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Research Paper

Food Insecurity and Dietary Diversity in Bukang Liwayway, Kibawe, Bukidnon, Philippines

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ABSTRACT

Food insecurity remains a critical public health issue, particularly in Geographically Isolated and Disadvantaged Areas (GIDAs) where socioeconomic and geographic barriers limit access to adequate food and nutrition. This study aimed to assess the prevalence of food insecurity and examine dietary diversity in Bukang Liwayway, a rural village in Kibawe, Bukidnon. Using a cross-sectional design, household surveys were conducted among 18 households (n = 18). The **Household Food Insecurity Access Scale (HFIAS)** was used to measure food security status, while the **Household Dietary Diversity Score (HDDS)** assessed dietary diversity. Findings revealed that food insecurity is highly prevalent, with 50% of households categorized as severely food insecure, underscoring the urgent need for targeted interventions. The study also assessed dietary diversity, revealing moderate levels characterized by a heavy reliance on cereals and vegetables. However, the limited consumption of essential food groups such as fruits, dairy products, and protein-rich foods indicates potential nutritional deficiencies that could adversely impact health outcomes. These findings highlight the intersection of food insecurity and nutritional inadequacy in rural contexts, emphasizing the need for comprehensive, community-based programs to enhance food access, promote dietary diversity, and improve overall health and well-being.

Keywords: Bukang Liwayway, food insecurity, dietary diversity, GIDAs, households

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1. INTRODUCTION

Food insecurity is a pervasive issue affecting millions globally, with severe implications for health, nutrition, and socioeconomic well-being. It is defined as limited or uncertain access to sufficient, safe, and nutritious food necessary for an active and healthy life (Bickel et al., 2000; Tamargo, 2021). Affected households often face hunger, malnutrition, and increased disease risks. Among vulnerable populations, economic instability and geographic constraints exacerbate food insecurity, with agricultural households being particularly susceptible due to fluctuating incomes and dependence on environmental conditions (Ahmad et al., 2021). In the Philippines, approximately one in ten households' experiences food insecurity, with rural and agricultural communities disproportionately affected (WFP Philippines, 2022). The national data underscores the urgency of addressing food insecurity through targeted, context-specific interventions (Cruz, 2022).

Dietary diversity is a critical measure of diet quality and food security, reflecting the range of food groups consumed over a given period (Ruel, 2003). As a proxy for nutritional adequacy, dietary diversity emphasizes the importance of varied diets to meet essential nutrient needs and prevent deficiencies. Factors influencing dietary diversity include household income, size, agricultural practices, and access to markets (Powell et al., 2017). Low dietary diversity often correlates with nutrient deficiencies, which increase vulnerability to poor health outcomes and hinder long-term socio-economic development. Research shows that promoting dietary diversity significantly improves nutritional status and resilience, particularly in resource-constrained settings where access to diverse food groups is limited (Kennedy et al., 2011).

This study aims to assess food insecurity and evaluate the dietary diversity among households in Bukang Liwayway, Kibawe, Bukidnon, one of identified Geographically Isolated and Disadvantaged Areas (GIDAs) in Mindanao. Using a cross-sectional approach, it explores the prevalence of food insecurity and evaluates dietary diversity to provide insights into the challenges faced by rural communities. By identifying gaps in food access and nutrition, it is essential for improving public health, reducing malnutrition, and fostering sustainable development.

2. METHODOLOGY

Ethical Considerations

All necessary permits and ethical approvals, including Prior Informed Consent (PIC) from the barangay local government and communities, and clearance from the Institutionalized Ethics Review Committee (IERC) (permit no. 0915 s. 2024) of Central Mindanao University (CMU), were processed before conducting interviews and collecting samples in the study area. Ethical considerations included ensuring the anonymity and confidentiality of respondents by assigning pseudonyms and disclaiming any implications about their identity, origins, or language.

Study Design and Site

The study was conducted in Barangay Bukang Liwayway, situated in the Municipality of Kibawe, within the Province of Bukidnon, at coordinates 7.4857° N latitude and 125.0443° E longitude. Kibawe is a 2nd class municipality and bordered by Dangcagan to the north, Damulog to the south, Magpet in North Cotabato to the east, and Kadingilan to the west, with the Muleta River serving as a natural boundary. The study was implemented over a year, from August 14, 2023, to August 13, 2024. A cross-sectional descriptive research design was employed in Bukang Liwayway, Kibawe, Bukidnon.

Criteria for the Selection of Key Informants

Only the residents of Bukang Liwayway, Kibawe, Bukidnon were invited to participate in the study. The key informants were the head of the household, aged 18 years or older, and permanent residents of Bukang Liwayway, Kibawe, Bukidnon. The study was limited to one or two respondents per household, depending on the number of extended families. The sample size was determined using the Qualtrics sample size calculator set at a 95% confidence interval with a 5% margin of error.

Key Informant Interviews

The study utilized a combination of qualitative or the Key Informant Interview and quantitative approaches. The key informant interviews were conducted with household heads, but the responses were quantified using the FAO Household Food Insecurity Access Scale (HFIAS) and the 24-hour dietary diversity recall. These instruments generate quantitative categorical data, which were statistically summarized in frequency and percentage. Household food insecurity assessment was included in the interview using the global standard questionnaire of FAO (Ballard et al., 2013).

The researcher informed the key informants regarding the purpose and overall objectives of the project. The interview was voluntary without any monetary incentive, and the respondents could freely stop at any time. The interviews commenced only after obtaining verbal consent and completion of the prior informed consent form.

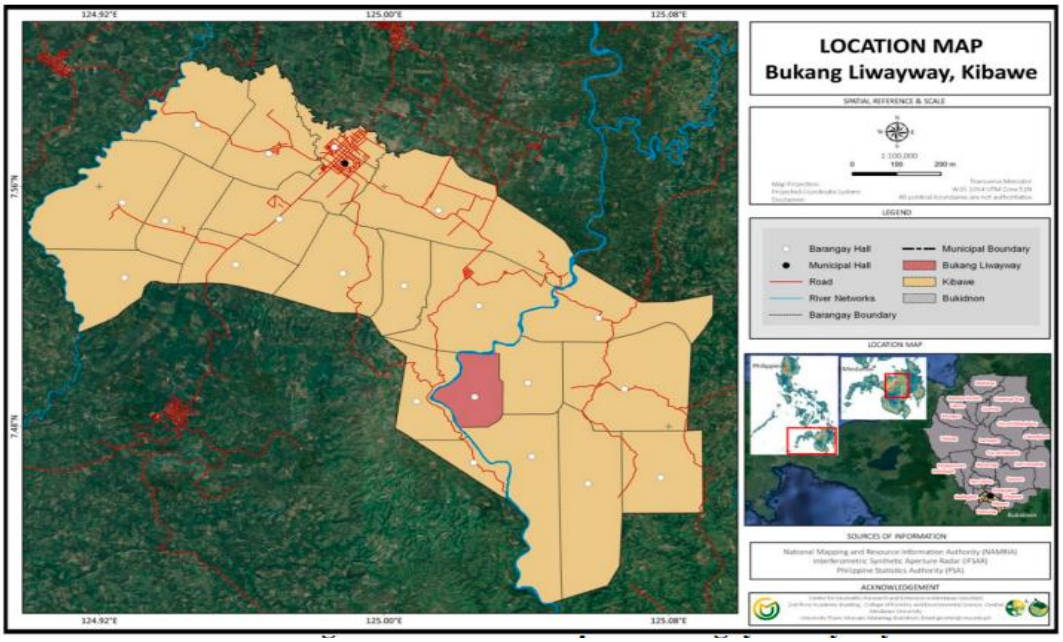

Figure 1. The location map of Bukang Liwayway Kibawe Bukidnon (from the study of Bruno et al., 2024)

Figure 2. Key informant interview on food insecurity and dietary diversity

Data Collection

Household food insecurity was assessed using the FAO's Household Food Insecurity Access Scale (HFIAS) (Ballard et al., 2013). Dietary diversity was measured through a 24-hour recall method, categorizing foods into 12 groups and following FAO guidelines (Kennedy et al., 2011). Food insecurity levels were derived using the FAO HFIAS algorithm, summing nine occurrence questions with frequency scores (0–3). Households were classified as food secure, mildly, moderately, or severely food insecure following Ballard et al. (2013).

Dietary diversity was measured using 12 FAO food groups: cereals; roots and tubers; vegetables; fruits; meat; eggs; fish and seafood; legumes, nuts and seeds; milk and milk products; oils and fats; sweets; and condiments/spices/beverages (Kennedy et al., 2011).

Data Analysis

Household Food Insecurity Access Scale (HFIAS) scores were computed based on the FAO guidelines (Ballard et al., 2013). Each of the nine occurrence questions was coded from 0 to 3 based on frequency-of-occurrence responses. Total scores were classified into four categories: food secure, mildly food insecure, moderately food insecure, and severely food insecure.

Dietary Diversity Scores (DDS) were computed by summing the number of food groups consumed over the 24-hour recall period, following FAO (Kennedy et al., 2011). A mean DDS value was calculated, and frequency distribution was used to determine the proportion of households consuming each food group. Statistical cross-tabulations and correlation tests between HFIAS categories and DDS were conducted to explore relationships between food insecurity and dietary diversity.

Data were analyzed using Microsoft Excel. Frequencies and percentages were calculated for

demographic and dietary variables. Statistical comparisons assessed relationships between food insecurity and dietary diversity.

3. RESULTS AND DISCUSSION

Socio-Demographic Profile

Out of the 50 planned households, 18 participated with response rate of 36%. The barangay has an estimated total of 138 households as per barangay profile. Non-response was mainly due to residents' absence during data collection and ongoing livelihood activities. The reduced sample limits generalizability, however, the data remain informative within the 95% confidence level for small population analyses.

The sample characteristics of the participants (Table 1) includes the determinants that may affect the food insecurity levels of households in the study area such as age of household head, sex, education, occupation, household size and estimated monthly income. The mean age of the respondents was 37.33 years. The age distribution indicated that 16.67%, 44.44%, and 38.89% belong in the age group of 16-30, 31-40, and >40, respectively. Most of the participants are females consisting of 83.33% whereas males only account to 16.67%.

In terms of education, half of the respondents achieved their highest educational attainment in the secondary level which accounted for 9 (50%). About 38.89% of the respondents reached the primary level and only 5.56% had both no formal education and tertiary level. The majority of the respondents are farmers (77.78%), 2 works as a housewife (11.11%), and one works as a store owner and volunteer (5.56%) as means of occupation. Moreover, most of the interviewed households has an estimated monthly income of P1000-P5000 (61.11%). The income of the residents of Bukang Liwayway are mainly from farming.

These findings align with previous research indicating that education and income levels are critical determinants of food security (Ahmad et al., 2021; Kennedy et al., 2011). Low educational attainment may limit employment opportunities, reducing household income and purchasing power for food.

Table 1. Socio-demographic profile of participants in Bukang Liwayway (n=18)

Variables	Frequency (*n*)	%
Age		
18-30	3	16.67
31-40	8	44.44
>40	7	38.89
Sex		
Female	15	83.33
Male	3	16.67
Education		
None	1	5.56
Primary Level	7	38.89
Secondary Level	9	50
Tertiary Level	1	5.56
Occupation		
Farmer	14	77.78
Housewife	2	11.11
Store Owner	1	5.56
Volunteer	1	5.56
Household size		
2-4	10	55.56
5-10	7	38.89
>10	1	5.56
Estimated monthly income		
	< 1000	33.33
	1000 – 5000	61.11
	6000 - 10000	5.56

Food Insecurity

Result showed that all surveyed households experienced some level of food insecurity and no households were classified as food secure (Table 2). Half or 50% experienced severe food insecurity, characterized by extreme hunger and lack of access to adequate nutrition. Only 16.67% as moderately food insecure, and 33.33% as mildly food insecure. Internal consistency for the nine HFIAS items was acceptable (Cronbach's α = 0.89). Factors contributing to food insecurity included limited income, large family sizes, and dependence on agricultural livelihoods.

This study underscores the severity of food insecurity in Bukang Liwayway, driven by limited income and reliance on subsistence farming, which is often vulnerable to environmental shocks and market fluctuations (Ballard et al., 2013; WFP Philippines, 2022). Factors such as large household sizes and low income emerged as critical determinants of food insecurity. Similar trends have been observed in other rural communities, where seasonal changes, economic instability, and climate-related challenges directly impact food availability (Bahiru et al., 2023).

Economic instability, lack of access to diverse food sources, and reliance on low-income farming contribute to the severity of food insecurity. The FAO (2023) emphasizes that communities with poor agricultural resilience and weak market access tend to suffer from higher rates of food insecurity. Additionally, the results suggest that larger household sizes may further strain available food resources, as observed in previous studies on food security in similar rural contexts (Tambe et al., 2023). Addressing these structural vulnerabilities requires multi-sectoral collaboration, including government, NGOs, and local stakeholders.

Dietary Diversity

The mean dietary diversity score (DDS) was 5.33 ± 2.23, indicating moderate diversity (Fig. 3). The mean DDS = 5.33 ± 2.23 falls within the FAO-defined 'medium diversity' range (4-6 food groups).

Table 2. HFIAS Category for Food Insecurity (n=18)
*Adapted from FAO HFIAS

HFIAS CATEGORY	N	(%)	DESCRIPTION *
Food Secure	0	(0)	Household rarely experiences worry about food access.
Mildly Food Insecure	6	(33.33)	Household worries about not having enough food sometimes or often, and/or is unable to eat preferred foods, and/or eats a more monotonous diet than desired and/or some foods considered undesirable, but only rarely.
Moderately Food Insecure	3	(16.67)	Household sacrifices quality more frequently, by eating a monotonous diet or undesirable foods sometimes or often, and/or has started to cut back on quantity by reducing the size of meals or number of meals, rarely or sometimes.
Severely Food Insecure	9	(50)	household has graduated to cutting back on meal size or number of meals often, and/or experiences any of the three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating), even as infrequently as rarely.

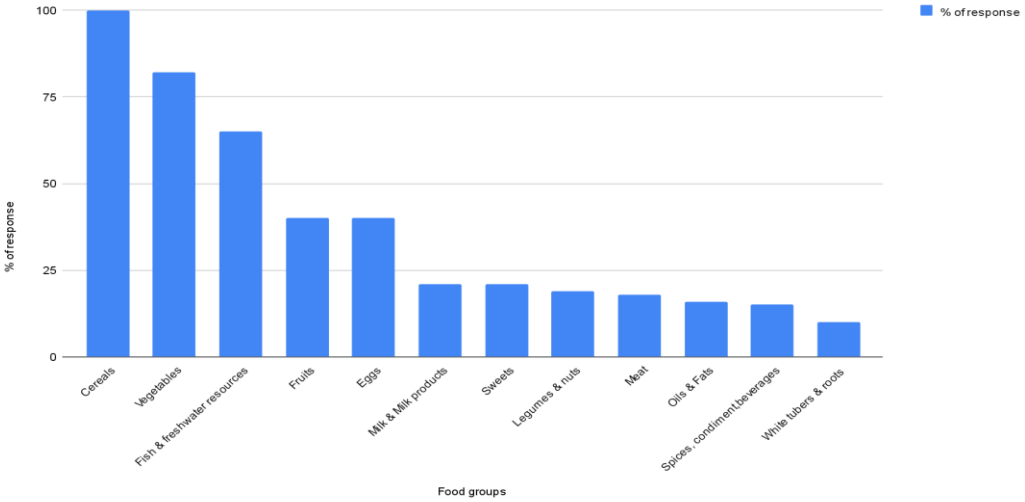

Figure 3. Household dietary diversity in Bukang Liwayway, Kibawe, Bukidnon

Cereals (100%), vegetables (83%), and fish (72%) were the most consumed food groups (Fig. 4) while low consumption was noted for dairy (22%), fruits (39%), and proteins (17%). Some of the plants in Barangay Bukang Liwayway, which hold significant potential as food plants, were listed and documented by Melencion et al. (2024) in their study in the same area.

The moderate dietary diversity observed aligns with other rural studies, where access to nutrient-rich foods is constrained. This suggests a lack of micronutrient-rich foods, which could lead to nutritional deficiencies and associated health risks, particularly among children and pregnant women (Kennedy et al., 2011; Faber et al., 2009).

Cross-tabulation between HFIAS categories and DDS showed that households classified as severely food insecure still exhibited moderate dietary diversity. In addition, Spearman correlation analysis was conducted to assess the relationship between food insecurity (HFIAS) and DDS ($r = -0.46$, $p = 0.05$), showing a negative correlation. The results showed that even households with severe food insecurity managed moderate dietary diversity due to subsistence farming and the availability of self-produced vegetables and cereals. This could be attributed to local subsistence farming practices that provide access to staple crops such as rice, corn, and root vegetables, even when purchasing power is limited. However, the low inclusion of protein and dairy sources indicates dietary monotony and hidden hunger.

The findings align with research indicating that rural households in low-income settings often struggle to diversify their diets due to financial constraints and limited market access (Powell et al., 2017). The reliance on cereals and vegetables, while beneficial in providing carbohydrates and fiber, does not ensure adequate intake of essential vitamins and proteins necessary for optimal health (Christian et al., 2020). Studies by Ihab et al. (2013) and Weerasekara et al. (2020) have shown that dietary diversity is strongly correlated with food security, and interventions aimed at improving food access can significantly enhance overall nutritional status.

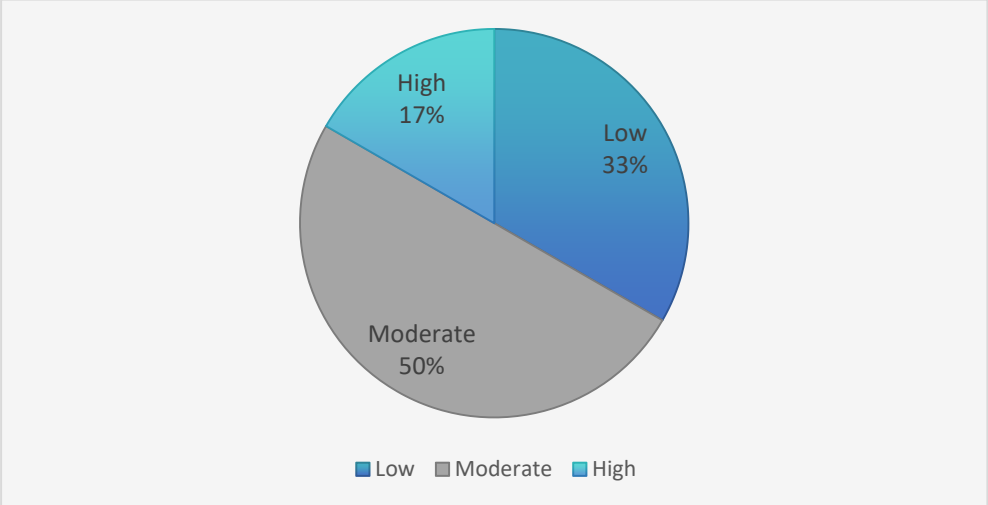

Figure 4. Percentage of Households that consumed different food groups

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4. CONCLUSION AND RECOMMENDATIONS

Therefore, there is severe food insecurity and moderate dietary diversity in Barangay Bukang Liwayway, Bukidnon, Philippines. This study highlights critical gaps in food security and dietary diversity in Bukang Liwayway. Severe food insecurity and moderate dietary diversity underline the need for targeted interventions to improve food access and nutrition. The coexistence of severe food insecurity and moderate dietary diversity underscores that food availability does not guarantee nutritional adequacy. These findings suggest that interventions should not only increase food access but also promote dietary quality through nutrition-sensitive agriculture, livelihood diversification, and market linkage programs.

Policymakers and local government units may consider integrating household nutrition education, small-scale food fortification initiatives, and community gardens into existing GIDA programs. Furthermore, future research should explore the seasonal variations in food insecurity and their implications for long-term nutritional outcomes

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Data Availability Statement: The data generated in the study are included in this article. Any raw data supporting the findings can be accessed from the corresponding author upon reasonable request.

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Conflicts of Interest: The authors declare that they have no conflicts of interest relevant to this study.

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