moreover, there was a significant mean difference after production and consumption, confirming the contribution of diversified production to increased consumption of diversified food groups.

Table 2. Consumption and production before and after the intervention.

Food groups	Before the intervention				After the intervention			
	Production		Consumption		Production		Consumption	
	n	%	n	%	n	%	n	%
Starchy staple foods	38	95.0	40	100	38	95.0	40	100
Beans and peas	30	75.0	40	100	30	75.0	40	100
Nuts and seeds	0	0	0	0	0	0	0	0
Diary	30	75.0	22	55	35	87.5	28	70.0
Flesh food	2	5.0	5	12.5	2	5.0	5	12.5
Eggs	4	10.0	7	17.5	4	10.0	7	17.5
Vitamin A rich greens	4	10.0	15	37.5	40	100	40	100
Vitamin A rich vegetables	4	10.0	10	25.0	40	100	40	100
Other vegetables	0	0	7	17.5	40	100	40	100
Other fruits	0	0	1	2.5	0	0	1	2.5

Table 3. Average food groups produced and consumed per household.

Category	Before intervention				After intervention			
	Min.	Max.	Mean	SD	Min.	Max.	Mean	SD
Number of consumed food groups	2	6	3.68	1.16	5	8	6.13	0.76
Number of produced food groups	1	5	2.63	1.05	4	8	5.63	0.9

Table 4. Paired samples test result

Paired samples	Paired correlation		Paired samples test		
	Correlation	P-value	Mean	T-value	P-value
Mean consumption before intervention- Mean consumption after intervention	0.27	0.09	-2.35	-13.82	<0.001
Mean production after intervention- Mean consumption after intervention	0.38	0.017	-0.35	-2.48	0.018
Mean production before intervention- Mean production after intervention	0.32	0.043	-3.05	-17.78	<0.001




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Figure 1. Vegetable seeds distribution

Figure 2. A Model of a female-headed household (ISD supervisors' team at the left).

Figure 3. Monitoring activities by researchers.

Figure 4. Mothers and children on their vegetable farm land.

Figure 5. ISD and Rural Service Providers (RSP) team of supervisors

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Figure 6. Male participation in child caring and home-garden agriculture.

Discussion

In this study, women had a low level of dietary diversification before the intervention. The majority of women consumed less than four food groups on average each day. 95% of the participants were eating starchy foods like maize, barely, and wheat before the intervention. Prior to the intervention, only 10% of the respondents reported eating vegetables and greens high in vitamin A. Excessive consumption of starchy staple foods in this region may be due to the products' accessibility and availability as well as the population's lack of knowledge regarding the advantages of diverse food production and consumption. Before the intervention, the majority of participants grew less than three crops.

Key informants and focus group participants claimed that there was little dietary diversity among women in the neighbourhood. They had relatively little knowledge of diversified diets. The local community's culture and traditions had a significant impact on the diversity of eating practices, and the people's diet was dominated by staple cereal crops. Maize, wheat, faba beans, oats, and sorghum were among the main crops farmed in the area. Due to low level of understanding and cultural pressures, the community showed relatively little care for eating nutrient-dense foods. As a result, practically all the households in the area had consistent consumption patterns throughout the year. Inadequate intake of micronutrients was one of these situations which significantly added to the burden of malnutrition. There had not been also intervention on nutrition or nutrient-sensitive agriculture in the area to modify local residents' behaviour. Furthermore, there was virtually little coordination between agricultural and health extension workers' experts. These all contributed to the area's exceptionally low level of dietary diversification among females. In addition to the poor dietary diversity of women, children, and the household as a whole, only a small number of foods predominated. The availability of fruits and vegetables from home gardens helped to ensure dietary diversity (Poole *et al.*, 2019).

Through this micro-intervention, the authors found how home gardening might improve women's dietary diversification. The outcome demonstrated that all the participants produced and consumed a variety of food groups following the project's intervention. This finding was consistent with the research by (Campus and Mthatha, 2018, Sekabira and Nalunga, 2020), which found that households with non-agricultural practices as their primary source of food had the lowest household dietary diversity scores when compared to households with mixed-farming practices.

It was observed that empowerment of women and a rise in their level of participation in diverse vegetable producing activities depended heavily on training and dietary diversity awareness. Previous studies claimed that farmers' lack of understanding impacted the yield of vegetables (Gebru *et al.*,

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2019). To improving mothers and children's nutritional status, there is a need for significant engagement by concerned parties in the area of education to empower women (Zewdu *et al.*, 2020).

Case study 1

‘’I'm TM, by the way. I have two daughters. Since my husband passed away, I am now the household's head. Previously, we solely produced grain crops. Today, however, only one food group dominated our diet. After I joined the initiative and went through training, I used my tiny piece of land to produce a variety of food items using integrated and diversified production methods. This benefits my family, and diversifies our diets, which maintains our health, and increases our overall household enjoyment. I grow lettuce, head cabbage, tomatoes, carrots, garlic, and spices on this small plot of land.’’

Case study 2:

“… When I walk into my garden, I instantly feel peaceful. It is my inn, vacation spot, health, family's physician, and my security officer. On this small plot of land, I grow more than six different kinds of vegetables, including lettuce, beet root, potatoes, tomatoes, head cabbages, and carrots. It does not really matter how much land you own; what counts is how you manage it. The seed for the first producing season has been delivered to me by Wollo University. However, I saved some of the vegetables as a source of seed for the following production season while also eating some of the production. I am confident that I would not return to my prior state, during which my family and I solely consumed cereal crops and got our entire diet from them.’’

The production and dietary diversity of smallholders, especially women and children, are improved by working on behavioural changes using various methodologies. The evidence demonstrates that promoting multifaceted strategies like the expansion of agricultural value chain and helping small farmers to alter their production patterns can increase dietary diversity (Farsi Aliabadi *et al.*, 2021). The production of more food groups contributes significantly to increase in WDDS. According to a research by (Dillon *et al.*, 2014), a 10% increase in agricultural crop diversity leads to a 2.4% increase in dietary diversity

Case study 3:

"... We feed our kids a variety of fresh, healthy, and delicious foods. Home-gardening is providing us with a wonderful and additional food supply. Our kids have a promising future. They have access to a wide range of nutrient-dense fresh foods. We take good care of both our kids and our vegetables. As much as we serve the farm, it also serves us.’’

According to (FAO and FHI360, 2016), the minimum dietary diversity of women measures if women aged 15 to 49 eat at least five of the ten food groups during the previous day and night. It is possible to utilize a population's percentage of women (15–49 years old) who meet this requirement as a proxy indicator for improved micronutrient adequacy- a crucial aspect of diet quality. Thus, the results of the intervention indicated that women met FAO's basic standards for dietary diversity with a mean of 5.37.

The Institute for Sustainable Development (ISD) team of supervisors and Rural Service Providers (RSP) regularly monitored the project's progress (**Figure 1-6**). Through a variety of channels, including Fana Media (FM) broadcast program, the community was informed of the program's effectiveness and the most important lessons learned from its execution. We might infer from this intervention that giving people more power and developing their capacity can increase the variety of their diets. Evidence supports the idea that educating and empowering women improves the nutritional condition of both mothers and children (Zewdu *et al.*, 2020). Similarly, (Mbwana and Yildiz, 2020) reported that providing direct nutrition education to rural women influenced on the improvement of women's understanding.

Among other things, it is critical to support women to recognize their value in agricultural industry. Compared to women who lacked this

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empowerment, those who made agricultural decisions scored much higher regarding dietary diversification (Gupta *et al.*, 2019). Women's empowerment and participation in decision-making, independent of the level of technology adoption, had a favourable and significant impact on their dietary score, according to studies conducted in Ethiopia (Kassie *et al.*, 2020, Sariyev *et al.*, 2020). In Ethiopia, the majority of vegetable cultivation activities are carried out by women. This industry is primarily managed by women. According to studies, the availability of fruits and vegetables from home gardens helps to ensure dietary diversity (Gebru *et al.*, 2019, Poole *et al.*, 2019).

One significant accomplishment of this project was male's involvement in child care and food production in home gardens (**Figure 6**). Focus group participants and key informants confirmed that home gardening ,child rearing and feeding were viewed as feminine tasks. This research illustrated that people's beliefs and behaviours can change when they are aware of the nutritional aspects causing an illness (Marzban *et al.*, 2022) .

The study's main drawback was failure to translate the weights of various foods consumed by individual women into kilo calorie (Kcal), However, respondents were instructed at the outset of the survey to only report food consumption which was presumed to be greater than one teaspoon.

Conclusions

The implementation of nutrition-sensitive interventions improves the nutritional status of households, especially women and children. This study provides the proof that home-garden farming contributes to dietary diversity through diversifying consumption. It was concluded that supply of agricultural inputs like vegetable seeds and training programs, greatly enhance the production and consumption of a diverse range of food groups and guarantees the diversification of diets. According to the current study, if someone shows the locals the way, they will eagerly diversify their consumption and production. Based on this micro-intervention, the following recommendations are forwarded. The government and other development partners need to concentrate on the following issues:

- ✓ Increasing the availability of vegetable seeds and the local community's physical and financial access to them;
- ✓ Raising the level of local agricultural communities' awareness regarding diverse food production and consumption;
- ✓ Enhancing stakeholder connections and cooperation;
- ✓ Continual oversight and monitoring of efforts

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Authors' contribution

Jemal Abdulkerime M conceived the study, and Asegie Asrat M**.** expanded on the study's oversights and the research plan. Data were gathered by Jemal Abdulkerime M and Asegie Asrat M**.**, and the quantitative data were examined by Asegie Asrat M**.** and Jemal Abdulkerime M made a significant contribution regarding case studies and qualitative data, and Asegie Asrat M**.** made a significant contribution to writing the research. The final manuscript was approved by all the authors.

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Conflict of interests

The authors declared no conflict of interests.

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