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

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

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Abstract

For better nutritional results, nutrition education is essential. To the best of our knowledge, hardly any research has examined the effects of nutrition education, diverse farm production, and commercialization on household, women's, and children's diets. This study examines the impact of commercialization, agricultural diversification, and nutrition education on household dietary diversity in Bangladesh. We also examine the effects of specific agricultural techniques, crop and livestock variety, and animal diversity on nutritional diversity. Data were obtained from 300 randomly selected families in a district. For model estimation, negative binomial regression was utilized. The mean household dietary diversity (HDD) is 7.59. Among food groups, 99% of participants intake cereals, more than half of the participants intake meat and egg and less than half of the participants intake fish. 49.3% of participants had adequate dietary diversity and 50.7% of participants had inadequate dietary diversity. HDD was significantly associated with household size, farm production, market participation, and rearing of domestic animals. The HDD score increases with increased household size. As farm production increases the odds of HDD score increases by 1.35 units. The HDD score was higher for market participation individuals. For the people who reared domestic animals, the HDD was 0.16 times lower than those who do not rear. The improvement of dietary diversification at the household level can be achieved through nutrition education and improved market access. The findings highlight the need of enhancing market access, crop-livestock integration, small livestock, legumes, vegetables, and fruits for enhanced nutrition.

Keywords: production diversity; commercialization; dietary diversity; livestock; Banglades

Chapter 1. Introduction

Quality of food consumption can be measured by how many different foods are available in a household, and how many nutrients are included in an individual's diet. When it comes to measuring nutritional quality and sufficiency, it is common practice to look at dietary diversity (DD). To meet the WHO's minimum dietary diversity recommendations, children aged 6 to 23 months must have received at least four different types of food from the seven standard food groups the day before, including grains, roots and tubers, legumes and nuts, dairy products, meat, fish, poultry, and organ meats, eggs, vitamin A-rich fruits and vegetables, and other vegetables and fruits (Habtemariam et al., 2021).

One of the most important indicators of an individual's food security is the number of food categories consumed by their household over a certain period. When it comes to determining a person's nutritional status, a person's diet composition is closely linked to their intake of certain micronutrients as well as the overall quality of their diet (Sekabira & Nalunga, 2020) (Pinstrup-Andersen, 2009).

Farm production diversification is suggested as a feasible technique for improving the diet diversity and nutrition of rural households. There are two main paths from increased product variety to improved household nutrition (Habtemariam et al., 2021). First, diverse food production ensures that diverse food products are available for individual consumption, which is likely to increase diet quality and nutrition. Second, diversifying farm production assures enhanced and steady revenue by reducing market risks during periods of price volatility and production output fluctuation, both of which are influenced by occurrences such as climate change. Increased and consistent income allows households to acquire and consume a variety of food items (Thorne-Lyman et al., 2010). The direct production-consumption link should be strong, particularly for subsistence and semi-subsistence farming households. Given that the majority of rural households consume a significant percentage of their products, a direct positive relationship between product variety and dietary diversity is feasible (Sibhatu et al., 2015a). Other researchers, however, contend that diversification may not always be the ideal technique for boosting the dietary diversity of agricultural households due to the lost economic opportunity from specialization (Jones et al., 2014; Kabir et al., 2022;

Tischler et al., 1998). However, previous research has shown that increased income from agricultural commercialization alone does not significantly increase household nutrition (Begum & Biswas, 2020).

Empirical research findings establishing the link between production diversification and household food diversity and nutrition are ambiguous. Some research has found a favorable link, whereas others have shown mixed results or no correlation. Because of this, it is uncertain if and to what extent diversification contributes to a more diverse diet overall (Sibhatu & Qaim, 2018).

Beginning in the late 2010s, increasing attempts have been made to use panel data sets and approaches to improve the empirical evidence on the relationship between production diversity and dietary variety. But none of the studies was conducted in some Upazila like Satkania and Lohagara. The current study contributes to the existing body of knowledge by using a panel data method to ideally determine the link between production diversity and dietary diversity. It is based on information gathered during a household survey of 300 rural homes in Satkania & Lohagar Upazila, Chattogram, Bangladesh.

In places with limited resources, monotonous low-quality meals are the norm. When diets are mostly composed of grains or tuber-based staple foods and exclude vegetables, fruits, and meals derived from animals, there is a significant risk for a variety of micronutrient deficiencies (Mekuria et al., 2017).

Evidence from developed countries showed that dietary diversity is strongly associated with nutrient adequacy. Head of the family, frequency of eating per 24 h, water shortage for cooking, ownership of farming land, and household food insecurity access score were significantly associated with household dietary diversity. The Head of the family is among various socio-demographic factors that show significant association with household dietary diversity (Mekuria et al., 2017).

Market access, a significant confounding variable, is critical in understanding the relationship between production and dietary diversification. Increased market access and involvement enable smallholder farmers to sell a portion of their harvested crops and use the proceeds to acquire more diverse food. Occasionally, market access has been found to have a greater impact on dietary diversity than production diversity. Residents who reside near markets have easier access to a wider variety of foods throughout the year. According to a study on the nature and influence of farm output

on HDD conducted in rural and peri-urban areas of Kenya and Tanzania, dietary diversity was found greater in peri-urban areas with better market access, despite lower production variety (Kissoly et al., 2020). Agricultural technology adoption has also been identified as a propitious strategy for ensuring a diverse diet for farm households ((Koppmair et al., 2017; Sibhatu et al., 2015b). One study reported that adopting agricultural technologies (improved seed and inorganic fertilizers use) significantly impacted food production and availability ((Magrini & Vigani, 2016). Besides these factors, one study conducted in Bangladesh reported the association of household wealth and literacy with household dietary diversity and improved food security (Harris-Fry et al., 2015).

Considering all these factors into account, this study attempted to assess the extent to which and the direction in which production diversity affects household dietary diversity in Satkania and Lohagara Upazila, Chattogram, Bangladesh. With its huge rural population and subsistence farming, Bangladesh is an important place to study this issue. Additionally, the study also seeks to adjust for and investigate the effect of market access, livestock production diversity, and other significant socioeconomic characteristics such as household income, family size, and the educational status of the household head. The study was extended to examine how the influence of production diversity on HDD varies with conditional market access.(Kabir et al., 2022)

1.1. Objectives and Goal of the study

The goal of this study was to explore the prevalence of household DD score and associated factors of socio-demographic and other characteristics.

Chapter 2. Materials and Methods

2.1. Study design, area, and period: A community-based cross-sectional study was conducted at Satkania and Lohagara, Chattogram during the period from 17th February to 28th April. Satkania is an Upazila of Chattogram District in the division of Chattogram, Bangladesh. 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 Upazila is divided into Satkania 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., 2013b).

Figure 1: Map of Satkania Upazila

Lohagara is another Upazila of Chattogram district in the division of Chattogram, Bangladesh. Lohaga is situated between Chattogram and Cox's Bazan. It is one of the largest and most densely populated Upazilas of Bangladesh. It has a population of 279913 and the total area is 258.87 km^2 (99.95 sq mi). 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 17 unions but no municipality. The union parishads are subdivided into 40 mauzas and 43 villages (Planning et al., 2013a).

Figure 2: Map of Lohagara 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, and 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 a structured questionnaire from the WHO assessment tool for household feeding practice into Bengali. 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 a 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 a short period of study time. The Upazila-based household was selected using a stratified random selection process.

2.4 Measuring household dietary diversity

A modified Household Dietary Diversity Score (HDDS) (Swindale & Ohri-Vachaspati, 2004) was calculated for each household using recall data on the consumption of foods over the previous 24 h. In general, a shorter recall period improves the accuracy of estimates compared with longer recall periods of 7 days (Hanley et al., 2021). The food items were categorized into 12 different food groups with each food group counting toward the household score if a food item from the group was

consumed by anyone in the household in the previous 24 h. The modified HDDS, then, is a count variable from 0 to 12. The food groups used to calculate the modified HDDS included cereals, roots and tubers, vegetables, fruits, meat, eggs, fish and seafood, pulses and nuts, milk and milk products, oils and fats, sugar, and condiments.

Chapter 3. Results

3.1 Household, farm, and socio-demographical characteristics

Characteristics of households are shown in Table 1. Table 1's top section displays the variety of diets for households. The typical household consumes foods from seven different food categories on the reference day; this is known as the mean dietary diversity at the household level, which is 7.5 whereas 49.3% of participants had adequate dietary diversity and 50.of 7% participants had inadequate dietary diversity.

The typical farm household raises 2.4 and 3.0 distinct types of animals, respectively. Vegetables were grown in every home, and pulses were grown in 67% of them. 50 percent of the sample homes sold crops or livestock as part of their market involvement. Crop sales were around 23.3 percent of the total. On the other hand, only approximately 10% of the agricultural harvest is sold. These findings indicate that a very tiny amount of crop output is sold on the market. Food self-sufficiency is prioritized in farm households, and only surplus is sold to the market.

Table 2's bottom half lists the variables that we use as covariates in the various regression model configurations. Male-headed families comprise our sample, with a mean age of 41.5. 78 percent of the household heads had completed at least a secondary education. With a mean of 1.62, the household sizes ranged from 1 to 8.

Table 1: Household, farm, and socio-demographical characteristics

Variable	Description	Value
Household dietary diversity (mean [SD]; median)	Frequency of consumption of food groups	7.59;(7.00),1.44
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
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 families consumed the most of: cereals (99%); condiments/ spices/beverages (99%); oils/fats (88%); roots and tubers (84%). The least eaten foods were sugar and sweets (21%) and fruits (30.3%). Vegetables (82.3%), eggs (58.3%), roots and tubers (84%), which were consumed by homes, were primarily produced by the households themselves; in contrast, cereals, oils and fats, sugars and sweets, condiments and spices, fish, meat, and milk products were primarily purchased.

Table 2: Proportion of households which had consumed foods from each food group

	Consumption		Own Production		Purchased	
Food groups	N	%	N	%	N	%
Cereals	297	99	2	0.7	298	99.3
Roots and tubers	252	84	140	46.7	112	37.3
Nuts and pulses	130	43.3	13	4.3	117	39
Green leafy vegetables	247	82.3	122	40.7	125	41.7
Fruits	91	30.3	9	3	82	27.3
Meats	189	63	4	1.3	185	61.7
Fish	126	42	1	0.3	125	41.7
Eggs	175	58.3	93	31	82	27.3
Milk and dairy products	154	51.3	55	18.3	99	33
Sugar and sweets	64	21.3	0	0	64	21.3
Oils and fats	264	88	0	0	264	88
Condiments, spices, and beverages	297	99	0	0	297	99

3.3 Effect of farm production, commercialization, domestic animal rearing, socio-demographic on HDD

A binary logistic regression model was applied to determine the parameter estimates of the HDD score. The model was fitted well (P value=0.09) by using the Hosmer and Lemeshow goodness of fit test. The coefficients were tested by using the likelihood ratio test. After adjusting the confounder, the model was significantly associated with household size, farm production, market participation, and rearing of domestic animals. The HDD was 0.26 times lower for household size members 1 to 6 than the member greater than 6. As farm production increases one unit (species) the odds of HDD score increases by 1.35 units. For the people who attend market participation, the HDD was 4.33 times higher for them than not to attend. For the people who reared domestic animals, the HDD was 0.16 times lower than those who do not rear.

Table 3: Parameter estimates of HDD by using a binary logistic regression model

Parameter	Estimate	Standard error	P value	Odds ratio (OR)	95% CI
Household size					
1-6	-1.336	0.538	0.013	0.26	0.09-0.76
>6				1	
Farm production	0.303	0.119	0.011	1.35	1.07-1.71
Market participation					
Yes	1.466	0.581	0.012	4.33	1.39-13.53
No				1	
Rearing domestic animal					
Yes	-1.821	0.470	0.000	0.16	0.06-0.41
No				1	

Chapter 4. Discussion

The HDDS (Household Dietary Diversity Score) statistic measures a household's economic access to food. A higher score for households indicates greater economic access to a diverse diet for family members. Household dietary diversity has been linked to caloric and protein sufficiency, as well as household income. Furthermore, the number of food categories consumed by a family during a given period is one of the most important markers of an individual's food security. A person's food composition is strongly connected to their consumption of particular micronutrients as well as the general quality of their diet when it comes to establishing their nutritional status.

In our study, we have found that HDD, or household dietary diversity, is an average of 7.59. 99% of participants consume grains, more than 50% consume meat and eggs, and fewer than 50% consume fish among the other dietary categories. 50.7% of individuals had inadequate dietary diversity, whereas 49.3% of people had enough variety. Household size, agricultural output, market involvement, and domestic animal raising all have a substantial impact on HDD. With an increase in household size, the HDD score rises. The likelihood of achieving an HDD score rises by 1.35 units as farm productivity rises. For those who participated in the market, the HDD score was greater. The HDD was 0.16 times lower for individuals who reared domestic animals compared to those who did not. While, most households consumed cereals, whereas few consumed fruits and animal-based foods. Similar results on the consumption of eggs were found in (Pauzé et al., 2016), while (Kabunga et al., 2017) found that diets were concentrated on starchy foods and animal-based products in rural and urban Ghana, respectively. Households' agricultural production was not the main source of foods consumed the day before the survey. This is a unique study that jointly examines the effects of farm production diversity and commercialization on household dietary diversity in a developing country context. The positive association between farm production diversity on dietary diversity confirms the findings of (Koppmair et al., 2017) and (Malapit et al., 2015), highlighting the crucial role of farm production diversity in improving household and women's dietary diversity. Similarly, (Sibhatu et al., 2015a)found a positive association between farm production diversity and dietary diversity. We also found an association between farm production diversity and household dietary diversity. These results contradict other study findings (Galbete et al., 2017; Koppmair et al., 2017; Sibhatu et al., 2015a).

Rearing domestic animals significantly and associated with household dietary diversity. But in rural (Koppmair et al., 2017) and (Jones et al., 2014) found that crop diversification improves dietary diversity. Livestock diversity is positively associated with both household and individual dietary diversity. However, the effects are relatively smaller, suggesting that substantial improvement in dietary diversity would require very high levels of crop and livestock diversity if these were the only strategies available. Other studies found similar results that livestock improves nutrition (Hirvonen & Hoddinott, 2017; Rawlins et al., 2014). (Hirvonen & Hoddinott, 2017) found that ownership of improved dairy cows enhanced household welfare and child nutrition in Uganda. In Northern Rwanda, (Rawlins et al., 2014) highlight the positive association between household ownership of dairy cows and child linear growth. Results indicated that the cultivation of pulses and fruits was associated with a significant increase in household dietary diversity. The important contribution of pulses to nutrition is also highlighted in Kenya (Romeo et al., 2016). Goat rearing was significant and positively correlated with household and women's dietary diversity. These results suggest that crop-livestock integration is crucial for improved nutrition. The preservation and storage of fodder for livestock feeding in the dry season is one crop-livestock integration activity that needs to be promoted to enhance livestock nutrition. Access to markets for buying food and for selling farm produce increased household, women, and children's dietary diversity. Various scholars found similar results (Koppmair et al., 2017) and Ethiopia (Hirvonen et al., 2017; Sibhatu & Qaim, 2017). Hence, improving access to markets through better infrastructure and institutions is a promising strategy to improve nutrition.

Strength and Limitations

The data used to create this article is cross-sectional and was collected all at once. In this study, which has limitations, we cannot account for seasonality in diets.

We have data on the sorts of meals consumed by the household, women, and children, but we don't know how much of each food was consumed. Furthermore, because the study only employed the 24-hour recollection approach, the results may not accurately represent the individuals' past food and eating patterns. Furthermore, there might be remembering bias, and because this was a self-reported study, it's conceivable that the least quantity of dietary diversity was not indicated properly. Furthermore, employing cross-section data may make proving causality challenging. The data used to create this article are cross-sectional and were collected Even if we identify an excellent instrument, the results of instrumental variable regression will only be as good as the underlying instruments. Panel data may be required in future studies to address these problems. The study's findings are not nationally representative since they are based on an LFSP that targets poor and vulnerable families.

Chapter 5. Conclusion

Household dietary diversity has been linked to caloric and protein sufficiency, as well as household income. In our study, we have found that HDD, or household dietary diversity, is an average of 7.59. 50.7% of individuals had inadequate dietary diversity, whereas 49.3% of people had enough variety. Household size, agricultural output, market involvement, and domestic animal raising all have a substantial impact on HDD. With an increase in household size, the HDD score rises. The positive association between farm production diversity on dietary diversity confirms the findings and, highlights the crucial role of farm production diversity in improving household's dietary diversity. We also found an association between farm production diversity and household dietary diversity. Rearing domestic animals significantly associated with household dietary diversity. In rural areas we have found that crop diversification improves dietary diversity. Livestock diversity is positively associated with both household and individual dietary diversity. The effects are relatively smaller, suggesting that substantial improvement in dietary diversity would require very high levels of crop and livestock diversity if these were the only strategies available. Goat rearing was significant and positively correlated with household's dietary diversity. Access to markets for buying food and for selling farm produce increased household's dietary diversity. Improving access to markets through better infrastructure and institutions is a promising strategy to improve 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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Biography of Author

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