

Article

Backyard Poultry Farming Among Urban Poor Households in Bangladesh: Production Capacity and Potential Contribution to Food Security

Sayaka Ushimaru ¹, A.K.M. Kanak Pervez ²  and Akira Ishida ^{1,*} ¹ Graduate School of Agricultural Science, Kobe University, Kobe 657-8501, Japan; 240a101a@stu.kobe-u.ac.jp² Department of Agronomy and Agricultural Extension, University of Rajshahi, Rajshahi 6205, Bangladesh; kp@ru.ac.bd

* Correspondence: akira_ishida@people.kobe-u.ac.jp

Abstract

This study aimed to examine the potential influence of backyard poultry farming, which can be readily established in urban and peri-urban environments, on the production capacity of backyard poultry and its potential contribution to food security among low-income households. Publicly accessible secondary microdata from the 2022 Bangladesh Demographic and Health Survey were used. To account for the non-random nature of backyard poultry-keeping decisions, the Heckman selection model was applied to estimate both the probability of engaging in poultry farming and the number of birds raised. The study revealed that over 20% of urban households and more than 30% of the poorest 11% households engaged in poultry farming. Although the number of birds raised is generally lower, the proportion of households raising poultry is higher among poorer households than among wealthier households. Among the poorest 11% households, the estimated per capita production of meat and eggs from backyard poultry farming was expected to be 5.4 g and 6.8 g per day, respectively. Due to data constraints, we compare production estimates with stratum-level consumption averages, providing an indication of potential contribution rather than household-level self-sufficiency. This comparison suggests that backyard poultry could serve as an important supplementary source, potentially contributing to approximately 15% of meat consumption and 47% of egg consumption for participating households from the lowest income strata.

Keywords: backyard poultry; livestock production; urban poverty; household survey; South Asia



Academic Editor: Jianming Cai

Received: 8 October 2025

Revised: 6 November 2025

Accepted: 7 November 2025

Published: 11 November 2025

Citation: Ushimaru, S.; Pervez, A.K.M.K.; Ishida, A. Backyard Poultry Farming Among Urban Poor Households in Bangladesh: Production Capacity and Potential Contribution to Food Security. *Urban Sci.* **2025**, *9*, 472. <https://doi.org/10.3390/urbansci9110472>

Copyright: © 2025 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

Animal protein consumption per capita tends to increase with GDP growth [1,2]. However, residents of developing countries typically consume less protein, particularly animal protein, than those in developed countries [3,4]. Food-insecure populations with lower incomes exhibit lower frequencies of animal protein consumption [5–7], which is associated with stunted growth [8,9], underweight conditions and stunting in children [5,10–13], high infant mortality [14], and ultimately intergenerational poverty through reduced lifetime earnings [15,16]. With rapid urbanization in developing countries, approximately one-third of the global poor now reside in urban areas [17], where poor households experience higher food insecurity [18–20], allocate more of their budget to food [21,22], and face greater vulnerability to food inflation [22–25], economic shocks [23,26], and social instability [23].

With urban populations projected to continue to grow, addressing food security issues, especially for urban poor households, is becoming increasingly critical. In this context, since the late 1990s, the Food and Agriculture Organization (FAO) has been promoting urban and peri-urban agriculture (UPA) as a solution to these challenges [27]. Consequently, research on UPA has increased over the past 20 years. Studies have shown that UPA contributes to improved food access [28], enhanced food and nutrition intake [29–34], increased or diversified income [33–35], reduced vulnerability to shocks, and enhanced resilience [36]. Additionally, UPA empowers women through economic independence [37–39], helps build social capital [30,40,41], and assists in mitigating surface temperature increase [42].

In numerous developing countries across Asia and Africa, poultry is the predominant form of livestock cultivated in urban environments owing to its cost-effectiveness, efficient use of limited space, and adaptability to urban conditions, in contrast to other livestock [27,43–45]. Within the poultry category, chickens are particularly valued as a readily available and accessible source of animal protein, providing both meat and eggs [44]. The responsibility of raising chickens typically rests on women and children [46], resulting in a relatively low opportunity cost for maintaining chickens. In backyard chicken keeping, leftover food/table scraps serve as the primary feed, which means there are virtually no feed expenses. Consequently, in urban households, especially those experiencing economic challenges, poultry farming, particularly chicken farming, can enhance meat and egg consumption (the main sources of animal protein) and contribute to food security for the urban poor.

However, a review article by Gaefe et al. [35] found that most studies have focused on the production of staple crops, vegetables, and fruits, and that merely 2% of the research on UPA explored urban and peri-urban livestock. In addition, to the best of our knowledge, quantitative studies that use microdata from large-scale sample surveys to examine the production capacity of raising livestock in urban and peri-urban areas of developing countries and its potential implications for poor households are lacking. This study examines Bangladesh as a case study from the South Asian region, where animal-source food consumption is among the lowest in the world [47]. According to the World Bank Development Indicators, the country exemplifies rapid urbanization in the world, with its urban population increasing by a factor of 2.19 between 2000 and 2023. Simultaneously, the proportion of the urban population relative to the total population has risen significantly from 23.6% in 2000 to 40.5% in 2023. Therefore, this study utilizes raw data from the 2022 Bangladesh Demographic and Health Survey (DHS) to examine the importance of backyard poultry farming for low-income households. It specifically analyzes their capacity for egg and meat production and evaluates the potential contribution to household food security.

2. Materials and Methods

This study analyzed raw data from the 2022 Bangladesh DHS. The survey included both urban and rural households, selecting 10,665 urban and 19,665 rural households. This yielded 10,508 urban responses (a response rate of 99.4%) and 19,510 rural responses (a response rate of 99.7%) [48]. The DHS collected information on household characteristics, fertility, maternal care, child mortality, and childcare. Although the survey did not collect data on the quantity or frequency of food consumption, it recorded poultry ownership and the number of birds of each household.

Using this data, we estimated household-level poultry meat and egg production based on the number of poultry raised. We based production estimates on the number of poultry households reported in the survey, so any mortality-related losses are already included. Most backyard poultry farmers in urban Bangladesh use local *deshi* breeds and traditional methods, with little variation in breeds or management. We then compared per capita

production estimates with average meat and egg consumption by income group in urban areas, using data from the Bangladesh Bureau of Statistics [49]. This comparison aimed to assess the potential contribution of backyard poultry farming to household consumption of meat and eggs, particularly for low-income households. The DHS dataset includes a code of “95” for households owning 95 or more poultry, which is rare in urban areas. Among 10,507 analyzed urban households, only five reported raising more than 95 birds. In such cases, we treated poultry ownership as capped at 95. One household with incomplete data was excluded.

According to sample-weighted estimates by the `svy` command of Stata/MP (Version 18.0), 22.5% of the households in urban areas raise poultry. Notably, the majority of households (over three-quarters) do not own poultry. Since it is assumed that the presence or absence of poultry farming is non-random, this study employs the Heckman selection model, which accounts for the non-random nature of the decision to raise poultry.

In the Heckman selection model, the outcome variable Y_i (number of poultry) is observed only when the selection variable S_i equals 1 (i.e., a household i raises poultry). The outcome equation is defined as:

$$Y_i = X_i\beta + e_i$$

where X_i is a vector of independent variables, β is the parameter vector, and e_i is the error term. The selection equation is:

$$S_i^* = Z_i\gamma + \varepsilon_i, S_i = 1 \text{ if } S_i^* > 0, \text{ and } S_i = 0 \text{ otherwise}$$

where Z_i is a vector of variables influencing selection, γ is the coefficient vector, and ε_i is the selection error term. The error terms of the selection and outcome equations are assumed to be jointly normally distributed with correlation ρ .

Following Yamashita and Ishida [50] and Ushimaru et al. [45], the decision to raise poultry and the number of birds in a household may be influenced by various factors. These include the gender of the household head (male = 1, female = 0), age of the household head (with categories under 30 as the reference group, 40s, 50s, and 60s or older), estimated household monthly income (see the succeeding paragraph for details), number of household members, and a dummy variable for residence in a City Corporation area (where applicable = 1, not applicable = 0). The number of rainy days per month is also included. To address selection bias, we used the “Enhanced Vegetation Index for 2020” for each primary sampling unit as an exclusion restriction variable. This index is measured at the cluster level rather than the household level, derived from GPS data reflecting green leaf density based on near-infrared and visible light bands [51]. Higher values indicate greater availability of green space. The justification for using this cluster-level vegetation index is: First, neighborhood greenness influences whether poultry farming is accepted and feasible. Areas with more vegetation may have lower population density and more permissive attitudes toward livestock keeping, affecting the probability of households engaging in poultry farming (selection equation). Second, the cluster-level vegetation index should not directly affect the quantities of birds in individual households (outcome equation). In urban areas, poultry numbers depend on household-specific factors, such as yard space, housing structure, and available caregivers, rather than neighborhood greenness. Within clusters, households vary significantly in land holdings and housing conditions. Because urban backyard poultry are raised mainly for domestic consumption, households have natural production limits based on family size and consumption needs, independent of neighborhood greenness. Therefore, while cluster-level vegetation may encourage households to start poultry keeping, it likely does not determine the number of birds each household raises.

Although the DHS does not include household income data, it provides the Wealth Index as a variable in its provided microdata. The Wealth Index estimation follows a multi-step procedure. First, the DHS collects binary data on household asset ownership (e.g., television, refrigerator, bicycle, motorcycle) and housing characteristics (e.g., type of flooring, water source, toilet facility). Second, these categorical variables are subjected to principal component analysis (PCA) to create a composite wealth index for each household, with the first principal component representing the household's relative socioeconomic position.

Therefore, we estimated income using the Wealth Index approach proposed by Harttgen and Vollmer [52], which transforms the Wealth Index into estimated household income using a lognormal distribution assumption. This method infers income based on asset ownership via a categorical principal component analysis. Household income H_i is estimated as:

$$H_i = \exp\left(\mu + \sigma\Phi^{-1}(F_i)\right)$$

where F_i is the cumulative distribution of the Wealth Index, and $\Phi^{-1}(\cdot)$ denotes the inverse of the standard normal cumulative distribution function. The parameters μ and σ are calibrated such that the resulting income distribution matches the mean income (45,757 Taka) and the Gini coefficient (0.539) reported in the 2022 Household Income and Expenditure Survey [49] of the Bangladesh Bureau of Statistics. The Gini index for a lognormal distribution is given by

$$G = 2\Phi\left(\frac{\sigma}{\sqrt{2}}\right) - 1$$

so that σ can be obtained from the observed Gini index.

Descriptive statistics for all variables used in the model are summarized in Table 1. In our Heckman model specification, all explanatory variables described were included in both the selection and outcome equations, except for the Enhanced Vegetation Index, which was included only in the selection equation as an exclusion restriction, consistent with the theoretical justification provided above.

Table 1. Descriptive statistics of explanatory variables.

Explanatory Variables	Mean	s.d.
Gender of household's head (dummy variable)		
Man	0.849	
Woman	0.151	
Age of household's head (dummy variable)		
10s and 20s	0.112	
30s	0.260	
40s	0.266	
50s	0.189	
60s and above	0.172	
Monthly household income (10,000 Taka)	4.567	6.246
Number of household members (persons)	4.100	1.637
Living in city corporations (dummy variable)		
Yes	0.296	
No	0.704	
Number of days (per month) receiving ≥ 0.1 mm precipitation	7.613	0.736
Enhanced Vegetation Index for 2020	0.301	0.066

Dummy variables are binary variables that take the value of 1 if applicable and 0 if not applicable. Standard deviations are presented for continuous variables only.

3. Results

Prior to presenting the results of the Heckman selection model, we analyzed the estimated household income using the method proposed by Harttgen and Vollmer [52]. The weighted average estimated household income is 45,668 Taka, which aligns with the 45,757 Taka reported by the Bangladesh Bureau of Statistics [49].

This study employed household income as the primary explanatory variable and attempted to incorporate it along with its squares and cubes. After evaluating several models, the estimation results using household income and its square were selected for the final analysis. Table 2 presents the results of the Heckman selection model. The t-value for the excluded variable “Enhanced Vegetation Index” was 8.097, corresponding to an F-value of 65.558 (this value equals 8.0968 squared). This F-value significantly surpasses the standard threshold of 10. To assess the validity of the exclusion restriction, we conducted an excludability test, which yielded a *p*-value of 0.134. This result suggests that the enhanced vegetation index does not exert a statistically significant direct effect on the number of poultry raised, thereby supporting its inclusion in the selection equation only. In addition, the reverse causality test produced a *p*-value of 0.146, indicating that the number of poultry raised does not significantly predict variation in the vegetation index. This finding rules out the possibility of reverse causation and further supports the exogeneity of the instrument. All the above tests provide evidence of the appropriateness of using “Enhanced Vegetation Index” as the excluded restriction variable. Furthermore, a significant correlation was identified at the 5% level between the error term of the probit regression regarding the presence or absence of poultry farming and the error term related to the number of poultry kept ($\rho = -0.110$). The standard error of the residuals in the outcome equation is significant at the 1% level ($\sigma = 8.985$). Additionally, the coefficients of the explanatory variables are statistically significant and consistent with the signs of the coefficients estimated by Yamashita and Ishida [50] and Ushimaru et al. [45]. Therefore, the estimation results presented in Table 2 are reliable and robust, thereby instilling confidence in the conclusions of our study.

Table 2. Estimation results by the Heckman selection model.

	Outcome Model			Selection Model	
	Coefficient	t-Value		Coefficient	t-Value
Dummy variable for gender of household head (man = 1)	−0.152	−0.302		−0.019	−0.331
Dummy variable for age of household head (Ref: below 30)					
30s	−0.561	−0.778		0.143	1.850
40s	0.749	1.060		0.268	3.160
50s	0.842	1.103		0.282	3.077
60s and above	0.140	0.216		0.361	3.801
Monthly Household income (unit 10,000 Taka)	0.675	2.807	**	−0.114	−8.666
Square of household income	−0.017	−2.329	*	0.001	7.143
Number of household members (unit: person)	0.213	1.561		0.130	9.499
Dummy for residing in a City Corporation (yes = 1)	−2.567	−3.996	**	−0.570	−5.741
Number of rainy days per month (days)	−0.911	−3.459	**	−0.125	−2.052
Enhanced Vegetation Index ¹				7.024	8.097
Constant	13.896	7.020	**	−2.305	−4.073
rho ²		−0.110			−2.233 *
sigma ³		8.985			12.350 **
lambda ⁴		−0.992			−2.164 *

Authors’ calculation. * and ** denote the estimated coefficient is significant at the 5 and 1 percent levels, respectively.

¹ All variables except the Enhanced Vegetation Index (EVI) are included in both the selection and outcome equations. EVI serves as an exclusion restriction and appears only in the selection equation. ² Correlation coefficient between the error terms of the selection and outcome equations. ³ Standard deviation of the error term in the outcome equation. ⁴ Covariance between the error terms in the selection and outcome equations.

The probit regression analysis revealed a positive association between the likelihood of engaging in poultry rearing and the age of the household head, particularly among

households with middle-aged and older heads. Additionally, a significant correlation existed between poultry rearing and households with a larger number of members, underscoring the social dynamics of this practice. Furthermore, a positive relationship was found between households located in regions with a high vegetation index and their propensity to maintain poultry. Conversely, the probability of raising poultry is lower for households residing in city corporations and areas that experience a high frequency of rainy days. Household income exhibits a significant positive effect, whereas the squared term of household income is significantly negative. This pattern suggests a nonlinear relationship between household income and the proportion of households involved in poultry rearing.

In the livestock number estimation model, the coefficients for the dummy variable representing residence in city corporations and the number of rainy days were both significantly negative. Household income has a significant positive effect, whereas the squared term of household income has a significantly negative effect. This pattern indicates a nonlinear relationship between household income and the number of poultry.

The summary table in the 2022 Household Income and Expenditure Survey [53] presents the number of households and the average household income across 19 income strata. After consolidating these into seven strata, we calculated the probability of households engaging in poultry keeping and the expected number of birds maintained by these households for each income stratum (Table 3). This analysis substituted the average household income for each strata into the estimation results of the Heckman selection model, as presented in Table 2. In the income strata below 10,000 Taka per month, which accounts for 10.71% of urban households, the predicted probability of poultry keeping exceeded 30%. In the 10,000–19,999 Taka stratum, this probability was 27.6%; in the 20,000–29,999 Taka stratum, 24.8%; in the 30,000–39,999 Taka stratum, 22.1%; in the 40,000–49,999 Taka stratum, 19.5%; in the 50,000–59,999 Taka stratum, 17.2%; in the 60,000–69,999 Taka stratum, 15.1%; and in the income stratum above 70,000 Taka, 3.0%.

Table 3. Predicted probability of raising poultry and the number of poultry raised.

Monthly Household Income Strata (in Taka) ¹	Number of Households ¹	% of Household ¹	Average Monthly Income (in Taka) ¹	Predicted Probability of Raising Poultry (%) ²	Predicted Number of Poultry Raised ²
Below 10,000	1,330,778	10.71	6394.08	30.33	6.33
10,000–19,999	3,465,018	27.88	15,043.36	27.61	6.81
20,000–29,999	2,594,758	20.88	24,573.16	24.79	7.31
30,000–39,999	1,550,030	12.47	34,585.65	22.06	7.80
40,000–49,999	903,561	7.27	44,763.84	19.50	8.27
50,000–59,999	564,614	4.54	54,676.95	17.23	8.69
60,000–69,999	353,784	2.85	64,801.93	15.13	9.08
70,000 and above	1,666,832	13.41	177,870.70	3.04	11.15

¹ Calculated using data from the 2022 Income and Expenditure Survey [49]. ² Based on the authors' estimation.

These findings suggest that the likelihood of keeping poultry is higher among individuals with lower incomes. Conversely, the predicted number of poultry kept increased with higher income strata. Specifically, the estimated results were: 6.3 birds in the stratum below 10,000 Taka, 6.8 birds in the 10,000–19,999 Taka stratum, 7.3 birds in the 20,000–29,999 Taka stratum, 7.8 birds in the 30,000–39,999 Taka stratum, 8.3 birds in the 40,000–49,999 Taka stratum, 8.7 birds in the 50,000–59,999 Taka stratum, 9.1 birds in the 60,000–69,999 Taka stratum, and 11.2 birds in the 70,000+ Taka stratum.

4. Discussion

Poultry farming is a prevalent practice in urban areas of Bangladesh, particularly among low-income households—an observation corroborated by Ushimaru et al. [45]. An examination of households engaged in poultry farming revealed that those with higher

incomes tend to maintain the largest number of birds. This phenomenon may be attributed to the greater availability of land or space among higher-income households, which would enable them to accommodate more poultry. Higher-income urban households generally possess larger residential plots that provide adequate yard space for poultry keeping, while lower-income households often have minimal housing space [54,55]. However, the number of birds kept per household did not significantly differ between lower-income households and those in the higher-income strata. On average, the lowest-income households rear approximately six birds, whereas the highest-income households with poultry raise approximately 11 birds. This finding indicates that the scale of poultry farming remains relatively consistent across income levels.

In urban environments, informal labor markets have emerged alongside formal ones. Consequently, labor markets have been shaped by factors such as educational attainment, age, and skill sets. However, the DHS does not gather data on employment status or wage labor income, which constrains ascertaining the precise employment status of family members within the surveyed households. However, it is likely that households belonging to the middle and upper economic classes exhibit higher wage levels and are more inclined to participate in formal employment. These households frequently benefit from stable employment, characterized by monthly salaries, in contrast to those dependent on daily wage systems. Furthermore, they may include family members engaged in professional occupations, such as medicine, law, and accounting, or they may operate businesses on a certain scale. Factors such as the monthly salary system, secure employment status, professional roles within the household, or the operation of a stable business contribute to enhanced employment stability. Opportunities associated with formal employment typically offer higher compensation and more stable long-term prospects than informal occupations. Consequently, middle- and upper-class households are less likely to engage in poultry keeping, as they possess the financial means to procure food through formal employment or self-employment. This suggests that the decision to raise poultry may be influenced by economic factors.

Households belonging to lower socioeconomic strata frequently encounter unstable employment and low-wage occupations, which contribute to food insecurity. To address this issue, these families often engage in poultry rearing—a practice that enables them to produce eggs and meat consistently and occasionally. This trend underscores the common practice of poultry farming among low-income families and offers a potential strategy to address their food security challenges.

To quantify this potential contribution, this section examines the potential role of poultry farming in contributing to food security through increased production capacity in the lowest economic class in Bangladesh. According to the Bangladesh Bureau of Statistics [49], the rapid urbanization and economic growth driven by the textile industry have increased per capita calorie intake, rising from 2130.7 kcal in 2016 to 2324.6 kcal in 2022. Furthermore, per capita consumption of meat and eggs increased from 33.7 g per day and 15.9 g per day in 2016 to 50.3 g per day and 17.2 g per day in 2022, respectively, underscoring the importance of backyard poultry farming in this context. A study examining the relationship between poultry ownership and income found that approximately 30% of households living in the lowest income stratum owned poultry. These households with poultry reported maintaining an average of 6.33 poultry. In Bangladesh, the most prevalent type of backyard chicken is an indigenous breed, such as *deshi*. Typically, these chickens reach adulthood at around six months of age, with body weights ranging from 1 to 1.3 kg [56,57]. Assuming that 50% of the weight is boneless raw meat, slaughtering one *deshi* chicken can yield approximately 3.5 g of raw poultry meat per day (calculated as $1250 \text{ g} \times 0.50 \div 180 \text{ days}$). Thus, maintaining an average of six chickens could meet the daily consumption of 21 g ($= 3.5 \text{ g} \times 6$).

of poultry meat. Indigenous chickens produce approximately 45–50 eggs per year, with an average egg weighing 35–39 g [56–58]. Assuming that the eggshell constitutes approximately 10% of the total weight, one *deshi* chicken can yield approximately 4.3 g of eggs per day (calculated as $47.5 \text{ eggs} \times 37 \text{ g} \times 0.9 \div 365$). Thus, assuming that all six *deshi* chickens are hens, the daily egg-harvesting capacity is approximately 25.8 g (calculated as $4.3 \text{ g} \times 6$), highlighting the significant nutritional benefits of egg production from indigenous chickens. These production characteristics have remained consistent over time, reflecting the stable traits of indigenous *deshi* breeds [56–58]. To assess the robustness of these production estimates under varying assumptions, we conducted a sensitivity analysis (Appendix A).

Important limitations exist in the comparison between the predicted production and actual consumption in Table 4. Owing to data constraints, we compared production estimates from poultry-raising households (from DHS data) with the average consumption across all households in each income stratum (from the Household Income and Expenditure Survey), including both poultry-raising and non-poultry-raising households. This comparison should be interpreted as follows: If 30% of households in the lowest income stratum raise poultry and produce the estimated amounts, this production could meaningfully contribute to meat and egg consumption for participating households. Because consumption data represent stratum-wide averages, our estimates indicate the potential contribution of backyard poultry farming rather than precise self-sufficiency rates. If poultry-raising households consume more meat and eggs than non-raising households (which seems plausible), our comparison would underestimate the contribution of backyard production to self-sufficiency. Conversely, if raising households sell some of their production rather than consuming it all, the contribution to household food security would be lower than estimated. Despite these data limitations, sensitivity analysis (Appendix A) confirms that the general pattern of results remains robust across a range of plausible parameter values. Future research with matched production and consumption data at the household level would provide more precise assessments.

Table 4. Predicted meat and egg production by backyard poultry farming.

Household Income Strata (in Taka) ¹	Predicted Number of Poultry Raised ²	Predicted per Capita Production ² (g/day)		Actual per Capita Consumption ^{1,3} (g/day)	
		Meat	Egg	Meat	Egg
Below 10,000	6.33	5.44	6.79	35.99	14.60
10,000–19,999	6.81	5.91	7.38	41.60	14.34
20,000–29,999	7.31	6.34	7.92	48.93	15.46
30,000–39,999	7.80	6.51	8.13	52.05	18.24
40,000–49,999	8.27	7.00	8.74	62.67	19.00
50,000–59,999	8.69	7.18	8.96	65.67	23.67
60,000–69,999	9.08	7.58	9.45	61.67	23.33
70,000 and above	11.15	9.03	11.27	83.67	30.33

¹ Calculated using data from the 2022 Income and Expenditure Survey [49]. ² Based on the authors' estimation.

³ Consumption data represent averages across all households (including both poultry-raising and non-raising households) in each income stratum.

To substantiate the significance of meat and egg production through backyard poultry farming, particularly among low-income households, we compared our findings with data from the 2022 Household and Income Expenditure Survey [53]. Table 4 presents the estimated meat and egg production achievable through poultry farming. The third and fourth columns show household-level production (in grams per day), which we then convert to per capita estimates by dividing by average household size in each income stratum. These estimates were derived by multiplying the predicted number of birds, as determined by the Heckman model, by the respective meat and egg production per bird. For egg production, we assume that all chickens lay eggs. The two columns on the right of Table 4 display the

average actual consumption of meat and eggs, which was calculated using aggregated data from the Household Income and Expenditure Survey [53]. Upon comparison, the actual per capita daily consumption of meat and eggs for the poorest households (those with incomes below 10,000 taka) was 35.99 g and 14.6 g, respectively. Backyard poultry farming, on average, is anticipated to yield approximately 5.44 g and 6.79 g of meat and eggs per person per day, respectively, among participating households. This suggests that poultry farming could contribute approximately 15.1% of meat consumption and 46.5% of egg consumption needs for participating households, serving as an important supplementary source of animal protein.

The remaining issues are as follows. First, owing to limitations in the available data, this study could not ascertain the extent to which the production from urban poultry farming contributes to improved nutrition for impoverished households. Second, data limitations hinder the examination of various adverse consequences associated with poultry farming. Investigating the adverse effects of poultry farming in densely populated urban areas of developing countries is imperative. These effects may include hygiene deterioration due to manure, noise issues, and an increased risk of infectious diseases, such as avian influenza. Considering these factors, it is crucial to ascertain how governments in rapidly urbanizing developing countries, such as Bangladesh, address the issue of residents engaging in poultry farming. A critical evaluation is necessary to determine whether these governments are attempting to regulate or suppress this practice, or if they are formulating effective policies to manage it. Moreover, our analysis assumes that all poultry products are consumed by households. However, poor households may sell eggs and meat for cash income, particularly when facing financial needs or favorable market prices. In such cases, backyard poultry farming contributes to food security through income rather than direct protein consumption. This income could be used to purchase a variety of foods, thereby diversifying the household diet. Without data on production sold versus consumption, we cannot determine the relative importance of these pathways—direct consumption and income generation—through which backyard poultry farming contributes to household food security. Future research should collect data on production and disposal patterns to understand the contributions of urban poultry farming.

5. Conclusions

This study examines the correlation between poultry farming and household income in urban Bangladesh, with the primary aim of examining the production capacity of backyard poultry and its potential implications for food security among low-income households. The analysis utilized raw data from the 2022 Bangladesh DHS. The findings are noteworthy, indicating that over 20% of urban households and more than 30% of low-income households engage in poultry farming. This study employed the Heckman selection model to investigate the association between income and poultry ownership. The results demonstrated that the number of poultry per household increases with higher income levels. However, households in the lower economic strata are more inclined to keep poultry, primarily to manage the stringent budget constraints associated with low income. Furthermore, the findings are contextualized by comparing them with the results of the Household Income and Expenditure Survey conducted by the Bangladesh government. This comparison suggests that meat and eggs from poultry raised by households living in absolute poverty or near poverty could serve as a crucial source of animal protein. While data limitations prevent precise measurement of household-level self-sufficiency, our analysis demonstrates that backyard poultry farming represents a potentially important food security strategy for urban poor households in Bangladesh. Further research using longitudinal data is necessary to assess the impact of backyard chicken farming on nutritional security, particularly

in the context of balancing the nutritional benefits of poultry with the regulation of poultry for urban sanitation in densely populated urban areas.

These findings have important policy implications for urban food security in developing countries experiencing rapid urbanization. Municipalities should integrate backyard poultry farming into food security programs by using targeted strategies. Local governments could distribute chicks to low-income households and provide technical training and veterinary support to boost productivity and biosecurity. To address land shortages in densely populated areas, municipalities could encourage community-based cooperative poultry farming, allowing households to jointly raise chickens and share eggs. Cooperatives could use an egg bank system, offering regular allocations and lending options, with surplus eggs sold for collective income. Adjusting zoning regulations to permit small-scale poultry farming in designated areas with clear flock size and sanitation guidelines would facilitate these efforts. Together, these policies would increase animal protein intake among urban poor households, ensure sanitation, and strengthen community resilience.

Author Contributions: Conceptualization, S.U. and A.I.; methodology, S.U. and A.I.; software, S.U.; validation, A.I.; formal analysis, S.U.; data curation, S.U.; writing—original draft preparation, S.U.; writing—review and editing, A.I. and A.K.M.K.P.; supervision, A.I.; project administration, A.I. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: Raw data are available to the public upon request from the Demographic and Health Survey Program homepage at <https://dhsprogram.com> (last accessed on 2 October 2025).

Acknowledgments: The authors thank the Demographic and Health Survey Program for providing raw data from the 2022 Bangladeshi survey.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

A sensitivity analysis was performed to evaluate the robustness of the production estimates. Key parameters influencing meat and egg production in backyard poultry farming vary. Three scenarios—pessimistic, base, and optimistic—were explored by adjusting the number of poultry raised, chicken body weights, and annual egg production.

Scenario Assumptions: The pessimistic scenario assumes a 20% reduction in all three parameters: poultry numbers (80% of predicted values), chicken body weight (1000 g), and annual egg production (38 eggs per bird). The base scenario applied the main model predictions, with a chicken body weight of 1250 g and 47.5 eggs per bird annually. The optimistic scenario assumed a 20% increase in poultry numbers (120% of predicted values), chicken body weight (1500 g), and annual egg production (57 eggs per bird). All scenarios maintained constant assumptions for the breeding period (180 days), edible portion of meat (50% of body weight), edible portion of eggs (90% after removing shells), and egg weight (37 g per egg).

Results: The sensitivity analysis revealed substantial variations in per capita production across income strata and scenarios. For the lowest income stratum (monthly household income below 10,000 Taka), per capita meat production ranged from 3.48 g/day in the pessimistic scenario to 7.84 g/day in the optimistic scenario, whereas per capita egg production ranged from 4.35 g/day to 9.78 g/day. In the highest income stratum ($\geq 70,000$ Taka), meat production ranged from 5.78 g/day to 13.00 g/day and egg production ranged from 7.21 g/day to 16.22 g/day. These results demonstrate that even under pessimistic assumptions, backyard poultry farming contributes to household food security, particularly in

lower-income households. The optimistic scenario suggests that improvements in poultry management practices, such as enhanced feeding, healthcare, and breed selection, could substantially increase the nutritional benefits of urban poultry farming. The wide range between scenarios underscores the importance of supportive policies and extension services to enable urban poor households to maximize production from limited resources. Production increases consistently across income strata in all three scenarios, reflecting both the higher predicted number of poultry raised and potentially better management practices among higher-income households. However, the proportional contribution to household food security remains most significant for lower-income households, which rely more heavily on backyard production to supplement limited food budgets.

References

1. Popkin, B.M. Nutritional patterns and transitions. *Popul. Dev. Rev.* **1993**, *19*, 138–157. [\[CrossRef\]](#)
2. Andreoli, V.; Bagliani, M.; Corsi, A.; Frontuto, V. Drivers of protein consumption: A cross-country analysis. *Sustainability* **2021**, *13*, 7399. [\[CrossRef\]](#)
3. Grigg, D. The pattern of world protein consumption. *Geoforum* **1995**, *26*, 1–17. [\[CrossRef\]](#)
4. Henchion, M.; Hayes, M.; Mullen, A.M.; Fenelon, M.; Tiwari, B. Future protein Supply and Demand: Strategies and Factors Influencing a Sustainable Equilibrium. *Foods* **2017**, *6*, 53. [\[CrossRef\]](#)
5. Isanaka, S.; Mora-Plazas, M.; Lopez-Arana, S.; Baylin, A.; Villamor, E. Food insecurity is highly prevalent and predicts underweight but not overweight in adults and school children from Bogotá, Colombia. *J. Nutr.* **2007**, *137*, 2747–2755. [\[CrossRef\]](#) [\[PubMed\]](#)
6. Kang, Y.; Hurley, K.M.; Ruel-Bergeron, J.; Monclus, A.B.; Oemcke, R.; Wu, L.S.F.; Mitra, M.; Phuka, J.; Klemm, R.; West, K.P., Jr.; et al. Household food insecurity is associated with low dietary diversity among pregnant and lactating women in rural Malawi. *Public Health Nutr.* **2019**, *22*, 697–705. [\[CrossRef\]](#)
7. Pérez-Escamilla, R.; Segall-Corrêa, A.M.; Kurdian Maranha, L.K.; Sampaio Md, M.F.A.; Marín-León, L.; Panigassi, G. An adapted version of the U.S. Department of Agriculture Food Insecurity Module is a valid tool for assessing household food insecurity in Campinas, Brazil. *J. Nutr.* **2004**, *134*, 1923–1928. [\[CrossRef\]](#)
8. Asare, H.; Rosi, A.; Faber, M.; Smuts, C.M.; Ricci, C. Animal-source foods as a suitable complementary food for improved physical growth in 6 to 24-month-old children in low- and middle-income countries: A systematic review and meta-analysis of randomised controlled trials. *Br. J. Nutr.* **2022**, *128*, 2453–2463. [\[CrossRef\]](#)
9. Dror, D.K.; Allen, L.H. The importance of milk and other animal-source foods for children in low-income countries. *Food Nutr. Bull.* **2011**, *32*, 227–243. [\[CrossRef\]](#)
10. Headey, D.; Hirvonen, K.; Hoddinott, J. Animal sourced foods and child stunting. *Am. J. Agric. Econ.* **2018**, *100*, 1302–1319. [\[CrossRef\]](#)
11. Khonje, M.G.; Qaim, M. Animal-sourced foods improve child nutrition in Africa. *Proc. Natl. Acad. Sci. USA* **2024**, *121*, e2319009121. [\[CrossRef\]](#)
12. Krebs, N.F.; Mazariegos, M.; Tshefu, A.; Bose, C.; Sami, N.; Chomba, E.; Carlo, W.; Goco, N.; Kindem, M.; Wright, L.L.; et al. Meat consumption is associated with less stunting among toddlers in four diverse low-income settings. *Food Nutr. Bull.* **2011**, *32*, 185–191. [\[CrossRef\]](#)
13. Zaharia, S.; Ghosh, S.; Shrestha, R.; Manohar, S.; Thorne-Lyman, A.L.; Bashaasha, B.; Kabunga, N.; Gurung, S.; Namirembe, G.; Appel, K.H.; et al. Sustained intake of animal-sourced foods is associated with less stunting in young children. *Nat. Food* **2021**, *2*, 246–254. [\[CrossRef\]](#) [\[PubMed\]](#)
14. Abrahams, Z.; Mchiza, Z.; Steyn, N.P. Diet and mortality rates in sub-Saharan Africa: Stages in the nutrition transition. *BMC Public Health* **2011**, *11*, 801. [\[CrossRef\]](#)
15. Alderman, H.; Hoogeveen, H.; Rossi, M. Preschool nutrition and subsequent schooling attainment: Longitudinal evidence from Tanzania. *Econ. Dev. Cult. Change* **2009**, *57*, 239–260. [\[CrossRef\]](#)
16. Ravallion, M. *The Economics of Poverty: History, Measurement, and Policy*; Oxford University Press: Oxford, UK, 2016.
17. World Bank. *Poverty, Prosperity, and Planet Report 2024: Pathways out of the Polycrisis*; World Bank: Washington, DC, USA, 2024.
18. Agarwal, S.; Sethi, V.; Gupta, P.; Jha, M.; Agnihotri, A.; Nord, M. Experiential household food insecurity in an urban underserved slum of North India. *Food Secur.* **2009**, *1*, 239–250. [\[CrossRef\]](#)
19. Chatterjee, N.; Fernandes, G.; Hernandez, M. Food insecurity in urban poor households in Mumbai, India. *Food Secur.* **2012**, *4*, 619–632. [\[CrossRef\]](#)
20. Joshi, A.; Arora, A.; Amadi-Mgbenka, C.; Mittal, N.; Sharma, S.; Malhotra, B.; Grover, A.; Misra, A.; Loomba, M. Burden of household food insecurity in urban slum settings. *PLoS ONE* **2019**, *14*, e0214461. [\[CrossRef\]](#) [\[PubMed\]](#)

21. Mohamed, S.F.; Mberu, B.U.; Amendah, D.D.; Kimani-Murage, E.W.; Ettarh, R.; Schofield, L.; Egondi, T.; Wekesah, F.; Kyobutungi, C. Poverty and uneven food security in urban slums. In *Rapid Urbanisation, Urban Food Deserts and Food Security in Africa*; Crush, J., Battersby, J., Eds.; Springer: Cham, Switzerland, 2016; pp. 97–111.
22. Mohiddin, L.; Phelps, L.; Walters, T. Urban Malnutrition: A Review of Food Security and Nutrition Among the Urban Poor, 2012. International Public Nutrition Resource Group. Available online: <https://alnap.cdn.ngo/media/documents/nw-urban-malnutrition-jun-13-website.pdf> (accessed on 15 November 2023).
23. Kimani-Murage, E.W.; Schofield, L.; Wekesah, F.; Mohamed, S.; Mberu, B.; Ettarh, R.; Egondi, T.; Kyobutungi, C.; Ezech, A. Vulnerability to food insecurity in urban slums: Experiences from Nairobi, Kenya. *J. Urban Health Bull. New York Acad. Med.* **2014**, *91*, 1098–1113. [\[CrossRef\]](#)
24. Pottier, J. Coping with urban food insecurity: Findings from Kampala, Uganda. *J. Mod. Afr. Stud.* **2015**, *53*, 217–241. [\[CrossRef\]](#)
25. Tawodzera, G. Vulnerability in crisis: Urban household food insecurity in Epworth, Harare, Zimbabwe. *Food Secur.* **2011**, *3*, 503–520. [\[CrossRef\]](#)
26. Piaseu, N.; Mitchell, P. Household food insecurity among urban poor in Thailand. *J. Nurs. Scholarsh.* **2004**, *36*, 115–121. [\[CrossRef\]](#)
27. FAO; RUAF. *Urban and Peri-Urban Agriculture Sourcebook—From Production to Food Systems*; FAO: Rome, Italy; Rikolto: Leuven, Belgium, 2022.
28. Khumalo, N.Z.; Sibanda, M. Does urban and peri-urban agriculture contribute to household food security? An assessment of the food security status of households in Tongaat, eThekweni municipality. *Sustainability* **2019**, *11*, 1082. [\[CrossRef\]](#)
29. Jongwe, A. Synergies between urban agriculture and urban household food security in Gweru City, Zimbabwe. *J. Dev. Agric. Econ.* **2014**, *6*, 59–66. [\[CrossRef\]](#)
30. Gallaher, C.M.; Kerr, J.M.; Njenga, M.; Karanja, N.K.; WinklerPrins, A.M.G.A. Urban agriculture, social capital, and food security in the Kibera Slums of Nairobi, Kenya. *Agric. Hum. Values* **2013**, *30*, 389–404. [\[CrossRef\]](#)
31. Lynch, K.; Maconachie, R.; Binns, T.; Tengbe, P.; Bangura, K. Meeting the urban challenge? Urban agriculture and food security in post-conflict Freetown, Sierra Leone. *Appl. Geogr.* **2013**, *36*, 31–39. [\[CrossRef\]](#)
32. Maxwell, D.G. Alternative food security strategy: A household analysis of urban agriculture in Kampala. *World Dev.* **1995**, *23*, 1669–1681. [\[CrossRef\]](#)
33. Smart, J.; Nel, E.; Binns, T. Economic crisis and food security in Africa: Exploring the significance of urban agriculture in Zambia's Copperbelt Province. *Geoforum* **2015**, *65*, 37–45. [\[CrossRef\]](#)
34. Zezza, A.; Tasciotti, L. Urban agriculture, poverty, and food security: Empirical evidence from a sample of developing countries. *Food Policy* **2010**, *35*, 265–273. [\[CrossRef\]](#)
35. Graefe, S.; Schlecht, E.; Buerkert, A. Opportunities and challenges of urban and peri-urban agriculture in Niamey, Niger. *Outlook Agric.* **2008**, *37*, 47–56. [\[CrossRef\]](#)
36. Uko, E.; Binns, T.; Nel, E. 'I lost my job suddenly, but I was prepared': The significance of urban and peri-urban agriculture in Benin City, Nigeria. *Agroecol. Sustain. Food Syst.* **2023**, *47*, 25–46. [\[CrossRef\]](#)
37. Gororo, E.; Kashangura, M.T. Broiler production in an urban and peri-urban area of Zimbabwe. *Dev. S. Afr.* **2016**, *33*, 99–112. [\[CrossRef\]](#)
38. Masvaure, S. Coping with food poverty in cities: The case of urban agriculture in Glen Norah Township in Harare. *Renew. Agric. Food Syst.* **2016**, *31*, 202–213. [\[CrossRef\]](#)
39. Simiyu, R.; Foeken, D. Gendered divisions of labour in urban crop cultivation in a Kenyan town: Implications for livelihood outcomes. *Gend. Place Cult.* **2013**, *21*, 768–784. [\[CrossRef\]](#)
40. Kanosvavhira, T.P.; Tevera, D. Urban agriculture as a source of social capital in the Cape Flats of Cape Town. *Afr. Geogr. Rev.* **2020**, *39*, 175–187. [\[CrossRef\]](#)
41. Olivier, D.W.; Heineken, L. The personal and social benefits of urban agriculture experienced by cultivators on the Cape Flats. *Dev. S. Afr.* **2017**, *34*, 168–181. [\[CrossRef\]](#)
42. Sagar, U.S.; Singh, Y.; Mahalingam, A.; Malladi, T. Future impacts of Urban and Peri-urban agriculture on carbon stock and land surface temperatures in India. *Urban Clim.* **2022**, *45*, 101267. [\[CrossRef\]](#)
43. Asadu, A.N.; Chah, J.M.; Attamah, C.O.; Igbokwe, E.M. Knowledge of hazards associated with urban livestock farming in southeast Nigeria. *Front. Vet. Sci.* **2021**, *8*, 600299. [\[CrossRef\]](#)
44. Correa, M.T.; Grace, D. Slum livestock agriculture. In *Encyclopedia of Agriculture and Food Systems*; Elsevier: Amsterdam, The Netherlands, 2014; pp. 113–121.
45. Ushimaru, S.; Iwata, R.; Amrullah, E.R.; Utami, A.W.; Ishida, A. Which households raise livestock in urban and peri-urban areas of eight developing Asian countries? *Agriculture* **2024**, *14*, 443. [\[CrossRef\]](#)
46. FAO. Livestock Keeping in Urban Areas. In *FAO Animal Production and Health Papers 151*; FAO: Rome, Italy, 2001. Available online: <http://www.fao.org/docrep/004/y0500e/y0500e00.htm> (accessed on 21 March 2025).

47. Miller, V.; Reedy, J.; Cudhea, F.; Zhang, J.; Shi, P.; Erndt-Marino, J.; Coates, J.; Micha, R.; Webb, P.; Mozaffarian, D.; et al. Global, regional, and national consumption of animal-source foods between 1990 and 2018: Findings from the Global Dietary Database. *Lancet Planet. Health* **2022**, *6*, e243–e256. [[CrossRef](#)] [[PubMed](#)]
48. National Institute of Population Research and Training (NIPORT); I.C.F. *Bangladesh Demographic and Health Survey 2022: Key Indicators Report*; NIPORT: Dhaka, Bangladesh; I.C.F.: Rockville, MD, USA, 2023.
49. Bangladesh Bureau of Statistics. *Statistical Yearbook Bangladesh 2022*; Ministry of Planning, Government of the People's Republic of Bangladesh: Dhaka, Bangladesh, 2023.
50. Yamashita, H.; Ishida, A. Who engages in urban and peri-urban agriculture in the condensed urban slums of Bangladesh? *J. Dev. Agric. Econ.* **2017**, *9*, 373–380. [[CrossRef](#)]
51. Dontamsetti, T.; Assaf, S.; Yourkavitch, J.; Mayala, B.K. A Primer on the Demographic and Health Surveys Program Spatial Covariate Data and Their Applications. In *DHS Spatial Analysis Reports No. 16*; ICF: Rockville, MD, USA, 2018.
52. Harttgen, K.; Vollmer, S. Using an asset index to simulate household income. *Econ. Lett.* **2013**, *121*, 257–262. [[CrossRef](#)]
53. Bangladesh Bureau of Statistics. *Detailed Tables: Household Income and Expenditure Survey, HIES 2022*; Ministry of Planning, Government of the People's Republic of Bangladesh: Dhaka, Bangladesh, 2023.
54. World Bank. Dhaka: Improving Living Conditions for the Urban Poor. In *Bangladesh Development Series Paper No. 17*; The World Bank: Dhaka, Bangladesh, 2007.
55. Ahmad, S.; Munir, F.; Avtar, R.; Sowgat, T.; Kundu, D.; Wang, Y.P. Housing adequacy in Delhi, Dhaka and Karachi: Strategies for promoting sustainable and inclusive housing. *Cities* **2025**, *160*, 105779. [[CrossRef](#)]
56. Bhuiyan, A.K.F.H.; Bhuiyan, M.S.A.; Deb, G.K. Indigenous chicken genetic resources in Bangladesh: Current status and future outlook. *Anim. Genet. Resour. Inf.* **2005**, *36*, 73–84. [[CrossRef](#)]
57. Hazary, M.E.H.; Khan, M.K.I. A review of indigenous chickens of Bangladesh: Underutilized animal genetic resources for genetic improvement. *Int. J. Curr. Res.* **2023**, *15*, 24619.
58. Bett, R.C.; Bhuiyan, A.K.F.H.; Khan, M.S.; Silva, G.L.L.P.; Thuy, L.T.; Sarker, S.C.; Abeykoon, M.N.D.; Nguyen, T.T.H.; Sadeh, S.; Kariuki, E.; et al. Indigenous chicken production in the South and South East Asia. *Livest. Res. Rural Dev.* **2014**, *26*, 229.

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.