ENHANCING FOOD SECURITY AND NUTRITION THROUGH URBAN AGRICULTURE IN ILORIN METROPOLIS: CUSHIONING POST-COVID-19 EFFECTS

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ABSTRACT

The COVID-19 pandemic has devastated local, national, and global economies. The resulting low GDP growth, high rates of hunger, food insecurity, poverty, and unemployment have severely challenged the inclusive growth and sustainable development in many developing countries. The pandemic has worsened food insecurity and malnutrition worldwide, especially in urban areas affected by climate change and environmental degradation. Despite governmental efforts through various food policies, food insecurity remains a significant issue in Africa, and particularly in Nigeria. It is crucial to assess the impact of COVID-19 on food security and nutritional status in urban centers such as the Ilorin metropolis. Urban agriculture is a proactive measure undertaken by residents of Nigerian cities, particularly in Ilorin, to mitigate the effects on food security and nutrition. This study aims to explore the mitigating impact of post-COVID-19 on food security and nutrition through urban agriculture, employing a mixed-methods approach. The findings indicate that household size significantly reduces household food consumption by 50.3%, which is negatively significant at the 5% level. Additionally, the dependency ratio has a negatively significant impact on household food consumption by 10.2%. This suggests that a higher dependency ratio correlates with increased food consumption and lower nutritional status, which can severely diminish food productivity and the nutritional status of urban farmers. Therefore, addressing the issues of food insecurity, hunger, malnutrition, and poverty has become a global imperative in the wake of COVID-19.

Keywords: Food Security, Nutrition Security, Urban Agriculture, Covid-19

1. INTRODUCTION

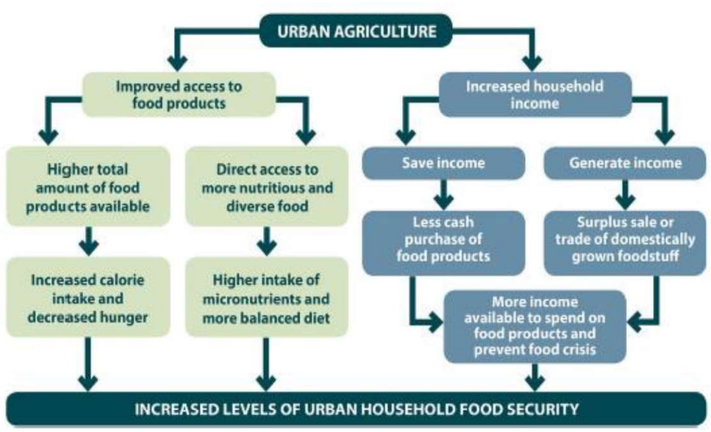
Africa has not yet embarked on a path to eliminate hunger by 2030, with malnutrition rates increasing from 17.6% in 2014 to 19.1% in 2019, according to FAO's 2019 report. The issue of adequate food security and nutrition has been a significant topic among scholars and stakeholders worldwide (Ejikeme, 2017; Osabohien et al., 2020). The COVID-19 pandemic has devastated economies at all levels, with far-reaching impacts on health, employment, poverty, food security, nutrition, education, and the functionality of food systems (Barrett, 2020; Devereux et al., 2020; Swinnen, 2020; GAIN, 2020). It has also caused supply chain disruptions, leading to instability in food availability and prices (Zurayk, 2020; Torero, 2020; Reardon et al., 2020a; Reardon et al., 2020b; Ihle et al., 2020; Akter, 2020; FAO, 2020). The challenge of mitigating food insecurity, hunger, malnutrition, and poverty has intensified globally due to COVID-19. The pandemic's aftermath has led to low GDP growth and high rates of hunger, food insecurity, poverty, and unemployment, posing a threat to inclusive growth and sustainable development. Agriculture has the potential to alleviate poverty and unemployment, increase incomes, and enhance food security for 80% of the world's poor residing in rural-urban areas and primarily engaged in farming (World Bank, 2021). Agricultural growth not only generates income and employment within the sector but also stimulates growth in other vital economic sectors. Studies have shown that agricultural GDP growth is at least twice as effective in reducing poverty compared to non-agricultural GDP growth.

The COVID-19 crisis, with its severe consequences, is not yet over. The virus has been circulating for over 20 months, and many health analysts believe it will continue to mutate and spread for several more years (Scudellari, 2020). This situation poses serious risks to food security and nutrition, exposing numerous vulnerabilities within food systems. Lockdowns, aimed at controlling the spread of the virus, have led to significant disruptions in food systems, resulting in a sharp increase in hunger. Recent estimates suggest that an additional 161 million people suffered from chronic undernourishment in 2020 as the pandemic escalated, with the total number of people facing chronic hunger increasing from approximately 650 million in 2019 to between 720 and 811 million in 2020. Additionally, around 320 million more people experienced moderate to severe food insecurity, with nearly one in three people now affected by hunger at these levels (FAO et al., 2021).

Future food productivity may also suffer, particularly if the virus remains uncontrolled and lockdowns persist. It is imperative for governments to urgently act to make food systems more resilient. Nonetheless, the challenge of achieving Sustainable Development Goal 2, which aims to end hunger, achieve food security, and improve nutrition by 2030, remains a significant concern for both developed and developing nations. Food security, encompassing availability, accessibility, stability, and utilization, can be realized by ensuring the agricultural sector is productive enough to meet each nation's food demand, according to the FAO (2017). With global urbanization, population, and income growth driving increased food demand, agriculture now faces the added challenges of natural resource limitations and the lingering effects of COVID-19.

Global hunger has severely disrupted domestic food distribution systems, leading to wage reductions, inflation, unemployment, diminished purchasing power, natural disasters, and urbanization. These factors have shifted the burden of malnutrition from rural to urban areas. Despite these obstacles, the demand for food has surged. Urban agriculture, present in both intra-urban and peri-urban zones, has become a significant element in the developing world. The COVID-19 pandemic underscores the need to shorten supply chains and bolster national food supply resilience. Urban agriculture utilizes small urban spaces like vacant lots, gardens, or rooftops for crop cultivation. While food security is vital, nutrition security is equally important, ensuring access to nutritious foods that support health and disease prevention.

In economically challenging times and food scarcity, urban agriculture becomes a critical survival strategy. Approximately 20% to 33% of urban families engage in this practice, with some relying on it as their sole means of livelihood (Rees, 2009). In Nigeria, food and nutrition security remain pressing issues despite various initiatives aimed at enhancing agriculture and increasing food production. Addressing these insecurities involves tackling both challenges and opportunities within agricultural and food systems. Sustainable agricultural systems necessitate the integration of science and technology to ensure both food and nutritional security.



Adapted from Laurenz Langer *et al.* (2014)

2. HOW COVID-19 IS AFFECTING FOOD SECURITY AND NUTRITION

The COVID-19 pandemic has precipitated a hunger crisis affecting millions globally. Strategies to curb the virus, such as physical distancing, school closures, trade restrictions, and countrywide lockdowns, have exacerbated nutritional challenges, particularly in low- and middle-income countries with large populations. These measures have likely interrupted agricultural production, raising concerns about food access for many. Experts agree that this hunger crisis is a global issue. The pandemic's associated loss of productivity and income, declining oil prices, reduced tourism revenue, climate change, and other factors have compounded the situation. A 2019 FAO report indicated that 820 million people worldwide suffer from starvation. The Global Report on Food Crisis (FSIN, 2020) further revealed that around 135 million individuals across 55 countries face acute food insecurity, with 73 million of them in 36 African countries. The United Nations has warned that COVID-19 could exacerbate poverty and food insecurity globally, making the achievement of sustainable development goals even more critical. COVID-19, a respiratory illness, has not been shown to be transmitted through food (ICMSF, 2020). Nonetheless, the virus and containment efforts have significantly impacted food security, nutrition, and food systems. Concurrently, malnutrition, including both obesity and undernourishment, can heighten susceptibility to COVID-19 (Butler and Barrientos, 2020). The initial and continuing uncertainty about the virus's transmission led to strict lockdowns and physical distancing measures in many countries, severely slowing economic activity and disrupting supply chains. This has triggered new dynamics with ripple effects on food systems and populations.

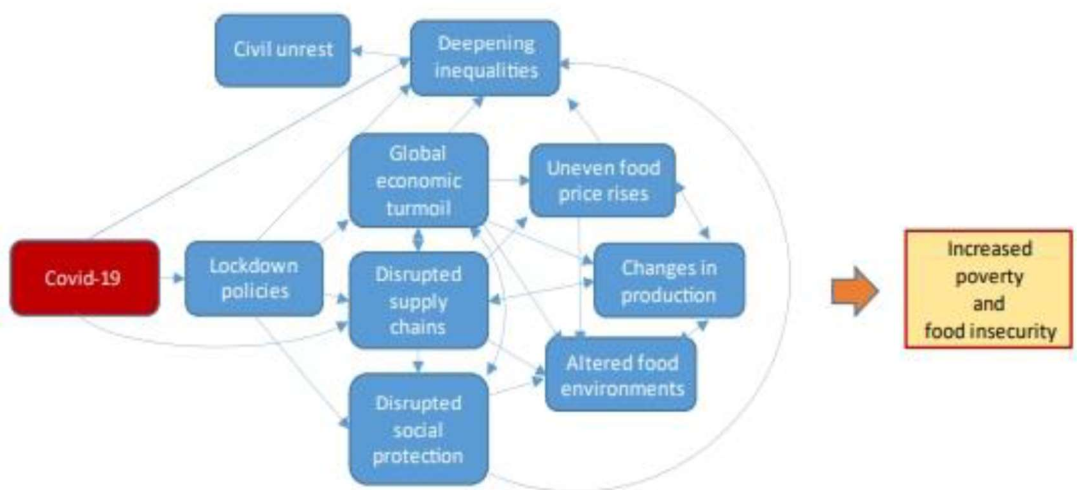
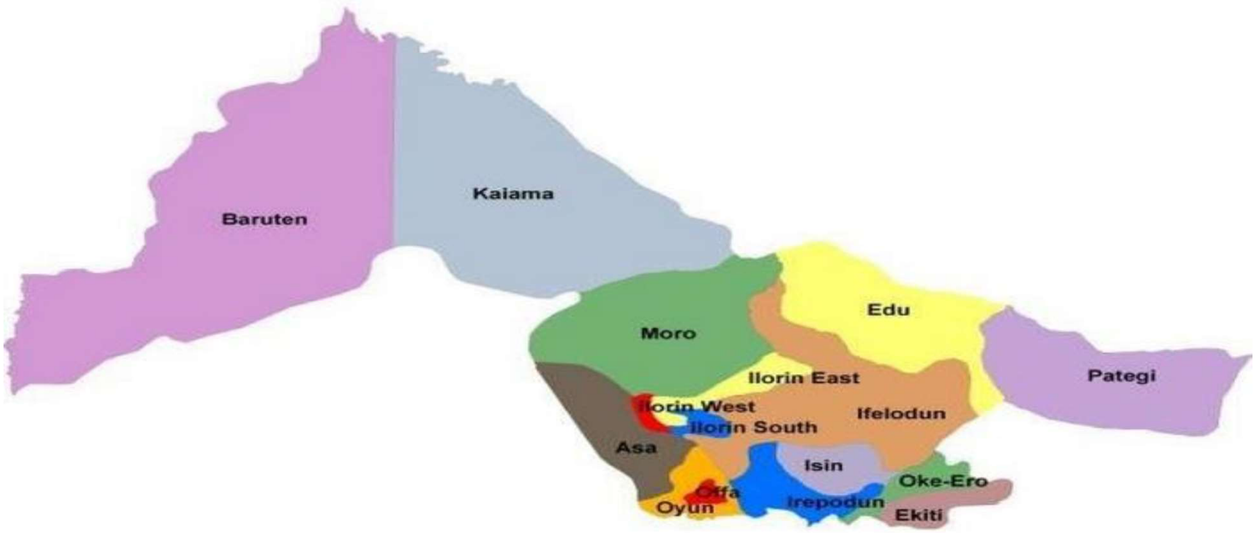


Fig. 1. The dynamics of COVID-19 that threaten food security and nutrition

3. METHODOLOGY AND ANALYTICAL TECHNIQUES

This study was conducted in Ilorin metropolis in Kwara State. Ilorin, the capital city of Kwara State, Nigeria located on latitude 80 24'N and 8036'N and longitude 4o 10'E and 4o 36'E with an area of about 765km^2. The study was carried out in three (3) local government namely; Ilorin East, Ilorin South and Ilorin West. The World Population Prospect projected that the population of Ilorin to be 814,192 in 2019 (NBS,2020). Ilorin is the most urbanized centre in Kwara State which lies approximately on latitudes 8^0 30`N and $8^0$32`N and longitudes 4^0 35` and $4^0$ 37`E (Oyebanji, 2019). The physical characteristics of Ilorin make urban farming a viable enterprise characterized by both high and low grounds ranging between 250m to 400m above the sea level. The climate of Ilorin metropolis is characterized by both wet and dry seasons. The temperature ranges from 33^0C to 34^0C from November to January while from February to April. Due of the high seasonal rainfall coupled with the high temperature, the soils of Ilorin are easy to farm because they contain loamy soil with sodium and low fertility (Ajibade and Ojeola, 2004). The rainy season usually starts around April lasting till September while the dry season is usually between November and March, with a mean annual rainfall of 1250 mm (Yusuf and Abbas, 2018).



3.1 Sampling Selection and Sample Size

A three-stage sampling techniques was used for this study. The first stage involved the purposive selection of the three (3) local government areas (Ilorin East, Ilorin West and Ilorin South) in Ilorin metropolis. These local governments were selected because of the prevalence of farming activities. The second stage involved a snowball sampling which was used to select fifty (50) urban farmers from each local government since the list of urban farmers are not known. Primary data and secondary data were used for this study.

3.1.1 Descriptive statistics

Descriptive statistics and household consumption per capita, multiple regression and Poisson regression methods were used for this study. Descriptive statistical tools were used to describe and compare the socio-economic characteristics of the urban farming households and identify the constraints affecting urban farming in the study area.

3.2 Model Specification

3.2.1 Household food security index

The study used the Food Security Index (FSI) and simple statistical techniques. The instrument has been used in Nigeria (Ahungwa et al., 2013); in Ghana (Kuwornu et al., 2013) and in Pakistan (Bashir et al., 2012). It was demonstrated that data on the caloric content of commonly consumed foods were collected using parameters that convert edible portions into calories. The food security indices were constructed and the caloric acceptability was calculated by dividing the calorie supply for the household by the family size adjusted for adult equivalent (Runge-Metzger, 1993).

The SPSS Statistical software; version 21 was used to calculate the frequency, mean, standard deviation and other food security metrics (Ahungwa et al., 2013).

$$Zi = \frac{\text{Household's daily per capita calorie avaibility (A)}}{\text{Household's daily per capita calorie requirement (R)}} \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

where,

Zi denotes the status of ith household food security ($Z \geq 1$ food secure and $Z<1$ food insecure). The study used the FAOrecommended daily caloric intake of 2,700 kcal for an adult aged man (30–60 years) as a benchmark for developing nations (Kidane et al., 2005) and as a criterion for food security status. Using the shortfall/surplus index, P, numerous food security indices were computed based on

$$Pi = \frac{1}{M}\sum_{i=1}^{m} GKi$$

where,

Pi denotes the shortfall or surplus index for the i^{th} household,

$$GK = \frac{X_{ki} - I}{I}$$

I = shortage or excess encountered by i^{th} household,

Xki = Mean everyday caloric accessible to the *ith* household.

M = the magnitude of households that are food secure (excess index) or food insecure (deficit index).

I = the food security line (2,700 kcal/capita/day).

3.3 Multiple Regression Model using Calorie intake per capita

Multiple regression models were used to the effect of Post-Covid 19 on food security and nutrition status through urban agriculture in Kwara state. The model is stated as follows:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + \mu_t$$

where,

Y= Household calorie intake per capita (kcal)
b_0 = Constant
$b_1 - b_{10}$ = co efficient of explanatory variables
X_1 = total grain equivalent from urban agriculture
X_2 = Gender of household head (Male=1, Female=0)
X_3 = Age of household head (Years)
X_4 = Educational level of household head (No of years spent in school)
X_5 =Household size (Number of individuals)
X_6 = Farm size (Hectare)
X_7 = Dependency ratio (%)
X_8 =engagement in off farm income (Naira)
X_9 = Urban agriculture experience of household heads (Years)
X_{10} = Household asset (Naira)
U_t = Error term

3.3.1 Household calorie Intake per capita

Calorie per capita intake was used to calculate the household food consumption. This was calculated by collecting data on food consumption at the household level. Quantities of food consumed include food from own production, market purchases, and out-of-home meals and snacks excluding food consumed during seasonal period. A 7-day recall will be employed in this survey for easy recall. Food quantities consumed at the household level will be converted to calories using the locally available food composition table. Resulting calorie values will be divided by the number of Adult Equivalent (AE) in a household, in order to obtain the per capita calorie intake. This will further be divided by the 7-days recall period to obtain per capita daily calorie intake of each household.

4. RESULTS AND DISCUSSION

4.1 Socio-economic Characteristics of the Farmers

This section represents an analysis on the data collected during the field survey on the relevant socio-economic profile of the respondents.

Table 1. Socio-economic Characteristics of the Respondents (N = 150)

Variables	Category	Frequency	Percentage	Mean
Gender	Male	77	51.3	
	Female	73	48.7	
Age(years)	≤ 30	12	8.0	50.45
	31 - 43	53	35.3	
	44 – 55	55	36.7	
	56 – 68	22	14.7	
	> 69	8	5.3	
Marital status	Married	96	64.0	
	Single	28	18.6	
	Divorced	6	4.0	
	Separated	7	4.6	
	Widowed	13	8.6	
Household size	≤ 5	32	21.3	6.79
	6 – 9	59	39.3	
	10 – 13	39	26	
	14 – 27	12	8.0	
	>18	8	5.3	
Educational level	No formal	26	17.3	
	Primary	16	10.7	
	Secondary	64	42.7	
	Tertiary	44	2.3	
Primary occupation	Yes	108	72	
	No	42	28	
Farm size (acre)	≤0.5	131	87.3	1.97
	1.0	16	10.7	
	2.0	2	1.9	

Variables	Category	Frequency	Percentage	Mean
Total grain obtain from farm (kg)	<500	50	33.3	1,254
	501-1000	60	40	
	1001-2000	32	21.3	
	2001-3000	8	5.33	
Farm experience	≤ 20	50	33.3	28.52
	21 – 33	44	29.3	
	34 – 45	25	16.6	
	46 – 58	21	14.0	
	>59	10	6.6	
Farmers association	Yes	30	20.0	
	No	120	80.0	
Access to credit	Yes	70	46.6	
	No	80	53.3	
Amount (income)	<2,000	46	30.7	
	2,001-40,000	86	57.3	
	40,001-60,000	17	11.3	
	60,001and above	1	0.7	

Source: Field Survey, 2020

Table 1 presents the sex distribution of respondents, indicating that 51.5% of urban crop farmers are male and 48.7% are female, suggesting a male majority among urban farmers in Ilorin metropolis. This contrasts with Hadebe and Mpofu (2017), who reported that women predominantly engage in urban agriculture. Additionally, Table 1 shows most respondents are aged between 31 and 55, with the average age of urban agriculture household heads being 50.45 years, indicating they are in their prime working years and likely to adopt productivity-enhancing innovations. This aligns with Dercon and Krishman (2019), who noted that household heads in their active working years tend to adopt beneficial innovations.

Regarding marital status, the study area's data reveals that 64.0% of farmers are married, with the rest being single, divorced, widowed, or separated. Married households, especially with both spouses working, are presumed to have better food security than those headed by single, widowed, divorced, or separated individuals. The common belief is that household size influences food expenditure and consumption patterns, impacting food security. Table 1 also indicates that 39.3% and 21.3% of urban farmers have household sizes of less than five and between six to nine individuals, respectively. The average household size for urban agriculture stands at 6.79, suggesting that larger households may have lower per capita food expenditure, potentially increasing food insecurity risks.

4.2 Determinants of Calorie Intake of the urban agriculture Household

Table 2. Household Calorie Intake Per Capita

Food items in Kcal	Mean	St. Deviation	Coef. of Variation	Range
Meat	248.74	203.21	0.817	0-2082.19
Cereals	1386.7	617.25	0.445	547.24-4617.22
Legumes, nuts and seeds	460.59	389.34	0.845	0.2817-67
Vegetables	33.51	55.96	1.670	4.63-555.43

Fruits	0.96	1.82	1.896	0-9.30
Fat and oil	424.11	171.26	0.404	0-1279.00
White tubers and roots	178.18	181.49	1.019	0-1325.75
Egg and milk	43.72	72.36	1.655	0-598.36
Fish and other sea foods	49.21	44.2	0.898	0-266.87
Beverages	13.43	34.36	2.559	0-191.89
Spices and condiments	1.33	0.66	0.496	0.10-5.07
Total calorie per capita	2840.46	1168.89	0.412	1379.06-944.03

Source: field survey, 2020

After the identification and aggregation process, the daily per capita consumption patterns were calculated. Table 2 reveals that the majority of the food consumed by households comes from cereal products. The average daily caloric intake from cereals was 1386.7 kcal per person, with legumes at 460.59 kcal, fats and oils at 424.11 kcal, and roots and tubers at 178.18 kcal. These food groups constitute the main source of calories for farm households, with starchy foods dominating except for legumes. Notably, the coefficient of variation for legume consumption is high at 0.845, whereas it is low for cereals and fats and oils (0.445 and 0.404, respectively).

This indicates significant variability in legume consumption among the sampled population. The findings also reveal that the daily per capita calorie intake from protein-rich foods is quite low, with a high coefficient of variation, indicating that the average does not accurately represent the population. The average daily caloric intake from meat was 178.18 kcal (with a coefficient of variation of 1.019), from fish was 49.21 kcal (0.898), and from other animal protein sources like eggs and dairy was 43.72 kcal (1.655) per person. The calorie contributions from fruits and vegetables were also low, at 0.96 kcal and 33.51 kcal respectively, and the variation in consumption within the population was notably high. The coefficient of variation for these food groups was alarmingly high, even at such low levels of daily per capita consumption.

4.3 Household Diversity Score

Table 3. Household Dietary Diversity Score

Diversity categories	Cut-off values	Frequency	Percentage
Low dietary diversity	0 – 3	25	16.7
Medium dietary diversity	4 – 6	98	65.3
High dietary diversity	7 - 12	27	18
Total		150	100

Source: Field Survey, 2020

The majority (65.3%) of household fall within medium dietary diversity category with scores ranging between 4 and 6 points while the rest 18% falls within the range of higher dietary diversity category with the score above 7 points. This implies that about 17% of the households do not have adequate dietary diversification while the majority (about 83%) is enjoying good dietary diversification.

Table 4. Effect of Urban Farming on Household Consumption

Variables	Coefficient	Standard error	Z value	p>[t]
Total grain from urban farming	0.460764*	0.0622	7.4075	0.000
Gender	-0.451	0.369	1.221	0.222
Age	-0.031**	0.014	2.255	0.024
Household size	-0.503***	0.2628	3.666	0.056
Education	0.023	0.047	2.622	0.109
Urban Farming experience	0.032	0.0255	1.591	0.207
Farm size	0.141*	0.026	1.544	0.000
Off- farm income	0.835	0.3731	5.006	0.225
Household asset	-0.027	0.0476	0.313	0.576
Dependency ratio	-0.102**	0.041	-2.509	0.012
Constant	1.450	0.8684	2.788	0.095
LR $chi^2(8)$ = 12.164				
Prob>chi^2 = 0.0000				
Pseudo R^2= 0.17				
Log Likelihood = - 27.39237				

Note: ***, ** and * = Figures significant at 10%, 5% and 1% significant levels respectively

Source: Field Survey, 2020

Table 4 presents the regression analysis on the impact of urban farming on household food consumption. The chi-square value of 12.164 suggests that the logistic model's parameters are significantly different from zero at the 1% significance level. The Pseudo R2 value of 0.177 indicates that 17.7% of the variance in the farmers' household food consumption is explained by the independent variables in the model. Furthermore, the model's likelihood function was significant (Wald = -27.39237, with $p < 0.0000$), demonstrating the strong explanatory power of urban farming's impact on household food consumption.

Table 2 details the effect of urban farming on household food consumption. It shows the results of the factors influencing urban farmers' household food consumption in the study area. The pseudo R2 value is 0.17, significant at the 1% level. Of the 10 explanatory variables in the model, four significantly influenced the likelihood of urban farmers' household food consumption: age, household size, farm size, and dependency ratio. The age of urban farmers had a notable effect, increasing the probability of household food consumption by 0.024%. Conversely, a larger household size, which could provide more family labor, decreased the probability of household food consumption by 0.6%. This suggests that the availability of farm labor sometimes reduces household food consumption.

The implication is that these individuals are not consistently available for farm work and are not engaged in other non-farming activities that could enhance the urban farming family's income. The results indicate that household size has a substantial negative impact on household food consumption, by -50.3%.

5. CONCLUSION AND RECOMMENDATIONS

Urban agriculture is increasingly recognized as a viable strategy for the urban poor to supplement income and improve nutrition. It enables the poor to lessen their cash income dependency for food by cultivating their own plots within or outside the city, thereby enhancing access to essential food. While it has shown potential in contributing to food security and income generation, numerous challenges hinder these goals. Environmental and human health issues indicate that urban agriculture's sustainability is currently at risk. Research shows that most urban farmers operate on small land areas without significant investment in fertilizers or certified seeds, leading to low yields and perpetuating a cycle of poor productivity and food poverty. The growth and success of urban agriculture hinge on policymakers, administrators, and urban farmers adopting integrated social, economic, and environmental strategies to address food consumption, nutrition, food security, and urban poverty. While sustainable urban agriculture isn't a cure-all for economic woes or poverty, it offers a constructive means to enhance urban living standards.

Our empirical evidence suggests policy interventions should focus on improving farmers' education levels, promoting family planning awareness, and prioritizing nutrition education among urban farming families. Given the positive impact of crop output on production, efforts to boost production and productivity are also essential.
To this end, the following are recommended to ensure that these policies, schemes and programmes of the government succeed:

i. The government needs to tackle the challenges posed by the Land Use Act, particularly issues of land tenure and ownership. It should also focus on delivering urban infrastructure and extension services, while ensuring that incentives are clear and available to all investors.
ii. Additionally, the provision of essential infrastructure, such as quality roads, piped water, and electricity, is crucial for urban residents to improve their living conditions. These facilities will undoubtedly enhance the productivity of urban farmers and minimize waste.

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