

Asset Endowments and Post-Pandemic Diversification Strategies among Informal Food Traders: Insights from Polokwane, South Africa

Mapula Hildah Lefophane

University of Limpopo, Polokwane, South Africa – hildajie@gmail.com

Motsatsi Morwatshehla

University of Limpopo, Polokwane, South Africa – demorwatshehla975@gmail.com

Abstract

The COVID-19 pandemic disrupted informal food trading activities, weakened access to critical livelihood assets, and restricted diversification of livelihoods. Understanding how traders adapt through livelihood diversification is important for designing policies that strengthen resilience in the informal economy in developing countries. This study examines how livelihood assets influence the adoption of diversified income strategies among informal food traders in the Polokwane Local Municipality, South Africa. Guided by the Sustainable Livelihood Framework, survey data from 120 traders were analysed. Composite indices for human, financial, physical, natural, and social assets were constructed using the entropy method to capture differences in access to these assets. These indices were then incorporated into a Multinomial Logistic Regression model to assess their effects on the likelihood of adopting alternative livelihood strategies beyond informal food trading. The findings indicate that physical assets played a significant role in promoting livelihood diversification, despite traders having moderate access to physical resources. Conversely, human assets were found to inhibit diversification despite relatively high levels of human capital, while financial assets similarly constrained diversification, reflecting traders' limited access to financial resources. In contrast, natural and social assets did not significantly affect diversification strategies, despite traders having moderate to high access to them. Overall, the study provides empirical evidence on post-pandemic livelihood adaptation in the informal sector and highlights the need for targeted policy interventions to strengthen access to assets and support income diversification, resilience, and sustainable livelihoods in peri-urban areas.

Keywords: livelihood assets; livelihood strategies; informal sector; COVID-19.

1. Introduction

The informal food sector is a vital component of the broader agri-food system, linking smallholder farmers, processors, and consumers through flexible, cost-effective distribution networks [1]. In many African countries, informal traders, including street vendors and traditional market sellers, are often described as “Africa’s largest nutritional safety net” because they provide accessible, nutritious, and affordable food to millions. It is estimated that between 50% and 70% of agri-food trade in low- and middle-income countries occurs through informal channels, underscoring the sector’s importance for economic inclusion and community well-being [2].

The COVID-19 pandemic exposed the structural vulnerabilities of this sector while simultaneously highlighting its importance. Widespread job losses in the formal economy pushed many households toward informal trading as a survival strategy [3]. However, lockdowns, mobility restrictions, and market closures disrupted supply chains and trading operations [4], leading to income instability and livelihood insecurity among traders [5]. In response, traders adopted adaptive strategies, such as mobile vending, delivery services, and digital platforms, to sustain their businesses [6]. The extent to which traders could implement these strategies depended largely on their asset endowments, namely their access to human, financial, physical, natural, and social capital, which shape adaptive capacity, livelihood choices, and resilience [7,8].

Where asset endowments are limited or unevenly distributed, traders may remain confined to low-return activities, restricting income growth and slowing recovery from shocks. Importantly, emerging evidence suggests that the influence of asset endowments on diversification is context-specific rather than universal. For example, Khanal et al. [9] found that financial and physical assets promoted diversification among displaced households in Nepal, whereas social capital sometimes constrained it. This indicates that the effect of asset endowments is mediated by institutional arrangements, market structures, and local socio-economic conditions.

In Polokwane Local Municipality, Morwatshehla et al. [10] evaluated the livelihood status of informal food traders using the five livelihood capitals of the Sustainable Livelihood Framework, while a related study [11] analysed the socio-economic, legal, institutional, and physical factors influencing the adoption of livelihood strategies. Although these studies provided valuable descriptive insights into traders' conditions, they did not explicitly examine how differences in asset endowments across the five livelihood capitals shape the adoption of livelihood strategies.

This study addresses that gap by empirically modelling the relationship between livelihood asset endowments and livelihood strategies among informal food traders in Polokwane. By identifying which forms of capital significantly influence diversification decisions, the study advances understanding of how asset configurations shape adaptive behaviour in the informal economy. It is guided by the following research question: Which livelihood asset endowments significantly influence the livelihood strategies adopted by informal food traders in Polokwane Local Municipality?

The findings provide evidence to support policymakers and development practitioners in identifying which forms of capital require strengthening to enhance the adoption of appropriate strategies, improve resilience, and promote sustainable livelihoods among informal traders facing future economic shocks.

2. Data

Data were gathered from the Polokwane Local Municipality, located in the Capricorn District of Limpopo Province, South Africa. The choice of this municipality was based on three key reasons. Firstly, informal trading is a main livelihood for historically disadvantaged groups living in peri-urban and urban parts of the municipality [12]. Secondly, in 2023, the municipality accounted for 39.66% of informal employment [13]. Thirdly, informal traders face limited access to vital livelihood assets such as storage, water, and electricity [14]. The study focused on eight dense informal trading sites, where trading activity is highly concentrated and forms an important component of the local informal economy. The study

utilised the same dataset described in Morwatshehla et al. [10,11], which contains detailed information on the five livelihood assets (human, social, financial, physical, and natural capital) and the livelihood strategies adopted by informal food traders in Polokwane Local Municipality. The dataset, comprising 120 traders surveyed across the eight selected sites, provides a robust empirical foundation for analysing how livelihood asset endowments influence the adoption of livelihood strategies.

3. Analytical techniques

Entropy Weighting Method (EWM)

This study employed the entropy weighting method (EWM) to construct composite indices for the five categories of livelihood assets. The EWM assigns objective weights to indicators based on their variability, such that indicators with greater dispersion receive higher weights because they provide more information in distinguishing differences in asset access among traders [15]. After normalisation, weighted indicators were aggregated to generate composite indices representing human, financial, physical, natural, and social assets.

These asset indices were subsequently used as explanatory variables in a multinomial logistic regression (MNL) model to evaluate how differences in livelihood asset endowments influence traders' adoption of alternative livelihood strategies. The MNL framework allows estimation of the probability of each strategy relative to a reference category, thereby identifying which forms of capital significantly shape diversification behaviour [16].

Econometric Estimation

The multinomial logistic regression (MNL) model was used to evaluate the influence of livelihood assets on the likelihood of choosing one of three diversified livelihood strategies compared to the food trading-only strategy, which serves as the baseline category. The MNL model is appropriate for this analysis because the dependent variable, livelihood strategy adoption, is a categorical variable with more than two nominal, unordered outcomes, allowing for the estimation of probabilities for each category [12]. Following Liu *et al.* [16], the MNL for the study is expressed as follows:

$$\ln(p_{y2}/p_{y1}) = \beta_{210} + \beta_{211}X_1 + \dots + \beta_{21t}X_i \quad (1)$$

$$\ln(p_{y3}/p_{y1}) = \beta_{310} + \beta_{311}X_1 + \dots + \beta_{31t}X_i \quad (2)$$

$$\ln(p_{y4}/p_{y1}) = \beta_{410} + \beta_{411}X_1 + \dots + \beta_{41t}X_i \quad (3)$$

In Equations (1)-(3), $P_{y1} = 1$ for a trader livelihood strategy that is food trading, $P_{y2} = 2$ if food + non-food trading, $P_{y3} = 3$ if food + non-trading, and $P_{y4} = 4$ if food + non-food+ non-trading. $\beta_{210}, \beta_{211}, \dots, \beta_{21t}$; $\beta_{310}, \beta_{311}, \dots, \beta_{31t}$; and $\beta_{410}, \beta_{411}, \dots, \beta_{41t}$ are the coefficients to be estimated. They indicate the variation in the outcome variable that results from a change in one unit of the related predictor variable. When the estimated coefficient is greater than zero, the probability that the outcome variable will occur grows as the associated predictor variable increases, while the other variables remain constant. When the estimated coefficient is smaller than zero, the likelihood of the outcome variable occurring falls as the associated predictor variable increases, while all other variables remain constant. X_1-X_i are independent variables.

4. Results and discussion

Livelihood Strategy Classification

Livelihood strategies refer to the combinations of income-generating activities individuals pursue to sustain or improve their living standards, often involving diversification in response to economic conditions [6,17]. In this study, strategies were classified according to traders' primary and supplementary economic activities [18], resulting in four categories:

1. *Food trading only* – traders engaged exclusively in food sales, representing a non-diversified strategy with limited income potential; this serves as the baseline category in the analysis.
2. *Food and non-food trading* – traders combining food sales with non-food items such as clothing, appliances, or accessories, reflecting moderate diversification.
3. *Food and non-trading activities* – traders supplementing food sales with wage employment, domestic work, or other off-market activities, providing flexible but variable income sources.
4. *Food, non-food, and non-trading activities* – the most diversified strategy, integrating multiple income streams and associated with greater adaptive capacity.

Based on the above classification, Fig. 1 shows that most traders (51.7%) relied solely on food trading, indicating limited diversification and suggesting restricted access to key livelihood assets. Such dependence on a single income source may reduce earning potential and increase vulnerability to future shocks [19].

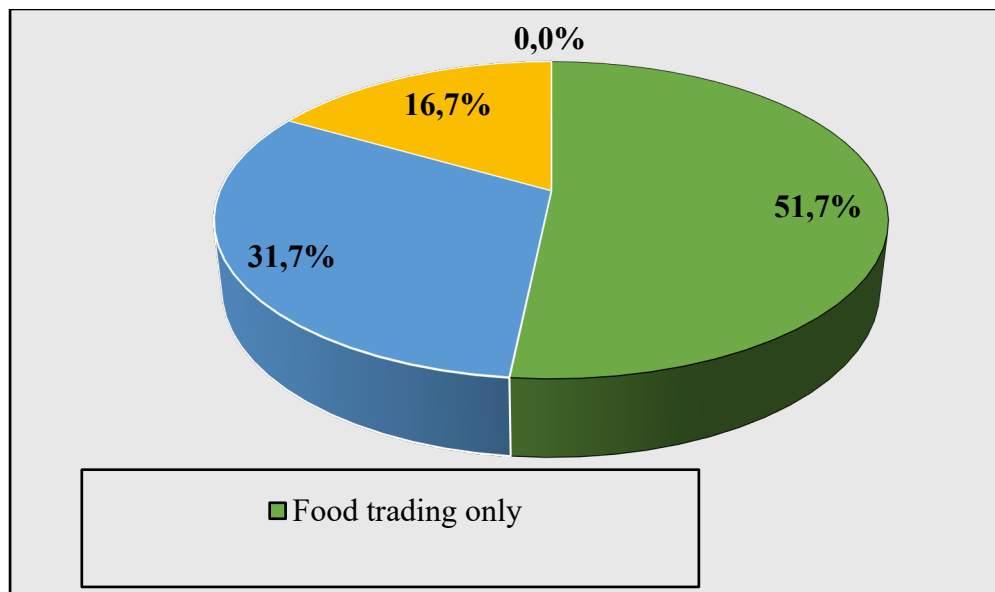


Fig. 1. Distribution of livelihood strategies

A further 31.7% combined food and non-food trading, reflecting moderate diversification and likely linked to access to certain enabling assets that support expansion into complementary activities. Only 16.7% engaged in food trading alongside non-trading activities such as external employment, indicating that broader asset endowments were required to support this form of diversification.

Notably, no trader adopted the most diversified strategy by combining food trading, non-food trading, and non-trading activities. This underscores persistent structural constraints to

comprehensive asset access and highlights the limited scope for fully diversified livelihood portfolios among informal traders.

EWN results

Prior to constructing the livelihood asset indices, indicators were screened for suitability within the entropy weighting framework. Labour, informal education, and income were excluded due to severe multicollinearity, as highly correlated indicators would introduce redundancy and undermine the assumption that each variable contributes independent information to the entropy calculation. In addition, insurance and transport were omitted because they exhibited zero standard deviation, indicating uniform access to these livelihood assets across respondents and therefore no ability to distinguish differences in asset endowments. The remaining indicators displayed sufficient variability and were retained for entropy analysis. Using the entropy weighting method, indicators with greater dispersion received higher weights, ensuring that the composite livelihood asset indices accurately reflected differences in asset endowments among traders. The resulting indices are presented in Table 1.

Table 1. Entropy results

Livelihood asset	Indicator	Weight Index	Value	Formula for calculations	Mean value
Human Assets (HA)	Health	0.43	0.92	HA = (0.92 * 0.43) + (0.38*0.03) + (0.05*0.52) + (0.90*0.02)	0.45
	Experience	0.03	0.38		
	Training	0.52	0.05		
	Formal education	0.02	0.90		
Financial Assets (FA)	Savings	0.18	0.28	FA = (0.28*0.18) + (0.28*0.18) + (0.75*0.04) + (0.03*0.51) + (0.52*0.09)	0.19
	Formal loan	0.18	0.28		
	Informal loan	0.04	0.75		
	Pension	0.51	0.03		
	Social grant	0.09	0.52		
Physical assets (PA)	Storage facilities	0.22	0.28	PA = (0.28*0.22) + (0.78*0.04) + (0.67*0.07) + (0.32*0.20) + (0.37*0.18) + (0.33*0.20) + (0.64*0.08) + (0.98*0.00)	0.39
	Trading Stall	0.04	0.78		
	Public Space	0.07	0.67		
	Trading licence	0.20	0.32		
	Trading contract	0.18	0.37		
	Cellphone	0.20	0.33		
	Housing status	0.08	0.64		
	Electricity	0.00	0.98		
Natural Assets (NA)	Land	0.16	0.38	NA = (0.38*0.16) + (0.08*0.39) + (0.94*0.45)	0.52
	Livestock	0.39	0.08		
	Water	0.45	0.94		
Social Assets (SA)	Membership in organisation	0.10	0.56	SA = (0.56*0.10) + (0.30*0.15) + (0.58*0.18) + (0.28*0.31) + (0.64*0.07) + (0.32*0.19)	0.40
	Trust in organisation	0.15	0.30		
	Information Sharing	0.18	0.58		
	Trust in institutions	0.31	0.28		

The group saving club	0.07	0.64
Opportunities to obtain assistance	0.19	0.32

Human assets were evaluated through indicators such as health status, work experience, labour availability, training, and both formal and informal education [9,20]. These indicators capture the expertise, skills, and physical abilities that informal food traders use to enhance their livelihoods [20].

Most traders were in good health, with 91.7% reporting no chronic illnesses, resulting in a high indicator value of 0.92. Good health is crucial for maintaining stable work routines and consistent income, especially given the physical demands of street vending [21]. However, a moderate weight of 0.43 suggests enough variation in health status to influence human asset scores, and those in poorer health may face limitations in pursuing additional livelihood activities.

Most traders had moderate trading experience, averaging 11.2 years. Nonetheless, a low variation score of 0.38 and an insignificant weight of 0.03 indicate that experience contributed minimally to disparities in human asset scores. While experience is acknowledged as vital for resilience in informal trade [5], its homogeneity may restrict diversification opportunities. Furthermore, 95% of traders lacked formal training, as reflected by a very low value of 0.05; however, its high weight of 0.52 underscores training as a pivotal human asset for enhancing business skills and marketing capacity [19]. Conversely, despite 90% of traders having formal education (value 0.90), its exceedingly low weight of 0.02 suggests a limited impact on variability and livelihood diversification.

Financial assets encompass the disposable and financing resources that enable informal food traders to maintain their livelihoods [22]. These include savings, both formal and informal loans, pensions, and social grants [9,23]. Although only a small proportion of traders accessed pension funds (Value = 0.03), their high weighting (0.51) indicates that, while pensions have the potential to enhance financial stability, their limited accessibility, particularly among younger traders, diminishes their overall impact on diversification. Similarly, both savings and access to formal credit were limited (Value = 0.28 for each; Weight = 0.18), signifying minimal variation among traders. Consequently, financial exclusion remains pervasive, thereby restricting traders' capacity to absorb shocks and sustain operations during periods of income disruption [24].

Conversely, social grants were comparatively accessible (Value = 0.52); however, their low entropy weight (0.09) signifies limited differentiation in financial capacity. Consequently, although grants offer essential income support, their modest magnitude and uniform accessibility suggest that they primarily serve as a subsistence buffer rather than a catalyst for diversification [20]. Overall, restricted access to dynamic financial assets constrains traders' resilience and adaptive capacity.

Physical assets encompass tangible resources and infrastructure that facilitate trading activities [15]. These assets include access to storage facilities, transportation, stalls, trading areas, licences, contracts, mobile phones, housing, and electricity [20,23]. Limited access to storage facilities was observed (Value = 0.28; Weight = 0.22), indicating that most traders lacked the capacity to preserve perishable goods or expand their operations, thereby restricting diversification into bulk or processed products [24]. Conversely, stall ownership was prevalent

(Value = 0.78); however, its low entropy weight (0.04) suggests homogeneity, implying that stalls function primarily as necessities rather than catalysts for diversification. Similarly, access to public spaces was moderate (Value = 0.67; Weight = 0.07), reflecting clustering within designated urban zones rather than variability in opportunities.

Furthermore, only a limited number of traders held trading licences (Value = 0.32; Weight = 0.20), which highlights barriers to formalisation that elevate regulatory risks and hinder scalability [20]. Similarly, the scarcity of supplier contracts (Value = 0.37; Weight = 0.18) and minimal mobile phone usage (Value = 0.33; Weight = 0.20) indicate weak digital and institutional linkages. While property ownership (Value = 0.64; Weight = 0.08) and nearly universal electricity access (Value = 0.98; Weight = 0.00) contribute to stability, their uniformity diminishes their explanatory power. Overall, physical assets possessed by traders are fundamental yet inadequate for fostering strategic livelihood diversification.

Land ownership and use were limited among traders, with only 38% engaging in agricultural land use (Value = 0.38). However, the low entropy weight (Weight = 0.16) suggests that land access had little impact on the variation in natural asset levels. This indicates that, in informal peri-urban and urban trading environments, spatial limitations and market-driven livelihoods favour non-agricultural activities [7].

In contrast, livestock ownership was considerably limited (Value = 0.08); however, its moderate entropy weight (Weight = 0.39) indicates that, despite its infrequency, livestock holdings substantially impact variations in natural assets. For the limited number of traders involved in livestock rearing, it plausibly augments income-generating opportunities through activities such as meat sales, dairy production, or input supply [25]. Meanwhile, access to safe drinking water was nearly universal (Value = 0.94); however, its moderate weight (Weight = 0.45) indicates that even minor variations in availability can significantly influence the variation of natural assets. This highlights the critical importance of clean water in fostering hygiene, ensuring food safety, and adhering to informal food standards [26]. Consequently, dependable water access may enable diversification into cooked foods, juice processing, or other value-added enterprises.

Membership in organisations was moderate, with 56% of traders participating (Value = 0.56). However, the low entropy weight (Weight = 0.10) indicates limited variation and, therefore, a minor role in distinguishing social assets. This may reflect the limited post-COVID-19 support from organisations [27], thereby weakening their influence on livelihood diversification. Similarly, trust in organisations was moderate, with 57.5% expressing confidence (Value = 0.30; Weight = 0.15), whereas trust in institutions was notably low at 28.3% (Value = 0.28; Weight = 0.31). This contrast suggests that few traders maintain institutional trust, likely due to perceived neglect during restrictive periods such as lockdowns [24], which limits the potential of social capital to foster diversification.

Conversely, information sharing was relatively prevalent (58.2%; Weight = 0.18); however, the low variability indicates standardised practices that, although advantageous for routine operations, offer limited opportunities for market or product exploration. Participation in group saving clubs was moderate (64.2%; Weight = 0.07), serving as an essential mechanism for crisis resilience while exhibiting minimal differentiation. Similarly, access to assistance, such as labour, remained limited (31.7%; Weight = 0.19), suggesting weak social support networks that constrain flexibility for labour-intensive or innovative initiatives [28].

Overall, natural assets scored highest (average = 0.52), mainly because of widespread access

to clean water that supports food preparation and hygiene. However, their moderate variation indicates limited impact on diversifying into non-food activities. Human assets followed (average = 0.45), reflecting good health and formal education, but limited access to training and labour opportunities may restrict the skill diversification needed for broader livelihoods. Social assets ranked third (average = 0.40), supported by moderate levels of group membership, information sharing, and savings clubs, though their limited consistency limits access to new opportunities. Physical assets (average = 0.39) included essential infrastructure such as electricity and trading stalls, but limited access to storage, licences, and cellphones hampered diversification efforts. Financial assets had the lowest score (average = 0.19), due to restricted access to pensions and formal credit. While informal loans and social grants were more frequent, their low variability limited their ability to improve financial resilience and diversification.

MNL results

Table 2 presents the results for the multinomial logistic regression model, which was used to estimate how livelihood asset endowments influence strategy choice among informal food traders, with *food trading only* as the reference category. The model was statistically significant ($\chi^2 = 87.313$, $p < .001$) and demonstrated good explanatory power (Nagelkerke $R^2 = 0.599$), indicating that livelihood assets play an important role in shaping diversification behaviour.

Table 2. MNL regression results

Livelihood strategy	Asset type	β	Std. Error	Sig	Exp(β)
Food trading+non-food trading	Intercept	1.300	0.530	0.014	
	Human	-0.026	0.015	0.085*	0.974
	Financial	-0.017	0.010	0.098*	0.984
	Physical	0.019	0.010	0.052*	1.019
	Natural	0.018	0.018	0.310	1.018
	Social	-0.007	0.011	0.525	0.993
Food trading+non-trading	Intercept	1.267	0.587	0.031	
	Human	-0.018	0.016	0.271	0.982
	Financial	-0.030	0.017	0.080*	0.971
	Physical	0.023	0.011	0.036**	1.023
	Nature	0.014	0.020	0.494	1.014
	Social	-0.017	0.013	0.182	0.983
<i>Log-Likelihood</i> =151.556		Chi-Square=87.313		Sig.= <.001	
Pseudo R-Square: Cox and Snell: 0.517					
: Nagelkerke: 0.599					
: McFadden: 0.366					

Source: Compiled by authors

Physical assets emerged as the strongest positive determinant of diversification. Higher levels of physical capital significantly increased the likelihood of combining food trading with either non-food trading or non-trading activities. This finding suggests that assets such as storage, communication tools, and trading infrastructure enable traders to expand operations and manage multiple income streams. Similar patterns have been observed in studies of livelihood transitions in both rural and peri-urban settings, where physical infrastructure facilitates entry into new activities [8,9].

In contrast, human assets showed a weak negative association with diversification, significant only for the food–non-food strategy. This contrasts with findings from rural contexts where education and labour capacity typically promote diversification [7,10,12]. In Polokwane’s informal trading environment, however, widespread access to basic education and health appears insufficient to support diversification without specialised business or technical skills. The entropy results support this interpretation, indicating limited variation in general human capital indicators but greater differentiation in access to training.

Financial assets also exhibited a negative relationship with diversification across both strategies. Rather than enabling expansion, financial resources appear to support the stabilisation of core trading activities. This aligns with evidence from urban informal sectors where traders prioritise business security over riskier diversification, particularly when formal finance is limited and informal credit is widespread but uniform.

Natural and social assets did not show statistically significant effects on diversification decisions. In the urban and peri-urban context of Polokwane, natural resources such as land and livestock play a limited role in livelihood expansion, unlike in rural settings where they often underpin diversification [9]. Similarly, although traders reported moderate social participation, these networks appear to provide limited strategic support for entering new economic activities. This suggests that the quality and economic relevance of networks, rather than their prevalence, determine their contribution to diversification.

Overall, the results indicate that asset endowments influence diversification unevenly, with strategic physical resources acting as the primary enabler, while human and financial assets appear to reinforce specialisation in core trading activities. These findings highlight the need for targeted interventions that expand access to productive infrastructure and specialised training to strengthen diversification among informal traders.

5. Conclusions

This study investigated how livelihood asset endowments influence diversification strategies among informal food traders in Polokwane during the post-COVID-19 recovery period. Guided by the Sustainable Livelihoods Framework and using entropy-weighted indices within a multinomial logit model, the findings show that diversification is shaped unevenly by access to different forms of capital. Physical assets emerged as the primary enabler of diversification, suggesting that infrastructure, communication tools, and operational resources are critical for supporting multiple income activities. In contrast, human and financial assets were negatively associated with diversification, reflecting limited access to specialised skills, entrepreneurial training, and formal financial services. Natural and social assets, although moderately accessible, did not significantly influence strategy choice, indicating their limited strategic role in urban informal trading contexts.

These results highlight the need for policy interventions that prioritise productive infrastructure, targeted business and digital training, and inclusive financial mechanisms to strengthen traders’ capacity to diversify and adapt to shocks. Strengthening these asset bases can improve livelihood resilience while supporting more inclusive and sustainable urban food systems. Future research should examine how changes in asset access over time influence diversification trajectories across different geographical and institutional contexts, using

longitudinal and comparative approaches to better capture the dynamics of informal urban livelihoods.

References

1. Wegerif MC. Informal food traders and food security: Experiences from the COVID-19 response in South Africa. *Food Secur.* 2020;12(4):797–800. doi:10.1007/s12571-020-01078-z
2. Metelerkamp L, Bassermann L, Paganini N. Cape Town's food and nutrition crisis: Crafting systemic responses to systemic challenges [Internet]. *Urban Food Futures; 2023* [cited 2026 Mar 2]. Available from: <https://www.researchgate.net/publication/368389446>
3. Malemela MS, Selepe M. COVID-19 and the informal sector in South Africa: Lessons, challenges and benefits. *Innov J Soc Sci Econ Rev.* 2025;7(1):1–16. doi:10.36923/ijsser.v7i1.264
4. Skinner C, Watson V. Planning and informal food traders under COVID-19: The South African case. *Town Plan Rev.* 2021;92(3):301–307. doi:10.3828/tpr.2020.38
5. Mbatha MW, Ndimande NJ, Tembe KS. COVID-19 pandemic and food security in South Africa: The government's response. *Afr Renaissance.* 2021;18(4):305–317.
6. Zhou W, Guo S, Deng X, Xu D. Livelihood resilience and strategies of rural residents in earthquake-threatened areas of Sichuan Province, China. *Nat Hazards.* 2021;106(1):255–275. doi:10.1007/s11069-020-04460-4
7. He Y, Ahmed T. Farmers' livelihood capital and its impact on sustainable livelihood strategies in Southwest China. *Sustainability.* 2022;14(9):4955. doi:10.3390/su14094955
8. Giri YN. Relationship between livelihood assets and livelihood strategies of Dalit households. *Contemp Voice Dalit.* 2024;16(2):134–145. doi:10.1177/2455328X211060587
9. Khanal R, Duan Y, Ramsey TS, Ali S, Oo KH. Impacts of livelihood assets on displaced households' livelihood strategies: Evidence from Nepal. *Heliyon.* 2024;10(14):e23456.
10. Morwatshehla M, Lefophane MH, Belete A. Examining livelihood status of informal food traders post-COVID-19 pandemic in Polokwane Local Municipality, South Africa. *Int J Food Agric Econ.* 2025;13(2):87–105.
11. Morwatshehla M, Lefophane MH, Belete A. Determinants of livelihood strategies among informal food traders in the post-COVID-19 pandemic context: A South African case study. *OIDA Int J Sustain Dev.* 2025;18(12):353–376.

12. Pour MD, Barati AA, Azadi H, Scheffran J. Revealing the role of livelihood assets in livelihood strategies: Enhancing conservation and development in Iran. *Ecol Indic.* 2018;94:336–347. doi:10.1016/j.ecolind.2018.05.074
13. Mabitsela W. Regulating informal trading in local government: The case of Polokwane Local Municipality [dissertation]. Polokwane: University of Limpopo; 2017.
14. Polokwane Local Municipality. Integrated development plan 2023/24 [Internet]. Polokwane: Polokwane Municipality; 2023 [cited 2026 Mar 2]. Available from: <https://www.polokwane.gov.za>
15. Amin C, Pramono WT, Jumadi J, Sari DN, Samson MG. Navigating urban poverty: The role of livelihood assets in urban livelihoods. *Soc Sci Humanit Open.* 2025;11:101298. doi:10.1016/j.ssaho.2025.101298
16. Liu J, Qian C, Li X. Livelihood and food security in sustainable agriculture systems. *Foods.* 2024;13(14):2238. doi:10.3390/foods13142238
17. Xu D, Deng X, Guo S, Liu S. Sensitivity of livelihood strategy to livelihood capital: Evidence from rural China. *Soc Indic Res.* 2019;144:113–131. doi:10.1007/s11205-018-2037-6
18. He RW, Guo SL, Deng X, Zhou K. Influence of social capital on livelihood strategies in rural China. *J Mt Sci.* 2022;19(4):958–973. doi:10.1007/s11629-020-6395-6
19. Mago W. Understanding sustainable livelihood strategies of informal traders: A case of Mount Frere, Eastern Cape [dissertation]. Potchefstroom: North-West University; 2018.
20. Sepadi MM, Nkosi V. Strengthening urban informal trading and improving the health of vendors. *Int J Environ Res Public Health.* 2023;20(6):4836. doi:10.3390/ijerph20064836
21. Lefophane MH, Mdungwa MS, Oluwatayo IB. Factors influencing income generated by informal fresh produce traders during COVID-19 in Polokwane. *Int J Food Agric Econ.* 2022;10(4):325–342.
22. Chan JYL, Leow SMH, Bea KT, Cheng WK, Phoong SW, Hong ZW, et al. Mitigating multicollinearity problems: A review. *Mathematics.* 2022;10(8):1283. doi:10.3390/math10081283
23. Rwafa-Ponela T, Goldstein S, Kruger A, Erzse S, Abdool Karim S, Hofman K. Urban informal food traders and COVID-19 lockdown measures in South Africa. *Sustainability.* 2022;14(4):2294. doi:10.3390/su14042294
24. Kushitor SB, Badu M, Kushitor MK, Currie P. Access to market infrastructure and food handling practices among traders. *Front Sustain Food Syst.* 2022;6:724190. doi:10.3389/fsufs.2022.724190

25. Banda LJ, Tanganyika J. Livestock contributions in smallholder production systems. *Anim Front.* 2021;11(2):7–14. doi:10.1093/af/vfab001
26. García-Díez J, Gonçalves C, Grispoldi L, Cenci-Goga B, Saraiva C. Determining food stability to achieve food security. *Sustainability.* 2021;13(13):7222. doi:10.3390/su13137222
27. Baadjie T, Manyaga B. Exploring post-COVID-19 survival strategies for SMMEs in Johannesburg. *J Contemp Manag.* 2023;20(1):560–587.
28. Pohlman JT, Leitner DW. A comparison of ordinary least squares and logistic regression. *Ohio J Sci.* 2003;103(5):118–125.