Farm production diversity and commercialization on women and child dietary diversity in some selected areas in Bangladesh

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Abstract

Diversified agricultural production is considered a means to enhance food diversity at the household level, particularly in developing countries where subsistence farming is common .To our knowledge, no research have examined the effects of commercialization, farm production diversification and socio-demographic status on women's and children's dietary diversity**.** The influence of agricultural diversification, and commercialization on women's, and children's dietary diversity in Chattogram, Bangladesh is jointly examined in this research. Additionally, we examine the effects of individual agricultural methods and crop and livestock diversification as well as nutritional diversity independently.Data were obtained from 300 randomly selected families in a district. For model estimation, negative binomial regression was utilized. Diversity in women dietary composition was strongly and favorably correlated with family income. The WDD was 0.46 times lower likely of less than or equal to 25000 taka incoming people than greater than or equal to 26000 taka incoming people.The women diatery diversity was associated with family member. The WDD was 0.32 times lower for household size member 1 to 6 than the member of greater than 6. Furthermore, the diversity of women's diets was strongly correlated with market involvement.The people who attend market participation the WDD was 7.92 times higher for them than not to attend. The people who reared domestic animal the WDD was 0.36 times lower than who not reared.In case of children's diatery diversity, one unit increase of farm production the CDD rate increases 18%. The CDD rate among market participation (sale product) was 0.61 as low as the rate among non-market participation. Better market access and farm production diversity can be used to increase dietary diversity of women and children. The results emphasize the necessity of improving market access, family income, crop-livestock integration, small livestock, legumes, vegetables, and fruits for improved nutrition.

Key words: Production diversity; commercialization; dietary diversity; Chattogram – Bangladesh.

Chapter 1: Introduction

During the period 2014–16, it is anticipated that 795 million people globally suffer from malnutrition, with around 780 million of these living in developing nations (Saaka et al., 2017). Due to the reciprocal interdependence of their basic components, the notion of "Agriculture-Nutrition Linkages" for increasing food and nutrition security has emerged as a new topic of study (Kabir et al., 2022) .Diversified agricultural output like rearing livestock and crop production is more likely to supply a diverse choice of foods to the low population segment (Saaka et al., 2017) .Diversifying farm productivity is a reasonable and direct strategy to promote food diversity for subsistence farm households, an empirical investigation of the links between farm output diversity and household/individual dietary diversity yielded varied results that were context-dependent. The majority of research concluded that increasing agricultural production diversification improved nutritional diversity (Nandi et al., 2021). A gap is filled by the Minimum Dietary Diversity for Women of Reproductive Age (MDD-W), a dichotomous indicator established and verified as a proxy for micronutrient sufficiency (Adubra et al., 2019) . Women of reproductive age are especially prone to nutritional inadequacies, thus it's critical to support steps to enhance their nutrition that will also benefit their children's health, particularly through treatments aimed at the first 1000 days (from conception to the age of 24 months) (Adubra et al., 2019) . In three rural contexts, farm production variety was found to be positively associated with the MDD-W, while two studies looked into the relationship between the MDD-W and household food security indices (Adubra et al., 2019). If households consume what they produce, it stands to reason that families with different crops and animals should have diverse diets, which is why diverse farm output has been promoted as a strategy of increasing nutritional diversity (Saaka et al., 2017). Nutrition education raises awareness of malnutrition, the benefits of eating a nutritious diet, and the health consequences of eating different foods (Murendo et al., 2018).

Agriculture is the primary source of variety and nutritious meals in underdeveloped nations, and improved agricultural production through diversified farming can significantly impact food availability, diet, and nutrition (Murendo et al., 2018)

Agricultural commercialization, defined as farmers' increased engagement in input and output markets, is a crucial component of structural transformation and an important means for farmers to boost productivity and revenue (Kuijpers, 2018).Household income is increased through money gained from commercialization – crop and livestock sales, as well as income acquired through farm labor supply. Improved household income may allow households to spend their money more wisely on food and non-food products, such as healthcare, resulting in improved nutrition, health, and welfare (Murendo et al., 2018) . A rising body of research examining the impact of farm production diversity commercialization and nutrition education on household, maternal , and child nutrition is emerging. In Malawi, farm production diversity and commercialization are linked to food diversity in households, mothers, and children (Murendo et al., 2018) . In Mali, dietary diversity was found to be positively related to women's mean adequacy ratio. DDSs have also been observed to have a strong favorable link with nutrient sufficiency in children (Gupta et al., 2020) . Only a few studies have looked at the impact of nutrition education on household and individual-level nutrition in the literature on agriculture–nutrition links. Furthermore , to the best of our knowledge, no research have looked at the effects of nutrition education, farm diversification, and commercialization on household, women's, and child dietary diversity, particularly in Bangladesh. Furthermore, we disaggregate farm production diversity into crop and livestock diversity and examine their distinct correlations with household, women's, and kid dietary diversity, as well as nutrition education and commercialization. The majority of published research focuses on nutrition outcomes at the household level, failing to capture the effects at the individual level. We also look into the impact of certain crop and livestock methods on the dietary diversity of households, women, and children. Little research has been done in these areas.

Using cross-sectional survey data from 300 smallholder agricultural households randomly selected from Bangladesh's Chittagong district, this paper seeks to fill these gaps.

1.1 Objectives and Goal of the study

The goal of the study was

1) To observe the socio-demographic status of household.

2) Participant distribution of WDD, and CDD in different food groups

3) To examine how the influence of production diversity, market participation, rearing domestic animal and socio-demographic factors on WDD and CDD.

Chapter 2: Materials and Methods

2.1. Study design, area, and period

A community based cross-sectional study was conducted at Lohagara and Satkania, Chattogram during the period from 17th February to 28th April. Lohagara and Satkania are the Upazila of Chattogram District in the division of Chattogram, Bangladesh. According to the 2011 Bangladesh census, Lohagara Upazila had 52,873 households and a population of 279,913, 10.7% of whom lived in urban areas. 12.1% of the population was under the age of 5. The literacy rate (age 7 and over) was 49.2%, compared to the national average of 51.8%. Lohagara Upazila is divided into nine union parishads. The union parishads are subdivided into 40 mauzas and 43 villages.

Satkania Upazila had 70,808 households and a population of 384,806, 14.1% of whom lived in urban areas. 12.0% of the population was under the age of 5. The literacy rate (age 7 and over) was 52.7%, compared to the national average of 51.8% (Division, 2011). Satkania upzila is divided into Municipality and 17 union. The union parishads are subdivided into 73 mauzas and 84 villages. Satkania Municipality is subdivided into 9 wards and 19 mahallas (Planning et al., 2013)

Fig – 1: Map of Lohagara Upazila

Fig – 2: Map of Satkania Upazila

2.2. Data Collection

The structured questionnaire was used to collect data from face-to-face interviews with household persons. There are three primary sections to the survey: socio-demographic factors include the age of the mother, the education and occupations of the parents, the type of family and its members; anthropometric, other components include livestock rearing, microcredit loan taking, and nutrition knowledge. The dietary diversity was assessed using a 24-hour recall approach. They adapted and translated into Bengali a structured questionnaire from the WHO assessment tool for household feeding practice. To ensure that the questionnaire was accurate and consistent, we rechecked it before beginning the actual data collection. All analysis was done with IBM statistical software SPSS 23.0 and $P < 0.05$ level of significance was maintained during analysis.

2.3. Sample size and sampling procedure

A total of 300 participants were included in this study based on shor t period of study time. The upazila-based household was selected using a stratified random selection process.

2.4 Measures

2.4.1 Women dietary diversity score

The individual dietary diversity score of women between the ages of 15 and 49 is used to calculate the women's dietary diversity score (WDDS). Using 24-hour dietary recall data of women's own consumption from 11 food groups—starchy staples, pulses, dark green leafy vegetables, fruits and vegetables high in vitamin A, roots and tubers, other fruits and vegetables, milk and milk products, egg, fish, meat, sugar, and condiments—we compute individual dietary diversity scores**.**(Murendo et al., 2018)

2.4.2 Child dietary diversity score

The quality of each child's food was assessed using the child dietary diversity scores (CDDS). The number of food groups consumed in the previous 24 hours by infants aged 6 to 23 months is used to determine how diverse their diets are. These 16 food groups include cereal-based foods, tubers, orange vegetables, green vegetables, orange fruits, other vegetables and fruits, juice, organ meat, meat, eggs, fish, pulses and nuts, dairy, oils, sugar, and liquids.(Murendo et al., 2018)

2.5 Statistical analysis

Descriptive statistics like percentages, mean, median, and standard deviation were applied. A binary logistic regression model was applied to find out the factors of triggering the WDD and CDD. The models were fit proved by Hosmer and lemeshow test statistic. The parameters were significant tested by likelihood ratio test. Since the mean was lower than variance for children dietary diversity (CDD), which shows the overdispersed model. A negative binomial regression model was applied for CDD to observe the significant factors. Statistical package SPSS version 23.0 was applied for analysis and 5% level of significance with two tailed test was maintained.

2.6 Ethical consideration

This study was conducted accordance with ethical statement of Helsinki declaration (Declaration, 1964). Written informed consent was obtained from the household head after informing the purpose of the study and assuring the confidentiality of their information and not harmful of the study

Chapter 3: Result

3.1 Household, farm, and socio-demographical characteristics

Table 1 displays household characteristics. The top portion of Table 1 shows the range of diets for women, child, and households as a whole. The mean dietary diversity of women and child , which is 6.62 and 4.74, indicates that women and child eats items from almost seven and five different food categories on the reference day.

On average, 2.4 and 3.0 different kinds of animals are rared in farm households. Every home had a garden, and 67 percent of them grew pulses in addition to vegetables. 50% of the sample homes participated in the market by selling animals or crops. About 23.3 percent of the total was made up of crop sales. However, only around 10% of the agricultural harvest is actually sold. These results suggest that only a very small portion of agricultural yield is really traded. Farm households place a high priority on food self-sufficiency and only surplus is sold to the market.

The variables that we use as covariates into the different regression model settings are listed in the bottom half of Table 1. Our sample consists of male-headed families, with a mean age of 41.5 and a completion rate of at least a secondary education of 78%. The household sizes ranged from 1 to 8, with a mean of 1.62.

Table 1: Household, farm, and institutional sample characteristics

Variable	Description	Value
Women dietary diversity (mean [SD]; median)	Number of food groups consumed by women	6.62, (7),1.33
Child dietary diversity	Number of food groups consumed by child	4.74, (5),3.82
Farm production diversity (mean [SD]; median)	no. of livestock, no of crop and no. of vegetables	3.07 (2.03); 3.0
Crop diversity (mean [SD]; median)	Number of crop species grown	0.18 (0.39); 0.0
Vegetables diversity (mean [SD]; median)	Number of vegetables grown	1.53 (1.21); 2.0
Livestock diversity (mean [SD]; median)	Number of livestock species reared	1.36 (1.13); 2.0
Vegetables	Grew vegetables (1 = yes)	209
Fruits	Grew fruits (1 = yes)	230
Cattle	Reared cattle (1 = yes)	128
Sheep	Reared sheep (1 = yes	1
Goats	Reared goats (1 = yes)	49
Chicken	Reared chicken (1 = yes)	169
Pigeon	Reared chicken (1 = yes)	34
Duck	Reared chicken (1 = yes)	44
Market participation	Sold crop and livestock (1 = yes)	45
Age (mean [SD]; median)	Age of household head (years)	41.58,(11.00),40.00
Gender	Gender of household head (1 = male)	300
Education	Secondary education and above (1 = yes)	236
Household size (mean [SD]; median	Household size	1.62, (2.00);48
Orphans (mean [SD]; median)	Number of orphans	0.71, (1.00);0.57
Total income (mean [SD]; median)	Total household income (Taka)	25383.33, (12104.46),25000
Number of observations		300

Notes: Values are % unless specified as (mean [SD]; median). For all continuous variables, the median is reported, especially for age and income which are skewed

3.2 Food group consumption

Table 2 shows the food categories that child consumed the most of: cereals (62.3%); grains , root or vegetables (3.3%); green vegetables (30%); orange vegetables (10%) .juice (18%) ,other fruits and vegetables (41.3%). Meat (34.3%), any organ (17%), egg (52.3%), fish (23.3%), orange fruits (13.7%), pulses (27.3%), dairy products (36.6%), food cooked in oil (38.3%), sugar or honey (17.3%) and liquids (53%). Vegetables ,eggs, root and tubers which were consumed by child, were primarily produced by the households themselves; in contrast, cereals, juice, oils and fats, sugars and sweets, condiments and spices, fish, meat and milk products were primarily purchased.

Table 3 shows the food categories that women consumed:cereals (99%), roots and tuber (74.7%), green leafy vegetables (59.7%), vitamin A rich fruits and vegetables (17.7%), others fruits and vegetables(60.7%),meat(55.7%), eggs (56%), fish (37%), nuts and pulses (51%), dairy products (53.7%), sugar, sweets, condiments and spices (95.7%), Vegetables , eggs, root and tubers which were consumed by women, were primarily produced by the households themselves; in contrast, cereals, sugars and sweets, condiments and spices, fish, meat and milk products were primarily purchased.

Table 2 :Proportion of child who had consumed foods from each food group

	Consumption	
	N	%
Food groups		
Cereals	187	62.3
Grains,Roots & tubers	10	3.3
Green leafy vegetables	90	30
Orange vegetables	30	10
Juice	54	10
Other fruits & vegetables	124	41.3
Meat	103	34.3
Any organ(liver,kidney ,heart)	51	17
Egg	157	52.3
Fish	70	23.3
Orange fruits	41	13.7
Pulses/legumes/nuts	82	27.3
Dairy products(cheese,yogurt,milk&milk products)	110	36.7
Food cooked in oil or fat	115	38.3
Any sugar or honey	52	17.3
Liquids(any others food such as condiments ,coffee,tea,beverage)	159	53

Table 3 : Proportion of women who had consumed foods from each food group

	Consumption	
	N	%
Food groups		
Cereals	297	99
Roots & tubers	224	74.7
Green leafy vegetables	179	59.7
Vitamin A rich fruits, vegetables	53	17.7
Other fruits & vegetables	182	60.7
Meat	167	55.7
Eggs	168	56
Fish	111	37
Nuts and pulses	153	51
Dairy products	161	53.7
Sugar,sweets,condiments and spices	287	95.7

3.2 Effect of farm production, commercialization, domestic animal rearing, socio-demographic on CDD and WDD

Table 4 represents the effect of different factors on WDD. A binary logistic regression model was applied to determine the parameter estimates of WDD score. The model was fitted well (P value=0.15) by using Hosmer and Lemeshow goodness of fit test. The coefficients were tested by using likelihood ratio test. After adjusting the confounder, the model was significantly associated with family income, household size, market participation and rearing domestic animal. The WDD was 0.46 times lower likely of less than or equal to 25000 taka incoming people than greater than or equal to 26000 taka incoming people. The WDD was 0.32 times lower for household size member 1 to 6 than the member of greater than 6. The people who attend market participation the WDD was 7.92 times higher for them than not to attend. The people who reared domestic animal the WDD was 0.36 times lower than who not reared.

Table 4: Parameter estimates of WDD by using binary logistic regression model

Parameter	Estimate	Standard error	P value	Odds ratio (OR)	95% CI
Family income					
≤ 25000	-0.775	0.382	0.042	0.46	0.22-0.97
≥ 26000				1	
Household size					
1-6	-1.153	0.557	0.038	0.32	0.11-0.94
>6				1	
Market participation					
Yes	2.070	0.620	.001	7.92	2.35-26.71
No				1	
Rearing domestic animal					
Yes	-1.029	0.458	0.025	0.36	0.15-0.88
No				1	

Table 5 represents the effect of factors on CDD. The CDD score mean was less than the variance. The negative binomial regression model was fitted well in CDD score (P value=0.49). It was observed from the table that one unit increase of farm production the CDD rate increases 18%. The CDD rate among market participation (sale product) was 0.61 as low as the rate among non-market participation.

Table 5: Parameter estimates of CDD by using negative binomial distribution

Parameters	**IRR**	**Confidence interval**	**P value**
Farm production	1.18	1.06-1.30	0.0015
Market Participation			
Yes	0.61	0.39-0.96	0.0321
No	1		

Chapter 4: Discussion

The aim of the study was to observe the socio-demographic status of household. Participant distribution of WDD and CDD in different food groups. To examine how the influence of production diversity, market participation, rearing domestic animal and socio-demographic factors on WDD and CDD.

As far as we are aware, very few research have examined the impact of farm production and commercialization on the nutrition of women and children. Additionally, this study is distinctive since it explores how dietary variety among households, women, and children in developing contries is affected by diverse agricultural production, family income, household size and commercialization. The positive association of farm production diversity on dietary diversity confirms the findings of Koppmair, Kassie and Qaim (Koppmair et al., 2017) and Malapit, Kadiyala, Quisumbing, Cunningham and Tyagi (Malapit et al., 2015), underlining the vital impact that nutritional diversity for women has on the diversity of farm productivity. Between domestic animal raising and women's dietary diversity, we did not discover any beneficial associations. We discovered a beneficial correlation between children's dietary diversity and agricultural production diversification. Similar outcomes were discovered in other study findings (Saaka et al., 2017);(Koppmair et al., 2017) (Galbete et al., 2017). When compared to other studies, such as those by Koppmair, Kassie, and Qaim (Koppmair et al., 2017) and Saaka, Osman, and Hoeschle-Zeledon (Saaka et al., 2017), which included children up to 5 years old, our study measured dietary diversity in relatively younger children (6-23 months).

Results indicated that the family income and household size were associated with a significant increase in women dietary diversity.

Access to marketplaces for the purchase of food and the sale of farm products enhanced the dietary diversity of women . For Malawi (Koppmair et al., 2017) and Ethiopia (Hirvonen et al., 2017) several researchers discovered comparable outcomes.

Therefore, enhancing market accessibility through stronger institutions and infrastructure is a promising approach to enhancing nutrition. Between market Participation and the variety of children's diets, we did not find any correlation. These outcomes conflict with those of additional research (Koppmair et al., 2017);(Hirvonen et al., 2017).

The study also looked at the total vegetables, fruits, crop and livestock production over the previous 12 months and how much farmers consumed and sold on the market.Our study contributes to the literature to affirm the influence of production diversity in enhancing dietary diversity of the women.

Our study was conducted at the Lohagara and Satkania upzila, Chattogram.Where most of the people are earning their livelihood by buisness .Few people do agriculture.Joint families are mainly involved in agriculture. They market the surplus products. Small families grow few vegetables only for themselves

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Strength and limitations

The cross-sectional data that were utilized to create this article were collected all at once. In this study, which has limitations, we cannot account for seasonality in dietary patterns**.** We have information on the kinds of foods consumed by the household, women, and child, but we do not have information on how much of each food was eaten. Additionally, it's conceivable that the findings don't accurately reflect the respondents' prior food and eating patterns because the study only employed the 24-hour recollection technique. Furthermore, there could be recall bias, and as this was a self-reported study, it's possible that the minimum level of dietary diversity wasn't indicated accurately. Additionally, using cross-section data to demonstrate causation may be challenging. Even if we are successful in discovering a suitable instrument, the results of instrumental variable regression will only be as good as the underlying instruments. Future research may need to employ panel data to address these issues. The study's findings are not typical of all households because they are based on an LFSP that targets poor and vulnerable households.

For the study, no money was set aside. All the costs have to be communicated by the author alone. The sample size is small because the period of time was only 48 working days.

Chapter 5: Conclusion

This study examined the impact of commercialization and the diversity of agricultural produce on women's and children's diets. We made use of data gathered in Bangladesh's Chattogram district in 2022. The findings demonstrate a robust and favorable correlation between child and women dietary diversity and agricultural production diversity. Between domestic animal raising and women's dietary diversity, we did not discover any beneficial associations .These findings imply that increasing farm production diversity may enhance child and women nutrition. The diversity of diets among women and children is favorably correlated with the production of pulses and fruits. This indicates that promoting the production of pulses, vegetables, and fruits will maximize the nutritional value of diets and be good for women's and children's nutrition.

Market participation is favorably related to the variety of women's diets. Smallholder farmers only have a limited number of markets where they can sell their goods. They frequently reside in rural areas with inadequate infrastructure and few tourists. Additionally, they lack access to loans and have poor negotiating abilities with purchasers. Therefore, boosting initiatives that connect farmers to the market and enhancing access to markets through better infrastructure and institutions are promising measures to promote nutrition. Results indicated that the family income and household size were associated with a significant increase in women dietary diversity

The findings highlight the necessity for commercialization and farm output diversification as supplementary interventions for enhancing children's and women's nutrition.

Recommendation

Strong research designs at the national level should be carried out. To increase healthful food intake in the research region, dietary diversification measures must be promoted. Though increasing family income has a beneficial correlation, we also believe that programmers should increase their media presence and accessibility. The findings of this study will also assist policymakers in identifying high-risk groups associated with family nutrition status and implementing context-specific strategies to maintain appropriate dietary diversity in Bangladesh's rural areas.

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The Author

Biography

I am Klinton Barua, son of Sabul Barua and Baby Barua was born on 15th February, 1998. I have passed Secondary School Certificate examination from Adhunagar High School, Chattogram in 2014 (GPA-5.00) followed by Higher Secondary Certificate examination from BAF Saheen College, Chattogram (GPA-4.72). I am now enrolled in year-long internship programme for completion of Doctor of Veterinary Medicine (DVM) degree in Chattogram Veterinary and Animal Sciences University (CVASU), Chattogram, Bangladesh.

Bangladesh is a developing country in South Asia where livestock plays a very important role in our economy as well as the food chain. I expect to be a future researcher of life science to address the present challenges we have in this field.