Income Contribution of Backyard Gardening and its Association with Household Food Security: A Case Study in an Urban Setting

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ABSTRACT

Households located in urban township settings experience food insecurity which can be alleviated through backyard gardening. This study is to determine the extent of the contribution of backyard gardening to food security. Based on the Logistic Regression Model, household size, farming experience, employment status of the household head and harvesting frequency were found to be significant in affecting the food security status of the household. The study found that backyard gardening contributes (contribution index of 67.25%) towards household food security. Household specific factors should therefore be considered in policy targeted intervention strategies aimed at alleviating food insecurity.

Keywords: Food security status, backyard gardening, contribution index
JEL Classifications: Q1, Q18, Q180

1. INTRODUCTION

Although food security at household and national levels is interrelated, more often the observations are that the two metrics are not always in tandem, to the extent that national level food security does not guarantee household level food security (Altman et al., 2009; Drysdale et al., 2019; Adeniyi et al., 2021; Adom et al., 2022). Food security has been identified in various literature to be a crucial issue needing attention at household level for many African countries (Crush and Frayne, 2010), especially in the wake of high food prices and climate change impacts on agricultural productivity (Lobell and Gourdji, 2012). This is the case for South Africa which is reported to be food secure (Statistics South Africa, 2019) at national level due to the country's capacity to import in addition to producing food sufficiently (Adeniyi et al., 2021) thus highlighting the food value chain importance. Despite that fact, the current situation and evidence from more than a decade ago such as Altman et al. (2009) points to the fact that South Africa

faces structural[1] household food insecurity (FAO, 2005) which is often associated with chronic poverty and unemployment (Drysdale et al., 2019). This makes food insecurity at the household level a significant issue of concern (Shisanya and Mafongoya, 2016; Ogundeji, 2022) especially in the context of global crises ranging from prices, economic, climate, the recent pandemic and war in Ukraine. Resilient food supply chains are required in the wake of such global crises and in this regard, backyard gardens are known to present the shortest supply chains, thereby being better suited to respond to household level needs. It can be expected that by shortening the supply chain for commodities such as fruits and vegetables, backyard gardens can contribute to addressing economic challenges such as food price inflation (Mcata, 2016; Carstens and Laan, 2021). A home garden (also referred to as a backyard or kitchen garden) is characterised by the Food and Agricultural Organisation (FAO) as a farming system that combines economic, social, and physical functions around a family home (FAO, 2001). Galhena et al. (2013) provide

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1   Structural or chronic food insecurity implies a persistent inability on the part of the household to provision itself adequately with food (FAO, 2005)

an extensive review on definitions and characteristics of home gardens. Backyard gardens, mostly located in urban settings have an important role in alleviating urban household food insecurity (Mcata and Obi, 2015). It is important to give attention to food security as a component that can assist achieving the Sustainable Development Goal (SDG) of ending hunger in all of its forms, as noted by Echendu (2022). Key research contributing to attaining this goal, should also focus on gaining an improved understanding of the micro-level food security issues that are less well understood possibly due to the aggregation problem of measuring the food security status at a macro scale. This present paper fills the gap in micro-level analysis and adds to the already available literature by providing a focused case analysis of a few selected households in a township setting wherein the relevant food security metrics are gathered to provide a rich analysis at the household level.

According to Naicker et al. (2015), household food insecurity in informal settlements in urban South Africa spiked in 2009 (91%). Nationally the available statistics indicate that 10.5% of all South African households had limited access to food in 2017 and the limited access to food has been on an upward trajectory, increasing to 20.6% in 2020 and 20.9% in 2021 (Statistics South Africa, 2019; 2020; 2021). With slightly <6 years remaining before 2030, South Africa is still in progress to end hunger (Statistics South Africa, 2019) hence all efforts necessary to meet this challenge are needed (Ngumbela et al., 2020). Studies such as Zwane (2019) and Adom et al. (2022) suggest that food insecurity experiences in South Africa due to decreased food production is also as a result of climate impacts. South Africa has also not entirely recovered from the two waves of food price inflation experienced in 2001-2002 and 2007-2008 that undermined the food security status in many households (Van Wyk and Dlamini, 2018). Therefore, achieving Sustainable Development Goal 2 (SDG-2), considering climate change mitigation strategies, and reducing food price hikes requires attention to all four[2] dimensions of food security and nutrition (FAO, 2006, FAO, 2008). For this reason, backyard gardening is one of the coping strategies that can be used to alleviate food insecurity. As a climate change mitigation strategy, backyard gardening can be a source of African Leafy Vegetables (AFL)[3] that are tolerant to abiotic stresses such as drought and heat stress (Van Rensburg et al. 2007; Maseko et al., 2017). Backyard gardens can successfully alleviate food insecurity for urban households that face a multitude of income constraints due to competing demands posed by urban living and also by ongoing global crises (Galhena et al., 2013; Tumwebaze et al., 2018). Through backyard gardening, the food supply can be increased at a household level (David and Grobler, 2022; Thomas and Terblanche, 2021). Tumwebaze et al. (2018) supported the view by indicating that backyard gardens are the major food source for households in developing countries and that gardens significantly contribute to meeting daily household needs for better nutrition

and health. Moreover, Sithole et al. (2023) concluded that the consumption of fruit and vegetables influences household food security also concurring with studies such as Zanko et al. (2014) which asserted that community fruit and vegetable gardens have a potential to improve food security. However, prior literature, such as Musotsi et al. (2008) highlighted that in order to generate or increase household income, many households practising backyard gardening sell their produce without meeting their household food requirement. The present study therefore aims to better understand the state of household food security using the widely accepted method of the FAO *Household Food Insecurity Access Scale* (Coates et al., 2007) in addition to assessing the backyard gardening related indicators that contribute to household food security. Such findings will provide policy relevant information required to achieve the mandate on the local economic development policy, Agenda 2030, and most importantly, the Sustainable Development Goal 2.

While it is known that the issue of food security is highly complex and multifaceted (Kuzmin, 2016), historically in South Africa more attention on food security research has been in rural communities compared to townships (Battersby-Lennard, 2009). Narrowing down the focus to the provinces, the same observation applies with Limpopo province (which economically is one of the poorest provinces in South Africa), where various studies (De Cock et al., 2013; Rankoana, 2020) conducted on food insecurity in rural communities have gained more surveillance with less attention received on the state of household food security in townships of that province. Available statistics indicate that in 2014 the Limpopo province had 16.6% of households engaged in backyard gardening (Statistics South Africa, 2016). However, not all is understood concerning urban households' food security status and backyard gardening nexus. The present paper addresses that important gap in published studies and by analysing the contribution of backyard gardening towards household food security focusing on the case of Luthuli Park, which is a township in the Limpopo province of South Africa. Delving into the intricate dynamics of household food security and the role of backyard gardening in the context of global crises, will not only contribute valuable insights but will assist to stimulate global theoretical development conversations and add to the knowledge and information that is useful to address real-world challenges, in this case, food insecurity through backyard gardening. The paper is organised into six sections, where this introduction section is followed by a brief review of literature. In section 3, the methodology is elaborated and followed by the presentation of results in section 4. The discussion of results in section 5 is followed by the conclusion and recommendations in section 6.

2. BRIEF LITERATURE REVIEW

Past studies on backyard gardening have provided evidence of its importance in terms of nutrition, food security and income for households e.g., Oluwasola et al. (2013); Dorado et al. (2018); Oghenero et al. (2020) and Castañeda-Navarrete (2021). Singh et al. (2018) found that the production of vegetables in backyard gardens increased up to 160.93%, as a result of consumption increases (83.63%). Oghenero et al. (2020) in addition to

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[2] According to FAO (2008), there are four dimensions of food security known worldwide: food availability, food access, food utilisation, and food stability.

[3] African leafy vegetables are defined in Van Rensburg et al. (2007) as plant species in which the leafy parts, which may be young, succulent stems, flowers, and very young fruit, are used as a vegetable.

identifying that there is a mixture of backyard household enterprises that contribute to enhance household food security, found similarities with the study of Dorado et al. (2018) that women dominated (71%) backyard enterprises. To establish the nexus between backyard gardening diversity and food security Castañeda-Navarrete (2021) used regression analysis in a Mexican study and found a strong association. The study of Oghenero et al. (2020) and that of Dorado et al. (2018) used a 4-point Likert scale and T-tests to analyse dietary diversity scores respectively which showcases the various methods available to conduct such analyses. While there is evidence in literature on the contribution of backyard gardening and its impact on food security status of households, Mjonono (2008) found that food insecure households at times try to cope with food insecurity by reducing meal sizes, skipping meals, or even going without food for one or more days. Jacobs et al. (2016) found that households that practice backyard gardening enjoy diverse diets compared to non-gardening households that then engage in certain behaviours to cope with food insecurity as Mjonono (2008) indicated.

Some insights on household indicators that can explain the food security status of households practising backyard gardening in South Africa is given in various studies that include Mcata and Obi (2015); Dissanayake and Manawadu (2019); Mdiya and Mdoda (2021); Mokone (2016). For instance, Dissanayake and Manawadu (2019) found that factors such as basic knowledge in crop production practices, ability to obtain quality seeds and planting materials were among factors affecting the backyard gardeners' food security status. Mdiya and Mdoda (2021) found that location, years spent in school, total household income, land ownership, age, off-farm income, and family size were among other factors affecting backyard gardeners' food security status. Research by Mcata and Obi (2015) as well as Mokone (2016) conclude that household income, engagement in non-farm activities, years of experience in gardening, and the proportion of produce consumed impacted the food security status of backyard gardeners. Dissanayake and Manawadu (2019) used the cross-tabulation method and chi-square test, while Mdiya and Mdoda (2021) and Mokone (2016) used logit regression model. These past studies lack explicit information on the contribution of backyard gardens to household food security. A micro-level study as the present paper provides, is needed in response to the ever-changing landscape and/or dynamics regarding the food security at national level versus the household level. The literature gap filled by the present paper which analyses the contribution of fruit and vegetable backyard gardens to the food security status in a township setting for the selected households is one that requires ongoing research to inform food security policies. By building upon the findings of previous studies, this present paper uses a logistic regression model to identify the factors contributing to the food security status of selected urban households practicing backyard gardening in order to provide insights into the key factors that policymakers should target for improvement.

Studies elsewhere such as in Brazil, Ethiopia, Australia, Mexico and Nigeria converge on identifying the importance required in understanding the socio-economic factors that affect food security. Souza et al. (2016) conducted a study on demographic and socioeconomic conditions associated with food insecurity in households in Campinas, SP, Brazil. The study found that mild food insecurity was associated with demographic conditions, while moderate/severe food insecurity was associated with socioeconomic conditions. However, Seivwright et al. (2020) found that demographic characteristics do not significantly affect levels of food insecurity. A study on the vulnerability of smallholder rural households to food insecurity in Eastern Ethiopia found that vulnerability to food insecurity was strongly associated with various socioeconomic factors such as family size, size of cultivated landholding, soil fertility status of plots, access to irrigation, and the number of extension visits (Bogale, 2012). On the same study focus, Magaña-Lemus et al. (2016) found that vulnerability in terms of food insecurity was associated with socioeconomic factors such as the marital status of the household head.

A variety of analysis methods were used in the reviewed studies and include the Pearson chi-square tests to determine food insecurity and socioeconomic disadvantage in Australia (Seivwright et al., 2020). Magaña-Lemus et al. (2016) utilised data from a national household survey and established a food security scale to profile the socio-demographic factors affecting the level of household food insecurity in Mexico. Uzokwe et al. (2016) used mean distribution, grand mean distribution, and contribution index to measure the contribution of backyard gardens through a 5-point Likert scale in the study conducted on the contribution of home gardening to family food security in Nigeria. The study conducted by Uzokwe et al. (2016) as well as Oladele et al. (2020) influence this study in terms of analytical techniques applied such as the mean and contribution index but differs in the context and study country. In addition, the present paper customised the methods adopted from Uzokwe et al. (2016) to the specific South African township case and the Household Food Insecurity Access Scale Score (HFIASS) and the logistic regression model.

3. METHODOLOGY

3.1. Study Area and Data Collection
The present study was conducted in Luthuli Park, situated in

Figure 1: Study area location in Limpopo Province, South Africa
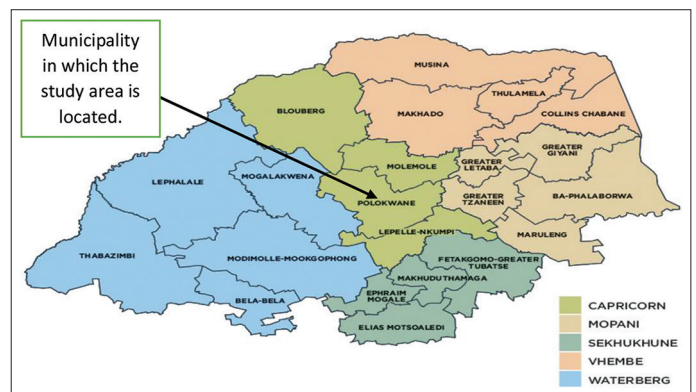
Source: Municipalities of South Africa, 2023, Limpopo Municipalities, accessed January 26, 2023 from https://municipalities.co.za/provinces/view/5/limpopo

Polokwane local municipality of the Capricorn district in the Limpopo province of South Africa (Figure 1, for location). The Capricorn district primarily thrives on mining and agriculture as its key sectors, as indicated by Corporate Governance and Traditional Affairs (2020). Previously, before its residential transformation, the selected study area was primarily utilised for agricultural activities. Thus, the area serves as an optimal location for households engaged in backyard gardening given the likelihood that the agronomic and horticultural potential is good.

The study area is divided into five distinct sections, referred to as phases, from which an equitable number of backyard gardeners were selected for in-depth interviews. A combination of quota sampling and the homogenous purposive sampling method (defined by Etikan et al. (2016) as a type of purposive sampling technique that focuses on a group or sample that shares similar traits or specific characteristics) was used. The uncontrolled quota sampling method is defined by Bhardwaj (2019) as a type of quota sampling technique that has no limitation as the sample is selected according to the convenience-specific characteristics chosen by the researcher in a specific category and in a well-planned manner. From each of the 5 phases, a total of 8 households engaged in backyard gardening were purposefully chosen, leading to a sample size of 40. The sampling technique was deemed adequate bearing in mind that obtaining a homogenous group (backyard gardeners) in Luthuli Park was desirable to enable the intricate study of food security at household level. The emphasis was to achieve a diversity across the various phases of the study area, aligning with the objectives of this present study and not to generalise findings. Informed consent was sought and given by all participants in the study.

3.2. Analytical Techniques

Descriptive statistics and their definitions mainly relating to the socio-economic characteristics of the study participants are presented in Table 1. Nine frequency occurrence questions were asked to the participants using the Household Food Insecurity Access Scale Score (HFIASS) which is based on the Food and Agriculture Organisation (2007) guideline indicator. Where a

participant answered in the affirmative for a given food insecurity condition or event occurring for their household, a further response was sought on the frequency of that occurrence and was marked according to rarely, sometimes, or often categories. Following Coates et al. (2007), the responses to the frequency occurrence questions were transformed into continuous scores ranging from 0 to 3, where 3 represented the highest frequency occurrence. The highest obtainable total score for the nine questions was 27. The higher the score, the greater the chance that the household is food insecure and the lower the total score, the lower the chance that the household is food insecure. Having summed the total for each household, the Coates et al. (2007) classification was used to delineate the households according to four groups: 0-1 (food secure score), 2-7 (food insecure with no hunger score), 8-14 (food insecure with moderate hunger score) and 15-27 (food insecure with severe hunger score). Once the categorisation into different food security groups was completed, the next step was to further disaggregate each food security group on the basis of household size categories to enable the calculation of the food security index and mean scores per household size categories. A four-point rating was assigned to the food security groups on a scale rating of 4 (food secure), 3 (food insecure with no hunger), 2 (food insecure with moderate hunger) and 1 (food insecure with severe hunger). The nominal sum of 10 points was therefore distributed across the four categories according to the food security status. To further assess the contribution of backyard gardening five questions were presented to the participants which related to: (1) the significance of backyard gardening contribution to household food security (2) whether all the food from the backyard garden is consumed by the household (3) whether some of the produce is sold (4) the significance of the contribution of the backyard garden sales to household income and (5) whether the backyard gardening helps to fill the pre-harvest gap. The responses were marked on a 4-point Likert scale specified as (4) strongly agree, (3) agree, (2) disagree, and (1) strongly disagree.

3.2.1. Scaling measurement and decision rule

The Likert scaling type measuring instrument is presented below following Uzokwe et al. (2016) and Oladele et al. (2020):

Table 1: Summary statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
Age of the household head (Years)	47	10.78	23	66
Household size	4	1.94	1	8
Farming experience (Years)	5.64	4.93	1	21
Other variables	**Percent Share**			
Gender of the household head	Male (37.5)			
	Female (62.5)			
Marital status of the household head	Married (37.5)			
	Not married (62.5)			
Household head employment status	Employed (12.5)			
	Not employed (87.5)			
Educational level of the household head	Primary education (17.5)			
	Secondary education (72.5)			
	Tertiary Education (2.5)			
	No education (7.5)			
Types of crops grown	Vegetables (43)			
	Fruits and vegetables (57)			
Harvesting frequency	Daily (67.5)			
	Monthly (32.5)			

$$X = \frac{\sum_{i=1}^{n} y_i}{z} \qquad (1)$$

Where X is the mean score, z is the number of categories and y is the rank or score (which is a nominal value for each assigned category or response category). Given the 4 categories and a 4-point scale, $\sum_{i=1}^{n} y_i$ is therefore equal to 10, giving the result $X = 2.5$ as the weighted mean of the scaling statement. Using the same measurement and threshold of 2.5, food secure households are classified as those scoring above the 2.5 threshold and backyard gardening is also considered as contributing towards household food security above that threshold. For scores lower than 2.5, the opposite is concluded. The indices calculated for the household food security level as well the backyard gardening contribution would range from 0% to 100%, with 100% being the most favourable status.

The general formulae used in calculating the means, grand means and indices are based on equations 2-4.

$$X_C = \frac{\Sigma(n \times r)}{N} \qquad (2)$$

$$\mu = \frac{\Sigma X_c}{C} \qquad (3)$$

$$I = \frac{\mu}{C} \qquad (4)$$

Where depending on the food security status or the contribution of backyard gardening:
X_C is the mean distribution.
n represents the number of households responding to a specific Likert scale rating.
r represents the specific Likert scale rating weight either for the indicator of the contribution of backyard gardening or for the food security category (HFIASS).
C represents the number of food security categories or the contribution indicators.
N represents the number of responses or the sum of the households in a specific household size category.
$\propto$ represents the grand mean.
I represents the index.

3.2.2. Logistic model specification
The factors affecting the household food security status of households practising backyard gardening were assessed using a logistic model, the dependent variable being a dichotomous variable where the HFIASS between 0 and 1 was coded 0 (food secure) and the HFIASS between 2 and 27 was coded 1 (being food insecure). The logistic model is mathematically explained and presented in Park (2013) as:

$$P_i = F(Z_i) = \frac{1}{1 + e^{-(\alpha + \Sigma \beta_i X_i)}} \qquad (5)$$

Where P_i represents the probability that the household is food

secure, X_i represents the ith explanatory variable, α and βi are regression parameters to be estimated and e is the base of the natural logarithm. Then the Logistic regression model can be written in odds ratio so that the probability that a household is food secure is represented by P_i and the probability of a household is food insecure is represented by $1-P_i$ as shown in equation 9.

$$\left(\frac{Pi}{1-Pi}\right) = e^{(Z_i)} \qquad (6)$$

Taking the natural logarithm of equation 7 results to a simple Logistic regression model:

$$\left(\frac{Pi}{1-Pi}\right) = In(odds) = In(y) = Z_i = \alpha + \beta_1 X_1 + U \qquad (7)$$

Therefore, the specific model was specified as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5$$
$$+ \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + U \qquad (8)$$

Where Y represents the probability of the household being food secure, β_0 is the slope of the equation, β_1-β_9 are the coefficients of the variables X_1-X_9 and U is the disturbance term.

Y = Dependent Variable (Food security status; food secure = 0 and food insecure = 1), X_1 = Age (Years), X_2 = Household size (Number of dependents), X_3 = Employment status (Employed = 1; Unemployed = 0), X_4 = Educational status (No Education = 0; Primary Education = 1; Secondary Education = 2; Tertiary Education = 3), X_5 = Gender (Male = 1; Female = 0), X_6 = Marital status (Married = 1; Not Married = 0), X_7 = Type of crops grown (Fruits = 1; Vegetables = 0), X_8 = Farming experience (Years), X_9 = Harvesting frequency (Daily = 1; Otherwise = 0).

4. RESULTS

The findings and discussion of the study results are presented in this section. Descriptive results in Table 1 are followed by the presentation of findings on the household food security status, the contribution of backyard gardening to the food security status of the household and finally the logistic model results.

4.1. Descriptive Results
The summary statistics for selected variables are presented in Table 1.

The respondent household head had a mean age of 47 years thus falling in the category of the working age group. That group would likely have more experience in gardening activities by virtue of their age group compared to younger respondents. However, relating to farming experience, the findings indicate that, on average respondents had about 6 years of experience in gardening in the backyard. This could be an indicator that the economic conditions and the food security situation in the five years prior to this study could have been the driver for more households to enter the backyard gardening activity to alleviate the

food security situation. This is plausible given that Altman et al. (2009) and Drysdale et al. (2019) reported structural household food insecurity and unemployment concerns in South Africa in the periods leading to this present study. Evidently, the findings also show that the younger generation of the household heads is in the minority as the standard deviation (10.78) indicates that most of the age group clusters around the average age of the household heads, and this is in line with the notion that there is low participation of the younger generation in agricultural activities which is the suggestion made in Oghenero et al. (2020). In terms of household size and the distribution of gender, similar to the findings in Oghenero et al. (2020), the results in Table 1 show that a typical household consisted of 4 members on average with close to two-thirds majority (62.5%) of the households being headed by females. Coincidentally, 62.5% of the household heads were married, with the majority (87.5%) of the respondents unemployed.

The findings on the high unemployment status of the households practising backyard gardening is a characteristic that is corroborated in Thomas and Terblanche (2021), where households interviewed for that particular study indicated that the purpose of their engagement in backyard gardening was to create employment. The findings, therefore, contribute to furthering the understanding of some of the reasons for backyard gardening as households seek opportunities to alleviate their food security situation. The summary statistics on the education level of the household heads may further explain the high unemployment status given that secondary school education was the highest (72.5%) level attained, therefore making it difficult for those household heads to penetrate the formal competitive job market. As much as this might be a good demonstration that most of the household heads have a basic academic background (ability to read and write), it does not eschew the point made in Mdiya and Mdoda (2021) that years spent in school can coerce households to end up practising backyard gardening as a means of survival especially by household heads with no education. Given that there are high levels of unemployment in South Africa (including the township of focus in the present study) and having found that household heads with tertiary education (2.5%) are the minority, the finding adds to the point made in Drysdale et al. (2019) that unemployment fuels structural household food insecurity.

The findings also show that close to 70% of the households harvested daily regardless of factors such as water scarcity, heat waves and varying rainfall patterns cautioned by Adom et al. (2022) that might influence the practice of backyard gardening among households. This may be a clear indication that backyard food production by enabling the daily frequency of harvesting was potentially reducing the chances of food insecurity for many households. However, respondents that only had an opportunity to harvested monthly (32.5%) could be exposed to high levels of insecurity as a result of reducing meal sizes and/or skipping meals to meet their monthly dietary requirements, as noted in Mjonono (2008) that food insecure households may try to cope with food insecurity by reducing meal sizes or even going without food for one or more days.

4.2. Prevalence of Food Insecurity among the Households

The results presented in Table 2, relate to frequency occurrence questions that were ranked using a Household Food Insecurity Access Scale Score (HFIASS).

From the analysis, most households (60%) were classified as food secure with a low (0-1) HFIASS. This indicated that generally, a slight majority of the respondents did not experience food insecurity conditions (i.e., not having enough food, being unable to eat preferred foods, eating more monotonous diet than desired, and some foods considered undesirable) noted in the FAO (2007) guideline indicator. There was still a portion in the study area that was food insecure with no hunger (17.5%) as determined by the HFIASS score of 2-7 and food insecure with moderate hunger (22.5%). The findings of this study indicate that there were no households that were severely food insecure, confirming that none of the households interviewed went to bed without food or skipped more than 5 days with no food. It can be drawn from the analysis that the HFIASS results found in Table 2 triangulate with findings shown in Table 3 that demonstrate that households with fewer members (household size of 1-6) fell under the food secure category.

A grand mean of 3.08 and a food security index of 0.77 (77%) were determined, thus supporting the finding that households are food secure based on the cut off score of 2.5 (equation 1). This might be a demonstration that households in the study area (urban setting) having fewer members to feed, likely have the ability to share equally the available produce harvested from their backyard gardens. This finding is in support of Mcata and Obi (2015) on the fact that backyard gardens, mostly located in urban settings, have an important role in alleviating urban household food insecurity. The findings on the households with more members (7-10), which tended to be food insecure, the implications could be as spelt out in Mjonono (2008), that food insecure households might find it difficult to agree on food choices and preference, making it more complicated to share available produce harvested from the backyard gardens to the available members of the households.

4.3. Contribution of Backyard Gardening towards Household Food Security

The results analysed on the basis of self-reported household backyard garden contribution assessment constructed on the five-context specific backyard garden contribution indicators are presented in Table 4. The grand mean contribution score of 2.69 is above the cut off threshold of 2.5 indicating that the backyard gardening contribution criteria align with the findings of the HFIASS in the assessment of the food security status of the sampled urban households. The findings of the contribution index indicate that households in the study area evaluate backyard gardening to have a 67% contribution towards their own household food security. This is relatively a high contribution emphasising the importance of backyard gardens for those urban households. The implication of this finding is that policymakers get some sense of how households rely on their backyard gardens, and this is information that the

Table 2: Distribution of sampled households according to the HFIASS

| Measure of variable | Household food insecurity status based on HFIASS (0-27) | | | |
	Food secure (0-1)	Mild food insecure (2-7)	Moderate food insecure (8-14)	Severely food insecure (15-27)
% of households	60	17.5	22.5	0

Table 3: Household food security index

| HFIASS categories | HFIASS category weight (r) | Number of households (n) per household size categories | | | | r*n per household size categories | | | |
		(1-2)	(3-4)	(5-6)	(7-10)	(1-2)	(3-4)	(5-6)	(7-10)
Food secure	4	9	5	10	0	36	20	40	0
Mild Food insecure	3	1	3	3	0	3	9	9	0
Moderate Food insecure	2	1	3	3	2	2	6	6	4
Severely Food insecure	1	0	0	0	0	0	0	0	0
Total		11	11	16	2	41	35	55	4
Mean						3.7	3.18	3.44	2.00
Grand food security mean								3.08	
Household food security index								0.77 (77%)	

Table 4: Contribution of backyard gardening

| Measure of variable | Responses | | | | | |
	Likert scale rating	No. of households	No. of households *Likert scale	Total rating per contribution indicator	Mean per contribution indicator	Backyard garden contribution ranking per indicator
Household food supply measure						2
Strongly Agree	4	31	124	151	3.78	
Agree	3	9	27			
Disagree	2	0	0			
Strongly disagree	1	0	0			
Household income measure						5
Strongly Agree	4	2	8	63	1.58	
Agree	3	6	18			
Disagree	2	5	10			
Strongly disagree	1	27	27			
Household own consumption measure						1
Strongly Agree	4	35	140	155	3.88	
Agree	3	5	15			
Disagree	2	0	0			
Strongly disagree	1	0	0			
Produce sales measure						4
Strongly Agree	4	4	16	66	1.65	
Agree	3	5	15			
Disagree	2	4	8			
Strongly disagree	1	27	27			
Household pre harvest food gap						3
Strongly Agree	4	5	20	103	2.58	
Agree	3	16	48			
Disagree	2	16	32			
Strongly disagree	1	3	3			
Grand mean contribution			2.69			
Contribution index			0.6725 (67.25%)			

analysis of the food security status of the household alone will not provide if not complemented with determining the source of the food security.

The highest contributory indicator shows that households primarily produce and harvest for their own consumption (3.88) followed by producing for the general contribution to household food supplies (3.78). The findings align with Singh et al. (2018) and Dorado et al. (2018) findings that, backyard gardening enhances household food security and increases household food consumption. Other studies, such as that of Oluwasola et al. (2013) and Musotsi et al. (2008), provided evidence that backyard gardening contributes towards household income and noted that households sell their produce without meeting their household food requirement. In the present study however, the contributory indicator on income ranks lowly amongst the five indicators analysed. Given the findings on the contribution to the food supply, the present study aligns with David and Grobler (2022) together with Thomas and Terblanche (2021) findings that backyard gardening has a greater chance of increasing food supply and reducing food insecurity at the household level.

Table 5: Logistic regression analysis results

Variables	Unit of measure	Coefficient (B)	Standard error (SE)	Wald stat	Significance
Age	Years	0.439	0.274	1.404	0.119
Household size	Number	−0.258	0.148	2.745	0.061*
Employment status	Dummy variable (1=if household head is employed, 0=Otherwise)	0.50	0.049	5.016	0.082*
Education level	Dummy variable (1=if household head is educated, 0=Otherwise)	0.21	0.226	0.092	0.927
Gender	Dummy variable (1=if household head is a male, 0=Otherwise)	−0.17	0.165	−0.105	0.560
Marital status	Dummy variable (1=if household head is married, 0=Otherwise)	0.004	0.143	0.029	0.982
Type of crops grown	Dummy variable (1=if fruits are part of crops in backyard garden 0=Otherwise)	0.004	0.171	0.023	0.194
Farming experience	Years	0.060	0.030	1.963	0.059*
Harvesting frequency	Dummy variable (1=if harvesting happens daily 0=Otherwise)	−0.180	0.149	2.612	0.045*
Constant	Constant	13.814	3.302	0.834	0.361
Model Chi-square−2 Log likelihood					0.337
Cox and Snell R square					21.76
Negalkerke R Square (Adjusted R square)					0.583
					0.634

*Significance at 10%

4.4. Logistic Regression Model Analysis

The Logistic regression model results are presented in Table 5.

Four of the nine variable were found to be statistically significant in influencing the household food security level. The findings demonstrate that as the household size increases, the household is likely to become food insecure (odds ratio −0.258). This is reasonable and implies smaller the household size, the chances that the households require more food decreases. This finding is a triangulation of this present study's results presented in sub-section 4.2 showing that the households with fewer members tend to be food secure. In addition, the findings are in line with Mdiya and Mdoda (2021) indicating that family/household size is among other factors affecting the food security status of backyard gardeners. The more harvesting is done on a frequent basis, the chances that household food insecurity decreases (odds ratio −1.80). This implies that the households with a reliable source of fresh produce from the backyard gardens improve their food security as they have enough food to consume. The findings of the present study support Jacobs et al. (2016) that households practising backyard gardening experience less food insecurity and are not likely to run out of food. In the situation where the household head is employed, the chances that the household is food secure increases by 0.50. This is plausible if it can be considered that the household with members who are employed has access to income, skills and knowledge that gives them a comparative advantage to enhance their food security status. In other words, they could buy other needed materials such as manure, seeds, and garden tools amongst others to assist in their backyard gardening activities. This finding is supported by Dissanayake and Manawadu (2019), noting that factors such ability to obtain quality seeds and planting materials were among other factors affecting the household's food security status of backyard gardeners. Households with more years in farming are more likely to be food secure with 0.06 probability. Mcata and Obi (2015) as well as Mokone (2016) concluded that years

of experience in gardening, impacted the food security status of backyard gardeners. That is the case in this present study, that the years of experience could have been the driver in households engaging in backyard gardening to increase the food supply at a household level. The Cox and Snell R square is 0.634, indicating that the independent variables of the model explain 63% of the variation on the dependent variable, which is food security status. The model is good enough as Ozili (2023) noted that an R-squared between 0.50 and 0.99 (50% and 99%) is acceptable in social science research especially when the explanatory variables are statistically significant. The remaining 37% is unexplainable variables and may be caused by the biased information provided by the respondents during data collection or unknown factors during data capturing.

5. CONCLUSION AND RECOMMENDATIONS

Granular detail is often lost in large-scale food security research projects which do not focus on the household level where the experience of food insecurity is often rife. Although the findings cannot be generalised to a larger population, this study has contributed to a more in-depth understanding at the household level. Backyard gardening is a significant contributor to household food security in Luthuli Park township, with household size, employment status of the household head, farming experience, and harvesting frequency being among the factors that affect the food security status of the household. The use of HFIASS enabled the classification of households into four categories of food security, which helped evaluate food security status using various measures such as mean, grand mean, contribution, and household food security index.

To effectively support household food security in Luthuli Park township and other similar townships, this study recommends that the government should engage extension officers to provide

mentorship and training through backyard gardening initiatives and programs. The provision of necessary inputs such as fertilisers, irrigation systems, and machinery needs to be considered. Furthermore, when developing hunger-alleviating programs, household-specific factors such as household size, employment status of the household head, and farming experience should be considered as important variables for targeting. Through such measures, the challenges facing household heads can be minimised, and the attainment of SDG-2 will be more feasible. The collaboration between the government and household heads with more farming experience can also help in the training of young farmers to improve their crop husbandry skills. Furthermore, backyard gardening can create a source of income for households, as indicated in this present study. Therefore, households in townships should be encouraged to expand production and sell their produce, albeit the need for local government to develop support infrastructure such as open marketplaces conducive for exchange of fresh produce thus creating local job opportunities.

6. ETHICAL CONSIDERATIONS

The study abides by the ethical standards for research stipulated by the University of Limpopo. The research study received approval after presentation to the Department of Agricultural Economics research committee. In particular, the study objectives were clarified to the participants who voluntarily participated after giving their consent.

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