

# Determinants of Food Security, diets and Nutrition in Nepal: Evidence from Nepal Living Standard Survey IV

Gangaram Bhattarai

National Statistics Office, Nepal, [gaganbhattarai9@gmail.com](mailto:gaganbhattarai9@gmail.com) [gagan2021@iuj.ac.jp](mailto:gagan2021@iuj.ac.jp)

## Abstract

Food security remains a major development challenge in Nepal, closely linked to poverty reduction, nutrition, and overall wellbeing. Despite national efforts aligned with the United Nations Sustainable Development Goals, particularly SDG 2 (Zero Hunger), many households continue to experience food insecurity. This study examines the determinants of household food insecurity using nationally representative data from the Nepal Living Standards Survey IV (2022/23), conducted by the National Statistics Office. Food insecurity is measured using a binary indicator based on per capita food expenditure relative to the sample median.

A binary logistic regression model is applied to estimate the probability of household food insecurity, and average marginal effects are reported. A Probit model is further estimated to test the robustness of the results. The findings show that agricultural landholding significantly reduces the likelihood of food insecurity, highlighting the importance of productive assets in ensuring livelihood security. Household education and per capita education expenditure are negatively and significantly associated with food insecurity, emphasizing the role of human capital in improving consumption behavior and economic opportunities. Animal asset ownership and remittance receipt also decrease the probability of food insecurity, indicating the importance of diversified income sources. Urban residence is associated with a lower probability of food insecurity, while larger household size increases vulnerability. The age of the household head has a small but significant negative effect. Food asset ownership, however, is not statistically significant. The Probit model confirms the robustness of these findings, as the direction and significance of key determinants remain consistent.

**Keywords:** Food Insecurity, Household Determinants, Agricultural Landholding, Education and Human Capital

## 1. Introduction

### 1.1 Background

Food security and nutrition are fundamental components of human development and wellbeing. Adequate access to safe, nutritious, and sufficient food supports physical growth, cognitive development, and overall health (Food and Agriculture Organization, 2008; World Health Organization, 2020). Globally, improving food security remains a priority development agenda under the United Nations Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger), SDG 1 (No Poverty), and SDG 3 (Good Health and Wellbeing) (United Nations, 2015).

In developing countries such as Nepal, food security is closely linked with poverty reduction, public health improvement, and social stability (World Bank, 2022; Asian Development Bank, 2021). Despite progress in economic and social development, Nepal continues to face structural challenges affecting food and nutrition outcomes. Poverty, income inequality, labor migration, climate change, and fluctuations in food prices are among the major factors influencing household

food availability and dietary quality (Food and Agriculture Organization et al., 2023; National Planning Commission, 2020).

Agriculture remains a key livelihood source in Nepal, yet productivity constraints, limited dietary diversification, and unequal resource access contribute to persistent nutritional vulnerability (Ministry of Agriculture and Livestock Development, 2021). Household-level socio-economic conditions, demographic structure, geographic location, and remittance dependency also play important roles in shaping food consumption behavior and nutrition status (Central Bureau of Statistics, 2019; International Food Policy Research Institute, 2020).

## **1.2 Problem Statement**

Food insecurity and inadequate dietary diversity remain significant public policy concerns in Nepal. Many households experience limited access to nutritious food due to income constraints, agricultural resource limitations, and market accessibility challenges. Evidence suggests that household socio-economic characteristics, education status, asset ownership, and urban–rural disparities influence food consumption patterns.

Understanding the determinants of household food security is essential for designing effective nutrition-sensitive development interventions. Although, Nepal has implemented various social protection and agricultural development programs, gaps remain in identifying key factors influencing food security, dietary diversity, and nutritional outcomes at the household level.

## **1.3 Objectives of the Study**

The main objective of this study is to analyze household food insecurity and its determinants in Nepal. The specific objectives are to :

- Examine the effects of agricultural holding, education expenditure, household education, household size, age structure, urban residence, and remittance status on household food security.
- Assess the role of socio-economic, demographic, and geographic factors in determining probability of food insecurity.

## **2. Literature Review**

Food security is a fundamental component of human development and wellbeing. The concept of food security has evolved from a narrow focus on food availability to a broader multidimensional framework incorporating access, utilization, and stability. According to Amartya Sen (1981), food insecurity is primarily caused by lack of entitlement and access rather than absolute food shortage. This entitlement approach emphasizes the role of income, employment, and social resources in determining food consumption outcomes. The conceptual framework of food security is widely supported by the Food and Agriculture Organization (2008), which defines food security as a condition where all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy

life. This framework highlights four major dimensions: availability, access, utilization, and stability.

Empirical studies have consistently shown that economic resources and household assets are key determinants of food security. John Hoddinott (2001) demonstrates that asset ownership and income stability improve household nutrition outcomes and reduce vulnerability. Similarly, Derek Headey (2011) finds that agricultural productivity growth contributes significantly to poverty reduction and improved food security in developing countries. Education is another important determinant of nutrition and dietary behavior. Human capital theory suggests that education enhances knowledge, employment opportunities, and health awareness. Lisa C. Smith and Lawrence Haddad (2000) show that improvements in education, particularly female education, significantly contribute to better household nutrition and child health outcomes across developing countries. Household demographic structure also influences food security status. Larger households may benefit from labor pooling and shared resource use; however, literature suggests that excessive household size may increase dependency burden when employment opportunities are limited (Hoddinott, 2001).

Urbanization has changed food consumption behavior and livelihood systems. Urban households are more dependent on market-based food access and are exposed to higher living costs. Rapid urban expansion in developing countries, including Nepal, has been associated with dietary transitions and increased reliance on purchased food (World Bank, 2022; Food and Agriculture Organization, 2023). Migration and remittance income are important livelihood components in Nepal. Keshav Lall Maharjan and Yogendra Gautam (2017) indicate that migration and remittance inflows can improve household welfare by increasing consumption capacity and smoothing income shocks. However, remittance income may not always be directly allocated to food expenditure, as households may prioritize education, housing, or debt repayment.

Overall, existing literature suggests that household food security is influenced by economic assets, education, demographic structure, migration dynamics, and geographic location. The present empirical investigation contributes to this literature by examining household-level determinants of food insecurity using econometric estimation of marginal effects, thereby providing probability-based interpretation of vulnerability factors.

### **3. Data and Methodology**

#### **3.1 Data Source**

This study uses data from the Nepal Living Standards Survey IV (NLSS IV) conducted by the National Statistics Office during 2022/23. The NLSS IV is a nationally representative household-level survey that collects comprehensive information on consumption, income, employment, agriculture, assets, education, health, and food security. The survey follows a stratified multi-stage sampling design covering both urban and rural areas across all provinces of Nepal. The dataset provides detailed information on household consumption behavior, agricultural production, livestock ownership, and socioeconomic characteristics, making it particularly suitable for analyzing determinants of household food insecurity.

## 3.2 Variables

### Dependent Variable:

The dependent variable is household food insecurity, constructed as a binary indicator. In this study, household food insecurity is measured using a relative expenditure-based approach. A binary indicator is constructed by comparing household per capita food expenditure (*pcep\_food*) with the sample median food expenditure. Households whose per capita food expenditure falls below the median are classified as food insecure.

$$\begin{aligned} FoodInsecure_i &= 1 \text{ if } pcep\_food_i < median(pcep\_food) \\ FoodInsecure_i &= 0 \text{ if } pcep\_food_i \geq median(pcep\_food) \end{aligned}$$

### Explanatory Variables:

#### **Agricultural Landholding (*ag\_holdin*)**

Total agricultural land owned or operated by the household. It represents productive capacity and food production potential. Larger landholdings are expected to reduce food insecurity. It is used to examine how access to agricultural land influences the probability of the outcome, as land ownership can enhance production capacity and livelihood security.

#### **Per Capita Education Expenditure (*pcedu*)**

Per capita education expenditure measures the average household spending on education per member. It reflects investment in human capital development, which may improve knowledge, productivity, and economic opportunities.

#### **Own account consumption of food items (*ownaccns\_fd*)**

Ownership or access to food-related assets indicates whether the household possesses assets that directly support food production, storage, or accessibility. This variable helps capture household food resource stability.

#### **Own account consumption of animals items (*ownaccns\_ani*)**

Animal asset ownership represents household possession of livestock or related assets. Livestock ownership is often considered an important source of income, nutrition, and financial security in rural settings.

#### **Household Education Level (*hh\_edu*)**

Household education level represents the overall educational attainment of household members. Higher education levels are generally associated with better awareness, decision-making ability, and access to economic opportunities.

#### **Household Size (*hhsiz*)**

Household size refers to the total number of individuals living in a household. Larger households may experience greater consumption pressure, which can influence the likelihood of the outcome variable. *y*.

### Age of Household Head (hh\_age)

Age of the household head is included to capture experience, maturity, and life-cycle effects in household economic and social decision-making processes.

### Urban Residence (urban)

Urban residence is a binary variable indicating whether the household is located in an urban area. Urban households often have better access to services, markets, and employment opportunities.

### Remittance(remit)

Remittance receipt is a dummy variable showing whether the household receives income from migrant family members. Remittances can improve household purchasing power and reduce vulnerability.

## 3.3 Model Specification

The study uses a binary logistic regression model to examine the determinants of the outcome variable (Y), where Y takes the value **1** if the event occurs and **0** otherwise. The marginal effects (dy/dx) are reported using the Delta method to interpret the change in probability of the outcome.

$$P(Y = 1 | X) = \beta_0 + \beta_1 ag\_holdin + \beta_2 pcedu + \beta_3 ownaccns\_fd + \beta_4 ownaccns\_ani + \beta_5 hh\_edu + \beta_6 hhsiz + \beta_7 hh\_age + \beta_8 urban + \beta_9 remit + \varepsilon$$

Since marginal effects (dy/dx) are reported, the coefficients represent the change in predicted probability of the outcome for a one-unit change in the explanatory variable, holding other variables constant. Probit Model has been used in order to check the robustness of the result.

## 4. Results

### 4.1. Effect of Explanatory Factors (Average Marginal Effects)

Variable	Marginal Effect (dy/dx)	Significance
Agricultural holding	-0.116 ***	Significant
Per capita education expenditure	-0.000008 ***	Significant
Food asset ownership	0.019	Not significant
Animal asset ownership	-0.055 ***	Significant
Household education	-0.169 ***	Significant
Household size	0.067 ***	Significant
Household head age	-0.005 ***	Significant
Urban residence	-0.053 ***	Significant
Remittance receipt	-0.040 **	Significant

Notes: \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.10

The result indicates that agricultural holding (*ag\_holdin*) has a statistically significant negative effect on the outcome variable. A one-unit increase in agricultural holding decreases the probability of food insecurity by about 11.6 percentage points, holding other factors constant. The coefficient of per capita education expenditure (*pcedu*) is negative and statistically significant. However, the magnitude of the effect is very small, suggesting that an increase in education expenditure slightly reduces the probability of the food insecurity. The variable ownership access to food (*ownaccns\_fd*) is positive but statistically insignificant, indicating that access to food ownership does not have a meaningful effect on food insecurity variable.

Similarly, ownership access to animal resources (*ownaccns\_ani*) shows a statistically significant negative relationship with the outcome. A unit increase in animal ownership access reduces the probability of food insecurity by approximately 5.5 percentage points. The result further shows that household education level (*hh\_edu*) has a strong negative and statistically significant effect. An increase in household education reduces the probability of food insecurity by about 16.9 percentage points. Household size (*hhsz*) is positively associated with the outcome variable and is statistically significant. An increase in household size increases the probability of the food insecurity by about 6.7 percentage points. The coefficient of household age (*hh\_age*) is negative and statistically significant, although the magnitude of the effect is small. This indicates that increasing household age slightly decreases the likelihood of the food insecurity. The variable urban shows a statistically significant negative effect, suggesting that urban households are about 5.3 percentage points less likely to experience the food insecurity compared to the reference category.

Finally, remittance receipt (*remit*) also has a statistically significant negative effect on the outcome variable, decreasing the probability by approximately 4.0 percentage points. Overall, the results suggest that agricultural holding, household education, household size, urban residence, and remittance status are important determinants of the food insecurity.

#### 4.2 Robustness Check

To verify whether the main findings are sensitive to the choice of functional form, a probit model was estimated as an alternative to the logistic regression. Both models are appropriate for binary outcomes, but they rely on different distributional assumptions (logistic vs. normal distribution of the error term). Consistency across these models strengthens confidence in the stability of the results. The probit estimation results confirm the robustness of the main determinants of food insecurity in Nepal.

Table 2. Effect of Explanatory Factors (Average Marginal Effects)

Variable	Marginal Effect (dy/dx)	Significance
Agricultural holding	-0.116 ***	Significant
Per capita education expenditure	-0.000008 ***	Significant
Food asset ownership	0.019	Not significant

Variable	Marginal Effect (dy/dx)	Significance
Animal asset ownership	-0.056 ***	Significant
Household education	-0.164 ***	Significant
Household size	0.065 ***	Significant
Household head age	-0.005 ***	Significant
Remittance receipt	-0.038 **	Significant
Urban residence	-0.054 ***	Significant

Notes: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$

The probit model results further confirm the determinants of household food insecurity in Nepal. Agricultural holding remains negatively and highly significant ( $p < 0.01$ ), indicating that increased access to agricultural land reduces the probability of food insecurity. This finding suggests that productive asset ownership plays an important role in livelihood security. Per capita education expenditure is also negatively and statistically significantly associated with food insecurity, highlighting the importance of human capital investment in improving household welfare and nutrition outcomes. Ownership of animal assets (*ownaccns\_ani*) becomes statistically significant at the 1% level, providing stronger evidence that livestock resources contribute to reducing household vulnerability. Household education continues to show a significant negative relationship with food insecurity, reinforcing the role of education in promoting better consumption behavior and economic opportunities.

On the other hand, household size shows a positive and highly significant effect, indicating that larger households face greater consumption pressure and higher risk of food insecurity due to increased dependency burden. Household head age maintains a negative and significant association, suggesting that more mature households may have relatively stable income and livelihood structures. Remittance receipt continues to reduce the probability of food insecurity, supporting the role of migration income in improving household consumption capacity. Urban residence is also significantly associated with food insecurity, indicating that urban households may face vulnerability related to higher living costs and market dependency. Overall, the probit model results are consistent with the baseline logit estimates, confirming the robustness of the key determinants of household food insecurity. Importantly, the sign and statistical significance of the core determinants remain stable relative to the logit specification. Although coefficient magnitudes differ (as expected due to scaling differences between logit and probit models), the direction and inference remain consistent.

The marginal effect estimates indicate that agricultural holding, education expenditure, animal asset ownership, household education, household size, household head age, remittance receipt, and urban residence remain statistically significant determinants of food insecurity. The sign and significance of coefficients are consistent with the baseline logit model results.

In particular, agricultural holding, education level, remittance receipt, and animal asset ownership reduce the probability of food insecurity, while larger household size increases vulnerability. The magnitude of marginal effects is similar to the logit model estimates, suggesting that the empirical findings are not sensitive to the choice of binary response model.

The robustness analysis therefore confirms the stability of the core determinants of household food insecurity.

## 5. Discussion

### Key Findings

This study examines household-level determinants of food security in Nepal using marginal effect estimates from a logistic regression framework. The results indicate that food security outcomes are significantly influenced by agricultural assets, human capital, demographic structure, residential location, and remittance behavior. The negative marginal effect of agricultural holding suggests that land size alone does not guarantee food security improvement. This finding reflects structural challenges in smallholder agricultural systems where productivity constraints, land fragmentation, and limited market integration reduce the welfare benefits of land ownership. Similar evidence is reported in development literature emphasizing productivity-enhancing agricultural transformation rather than mere expansion of landholding (Derek Headey, 2011; Food and Agriculture Organization, 2017).

Household education level shows a significant negative short-term association with the probability of food insecurity. While education is widely recognized as a long-term determinant of nutritional improvement, the observed result may reflect household budget allocation trade-offs. Investment in education may temporarily reduce disposable income available for food consumption, although long-term welfare benefits remain positive. This interpretation is consistent with human capital-based development perspectives highlighted by Lisa C. Smith and Lawrence Haddad (2000), who emphasize the role of education in improving nutrition and child health outcomes over time.

Household size demonstrates a positive association with the probability of food insecurity. Larger households may benefit from internal labor contribution and shared consumption mechanisms; however, the effect may vary depending on employment opportunities and dependency ratios. This finding aligns with household welfare and vulnerability theories discussed by John Hoddinott (2001), who highlights the complex relationship between demographic structure and household food security.

Urban residence is negatively associated with food security, indicating potential vulnerability of urban households to market price volatility and higher living costs. Rapid urbanization in Nepal has altered dietary behavior, increasing dependence on purchased food and processed consumption patterns (World Bank, 2022; Food and Agriculture Organization, 2023).

Remittance receipt also shows a negative marginal effect in the short run. Although migration and remittance flows are generally expected to enhance household purchasing power, the allocation of -0remittance income may not be primarily directed toward food consumption. This mixed effect

is consistent with migration and livelihood studies conducted by Keshav Lall Maharjan and Yogendra Gautam (2017), who note that remittance income is often allocated to education, housing, or debt repayment rather than immediate consumption.

Overall, the results highlight the importance of structural livelihood factors rather than single-resource ownership in determining household food security.

### Policy and Research Implications

The findings suggest that food security interventions should prioritize productivity-enhancing agricultural policies rather than focusing solely on land ownership expansion. Nutrition-sensitive social protection programs recommended by the Food and Agriculture Organization (2017) can play an important role in reducing vulnerability. Promoting dietary diversity through integrated crop–livestock systems is essential for improving nutritional outcomes. Additionally, reducing rural–urban welfare disparities and strengthening market accessibility can support sustainable food security. Future policy strategies should also consider mechanisms to encourage the effective utilization of remittance income for household nutrition and welfare improvement.

## 6. Conclusion and Recommendations

This study examined household food security determinants in Nepal using marginal effect estimates from a logistic regression model. The findings indicate that food security outcomes are shaped by a combination of agricultural assets, education, demographic structure, geographic location, and remittance behavior. The results suggest that structural livelihood factors are more important than single-resource ownership in determining household nutrition status. The study contributes to the sustainable development agenda, particularly supporting monitoring efforts under the United Nations Sustainable Development Goals (SDGs), especially United Nations SDG 2 (Zero Hunger). Consistent with the multidimensional framework advanced by the Food and Agriculture Organization, the evidence highlights that food security requires integrated policy interventions addressing availability, access, utilization, and stability (FAO, 2023).

Based on the findings, several policy recommendations are proposed. Nutrition-sensitive social protection programs, as emphasized by the Food and Agriculture Organization, should be strengthened to support vulnerable households. Agricultural diversification, productivity enhancement, and improved market access are essential to increase dietary diversity and livelihood resilience. Furthermore, policies promoting effective allocation of remittance income toward nutrition, health, and productive investments can enhance long-term food security outcomes. Strengthening rural–urban market linkages and reducing structural inequalities will also contribute to sustainable progress toward SDG 2 in Nepal.

## References

1. Asian Development Bank. Nepal: Macroeconomic update and development outlook. Manila: Asian Development Bank; 2021.
2. Central Bureau of Statistics. Multiple Indicator Cluster Survey (MICS) Nepal. Kathmandu: Central Bureau of Statistics; 2019.
3. Food and Agriculture Organization. The state of food security and nutrition in the world. Rome: FAO; 2023.
4. Gautam Y, Maharjan KL. Migration and remittance effects on household welfare in Nepal. 2017.
5. Headey D. Turning economic growth into nutrition-sensitive growth. World Dev. 2011.
6. Hoddinott J. Choosing outcome indicators of household food security. IFPRI Discussion Paper. Washington (DC): International Food Policy Research Institute; 2001.
7. International Food Policy Research Institute. Global food policy report. Washington (DC): IFPRI; 2020.
8. Ministry of Agriculture and Livestock Development. Statistical information on Nepalese agriculture. Kathmandu: Ministry of Agriculture and Livestock Development; 2021.
9. National Planning Commission. Multi-Sector Nutrition Plan II. Kathmandu: National Planning Commission; 2020.
10. Sen A. Poverty and famines: An essay on entitlement and deprivation. Oxford: Oxford University Press; 1981.
11. Smith LC, Haddad L. Explaining child malnutrition in developing countries. Washington (DC): International Food Policy Research Institute; 2000.
12. United Nations. Transforming our world: The 2030 agenda for sustainable development. New York: United Nations; 2015.
13. World Bank. Nepal development update. Washington (DC): World Bank; 2022.
14. World Health Organization. Healthy diet factsheet. Geneva: World Health Organization; 2020.

## Annex 1. Literature related to the Study

Author	Year	Region	Methodology / Model	Key Variables	Major Findings
Sen, Amartya	1981	Global	Entitlement theory (Conceptual model)	Income access, rights-based food security	Food insecurity occurs mainly due to access failure rather than food shortage
Maxwell, Simon	1996	Global	Household livelihood framework	Coping strategy, consumption behaviour	Food security should be measured at household level
Food and Agriculture Organization (FAO)	2001	Global	Multidimensional food security framework	Availability, access, utilization, stability	Food security is a composite welfare indicator
Hoddinott, John	2002	Developing countries	Household production model + regression	Assets, income, nutrition	Asset accumulation improves food consumption stability
Smith, Lisa C.	2000	Cross-country	OLS regression	Female education, child nutrition	Education significantly improves nutrition outcome
Headey, Derek	2013	Developing countries	Panel data fixed effect model	Agricultural productivity, income	Agricultural growth reduces food insecurity risk
Barrett, Christopher B.	2010	Africa & Asia	Structural household econometric model	Market access, poverty	Market integration improves food security
Bashir, Muhammad Khan	2012	Pakistan	Logistic regression model	Landholding, education, income	Land size and education positively affect food security
Central Bureau of Statistics Nepal	2019	Nepal	Descriptive + household survey analysis	Diet diversity, poverty	Rural poverty remains a major risk factor
Maharjan, Keshav Lall	2013	Nepal	Logistic regression / household survey model	Migration, agriculture, income	Migration improves household consumption security

<b>Author</b>	<b>Year</b>	<b>Region</b>	<b>Methodology / Model</b>	<b>Key Variables</b>	<b>Major Findings</b>
Gautam, Y.	2017	Nepal	Econometric household model	Remittance, food consumption	Remittance positively influences welfare stability
International Food Policy Research Institute (IFPRI)	2015	Global	Micro-simulation and panel regression	Agricultural investment, poverty	Agricultural development reduces hunger risk
Ministry of Agriculture and Livestock Development Nepal	2020	Nepal	Policy and statistical analysis	Food production, supply gap	Production diversity is needed for nutrition security