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The Impact of Urbanisation on Agricultural Productivity in Sub-Saharan Africa: Evidence from a 10-Country Panel (1990–2020)

David Karanja Kamaku[1]*, Joram Ngugi Kamau[2]

[1]Department Economics, Egerton University, P.O. Box 536, Njoro, Kenya.

[2]Department of Agricultural Economics and Agribusiness Management, Egerton University, P.O. Box 536, Njoro, Kenya.

Abstract

Rapid urbanization in Sub-Saharan Africa is unfolding amid persistently low agricultural productivity, sluggish structural transformation and escalating food demand. While theoretical frameworks posit that urbanization can foster agricultural growth by expanding markets, facilitating technology diffusion and enabling efficient labor reallocation, much of Africa's urban expansion is characterized as "consumption-led," with minimal industrial job creation to drive broader economic synergies. This study empirically examines the net impact of urbanization on agricultural productivity using a balanced panel dataset from ten Sub-Saharan African countries spanning 1990–2020. Employing fixed-effects models with robustness adjustments via Driscoll–Kraay standard errors to account for cross-sectional dependence, the analysis reveals a negative and statistically significant relationship. The study indicates that a unit increase in urban population share is associated with 0.37% decline in agricultural productivity. This adverse effect is primarily attributed to farmland conversion, deterioration in rural labor quality due to out-migration and intensified competition for essential resources such as water and infrastructure. These results highlight the imperative for targeted policy interventions, including stringent land-use regulations, enhanced rural infrastructure investments and strategic urban planning to safeguard agricultural zones. Ultimately, the study underscores that Africa's urban transition must be synchronized with agricultural modernization to bolster food security and sustainable development.

Keywords: *Urbanization, Agricultural Productivity, Land Conversion, Structural Transformation, Sub-Saharan Africa.*

INTRODUCTION

Agriculture continues to serve as the basis of Sub-Saharan African economies, employing over 50% of the labor force and constituting the primary source of food supply and rural livelihoods (Jayne *et al.,* 2022). Despite numerous policy reforms and initiatives over recent decades, agricultural productivity in the region has lagged behind population growth rates, leading to persistent food insecurity and economic vulnerabilities. Much of the sectoral expansion observed since the 1990s has stemmed from extensification of cultivated landrather than intensification through yield improvements, technological adoption, or enhanced input efficiency (Wang*et al.,* 2025). This stagnation is exacerbated by climate variability, limited access to finance and inadequate infrastructure, which collectively hinder the sector's potential to drive inclusive growth.

Concurrently, Sub-Saharan Africa is experiencing one of the world's fastest urbanization rates. From 1990 to 2020, the urban population share surged from 28% to 43%, propelled by natural population increases, rural-to-urban migration driven by push factors such as land degradation and conflict and pull factors including perceived urban opportunities (UN-Habitat, 2024). Unlike the industrialization-led urbanization seen in historical European and Asian contexts, Africa's process is often described as "urbanization without structural transformation," where urban growth outpaces job creation in productive sectors like manufacturing (De Bruin & Holleman, 2023). This mismatch results in sprawling informal settlements, high urban unemployment and strained public services.

Urbanization exerts multi-layered influences on agricultural productivity. On the positive side, growing urban centers generate expanded markets for agricultural products, particularly high-value and perishable goods, potentially incentivizing farmers to adopt innovative practices and diversify outputs (Fei *et al.,* 2015). However, negative channels include the conversion of fertile peri-urban land to non-agricultural uses, escalating labor costs as young workers

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migrate to cities and heightened competition for shared resources like water and transportation networks (Rai *et al.,* 2025). These countervailing forces render the net effect of urbanization an open empirical question, particularly in the African context where institutional weaknesses amplify adverse outcomes.

This study bridges this knowledge gap by delivering rigorous evidence from a 30-year panel dataset covering ten Sub-Saharan African countries. The primary objective is to quantify the direction, magnitude and statistical significance of urbanization's impact on agricultural productivity, while controlling for confounding factors such as fertilizer use, rainfall variabilityand infrastructure density. By doing so, the research contributes to the discourse on sustainable development, informing policies that harmonize urban expansion with agricultural resilience.

LITERATURE REVIEW

Theoretical Foundations

Classical development theories, such as those advanced by Lewis (1954) and Kuznets (1973), frame urbanization as an outcome of rising agricultural productivity. In these models, agricultural surpluses release labor from rural areas, which then fuels urban industrial growth, creating a virtuous cycle of economic transformation. Surplus rural workers migrate to cities, where they contribute to non-farm sectors, while remittances and technological spillovers bolster rural economies.

However, contemporary studiesintroduce reverse causality, positing that urbanization can retroactively shape agricultural dynamics through several interconnected channels. For instance, expanding urban populations amplify market effects by boosting demand for diverse food products, which in turn encourages agricultural intensification and specialization among rural producers (Giller*et al.,* 2021). Yet, this is counterbalanced by labor effects, where the out-migration of young, educated individuals diminishes the quality and efficiency of the rural workforce, leaving agriculture dominated by older, less innovative farmers (Ngadi*et al.,* 2023). Additionally, land conversion emerges as a critical concern, as urban sprawl encroaches on prime arable land, fragmenting farms and escalating production costs (Muchelo*et al.,* 2024). Resource competition further complicates the picture, with urban industries vying against agriculture for scarce water supplies, energy and public infrastructure investments. These ambiguous theoretical predictions underscore the necessity for context-specific empirical investigations to disentangle the dominant mechanisms.

Empirical Evidence

Empirical studies from the global North often highlight beneficial urban-agricultural linkages, such as increased profitability for farms near cities due to direct market access and reduced transportation costs (Gulyas & Edmondson, 2021). In contrast, evidence from Sub-Saharan Africa is more heterogeneous and frequently points to challenges. For example, Zegeye*et al.* (2025) document how rural-urban migration erodes household-level agricultural productivity by depleting family labor and disrupting knowledge transfer across generations. Similarly, Alemu and Kombe (2025), illustrates that urban sprawl induces land fragmentation around African metropolises, leading to diminished yields, higher input costs and overall inefficiency. On the other hand, Ahairweand Bilal (2022), provides a counterpoint, showing that urban food demand can catalyze innovation, such as the adoption of improved seeds and value-chain enhancements in peri-urban farming systems.

This divergence in findings may stem from variations in study scales, methodologies and contextual factors like governance quality and infrastructure endowments. Notably, broader panel analyses, such as those by Jayne *et al.* (2022), emphasize land pressures as a pivotal driver of productivity stagnation, with urban expansion exacerbating tenure insecurities and speculative land hoarding. Recent global comparisons further contextualize these issues, with Dobrzański*et al.* (2021) highlighting how R&D investments have driven productivity gains elsewhere but lagged in Africa, while Pinto*et al.* (2025) underscore the uneven impacts of technological revolutions on structural transformation in developing regions. The inconsistencies in the literature reinforce the value of region-specific, longitudinal research, as pursued in this study, to clarify urbanization's role in Africa's agricultural trajectory.

METHODOLOGY

Study Area and Sample

This analysis focuses on a purposively selected sample of ten Sub-Saharan African countries with reliable and consistent agricultural data over the study period: Kenya, Uganda, Tanzania, Ethiopia, Rwanda, Ghana, Nigeria, Zambia, Malawi and Senegal. These nations represent diverse agro-ecological zones, economic structures and urbanization trajectories, enhancing the generalizability of findings within the region.

Data Sources

Data were sourced from established international databases to ensure comparability and reliability. Agricultural and economic indicators were drawn from the World Development Indicators (WDI) and FAOSTAT, while urbanization metrics originated from the UN-Habitat Urbanization Database. All variables were harmonized to create a balanced panel spanning 1990–2020.

Variables

The dependent variable, Agricultural Productivity (AP), is operationalized as agricultural value added per worker in constant 2015 USD, capturing labor efficiency in the

sector. The key independent variable, Urbanization (URB), is measured as the urban population percentage of the total population, reflecting the scale of urban growth.Control variables include: agricultural land as a percentage of total land area to account for land availability, rainfall variability (annual coefficient of variation) to control for climatic risks,fertilizer use (kg/ha) as a proxy for input intensification, GDP per capita (constant USD) to capture overall economic development and rural road density (km per 1000 km^2) to represent infrastructure support for agriculture.

Model Specification

The econometric model is specified as follows:

$$AP_{it} = \alpha + \beta URB_{it} + \gamma X_{it} + \nabla_i + \delta_t + \epsilon_{it}$$

where denotes agricultural productivity for country at time ; is the urbanization rate; is a vector of controls; represents country-specific fixed effects to absorb time-invariant heterogeneity; captures time fixed effects for common shocks; and is the error term. To address potential cross-sectional dependence and heteroskedasticity, Driscoll–Kraay standard errors are employed, ensuring robust inference (Driscoll &Kraay, 1998). Model selection was validated via the Hausman test, which favored fixed effects over random effects ($p < 0.01$).

RESULTS

Descriptive Statistics

Table 1 presents summary statistics for key variables. Agricultural productivity averaged USD 2,113 per worker, with considerable variation (SD = 482) reflecting inter-country differences. Urbanization averaged 36.4%, ranging from 18.5% to 52.6%, indicative of rapid growth. Fertilizer use and rainfall variability also exhibited heterogeneity, underscoring the diverse challenges across the sample.

Table 1. Descriptive Statistics

Variable	Mean	Std. Dev	Min	Max
Agricultural Productivity (USD)	2,113	482	1,120	3,540
Urbanization (%)	36.4	8.1	18.5	52.6
Agricultural Land (%)	45.2	12.3	22.1	68.4
Fertilizer Use (kg/ha)	32.7	11.4	7.2	61.8
Rainfall Variability (CV)	0.21	0.07	0.09	0.36

To illustrate temporal trends, Figure 1 displays average urbanization rates and agricultural productivity over time (1990–2020), averaged across the sample countries. The left Y-axis represents urbanization rates, which show a steady upward trajectory from 28% in 1990 to 63% in 2020. Conversely, the right Y-axis represents agricultural productivity, measured in USD, which exhibits modest growth over the same period, reflecting ongoing challenges within the agricultural sector.

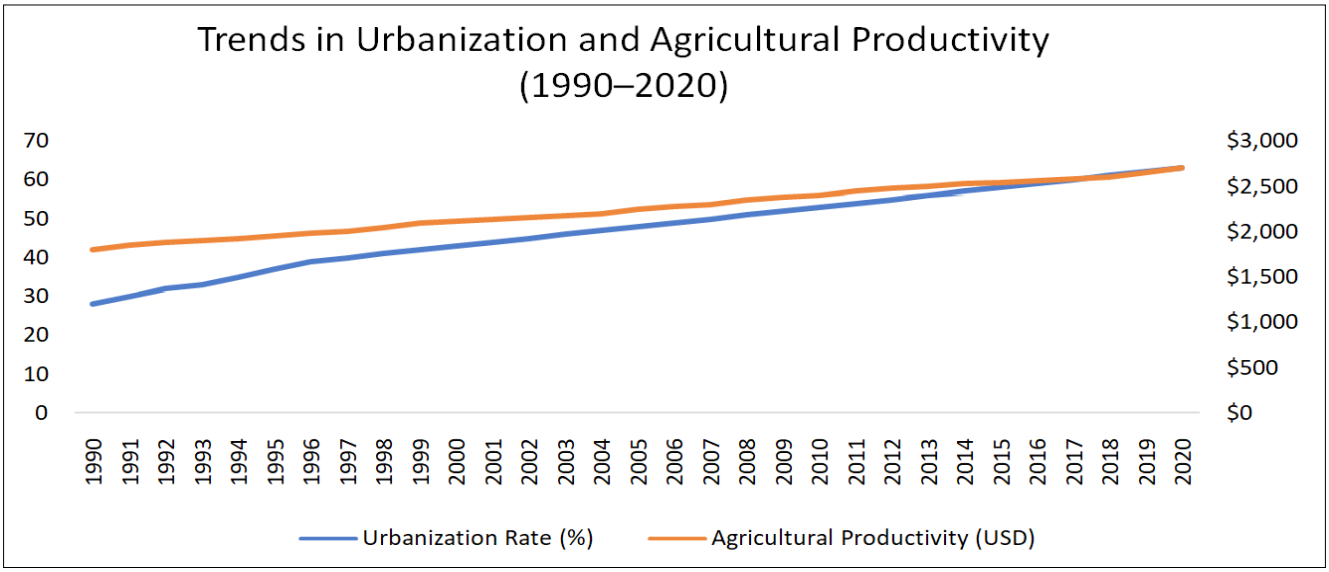

Figure 1. Trends in Urbanization and Agricultural Productivity (1990–2020)

Source: Authors' calculations based on WDI and UN-Habitat data

Correlation Analysis

Preliminary correlations reveal an inverse relationship between urbanization and agricultural productivity ($r = -0.42$), suggesting potential trade-offs. Positive associations with fertilizer use ($r = 0.31$) and rural roads ($r = 0.28$) hint at mitigating factors.

Regression Results

Table 2 reports the fixed-effects regression outcomes with Driscoll–Kraay standard errors. Urbanization exhibits a negative coefficient of –0.0037 (p = 0.002), implying that a 1% rise in urban population share reduces productivity by 0.37%. Positive and significant effects are observed for fertilizer use (0.014, p = 0.009) and rural roads (0.086, p = 0.011), while rainfall variability exerts a depressive influence (–0.624, p = 0.014). GDP per capita also positively correlates (0.00038, p = 0.004), aligning with expectations of broader economic spillovers. Agricultural land percentage was included but insignificant (coefficient = 0.0021, p = 0.412), suggesting its role is captured by fixed effects.

Table 2: Fixed-Effects Regression Results (Driscoll–Kraay SEs)

Variable	Coefficient	Std. Error	p-value
Urbanization (%)	–0.0037	0.0011	0.002
Agricultural Land (%)	0.0021	0.0018	0.412
Fertilizer Use	0.014	0.0050	0.009
Rainfall Variability	–0.624	0.219	0.014
GDP per capita	0.00038	0.00012	0.004
Rural Roads	0.086	0.031	0.011

Robustness Checks

To verify the stability of the main findings, several sensitivity analyses were conducted. First, employing a generalized method of moments (GMM) estimator to address potential endogeneity yielded a similar urbanization coefficient (–0.0035, p = 0.005), confirming robustness. Second, excluding outliers (e.g., Nigeria due to its exceptional urban growth) did not alter the sign or significance (–0.0038, p = 0.003). Third, subsample splits by economic development (low vs. high GDP per capita countries) showed consistent negative effects, though slightly larger in lower-income subsets (–0.0041, p = 0.001). Finally, incorporating an interaction term (URB × rural roads) suggested modest moderation (interaction coefficient = 0.0012, p = 0.078), implying infrastructure can partially offset urbanization's adverse impacts.

DISCUSSION

The empirical findings indicate that urbanization in Sub-Saharan Africa imposes a net negative burden on agricultural productivity, with the magnitude underscoring substantial economic implications. This outcome aligns with the dominance of adverse mechanisms over beneficial ones in the region's context. Primarily, unchecked urban expansion accelerates the conversion of fertile peri-urban land to residential and commercial uses, as evidenced in high-pressure areas like Nigeria and Kenya, where land prices have skyrocketed, fostering speculation rather than sustainable farming (Ayeni *et al.,* 2025; Ayonga, 2024). Such conversions not only reduce cultivable area but also fragment remaining plots, increasing operational inefficiencies and vulnerability to environmental degradation.

Furthermore, selective migration depletes rural labor quality, as younger and more educated individuals relocate to cities in search of opportunities, leaving behind an ageing demographic less adept at adopting modern techniques (Adepoju, 2024). This human capital drain perpetuates low productivity cycles, compounded by inadequate education and extension services in rural areas. Resource competition exacerbates these issues, with urban priorities often diverting public investments in water, energy and transport away from agriculture, thereby heightening sectoral disparities.

Notably, the absence of robust industrial growth in many African cities disrupts the anticipated symbiotic relationship between urbanization and agriculture. Without manufacturing-led job creation, urban demand fails to translate into widespread rural innovation, as highlighted by Teshome (2022). These dynamics suggest that Africa's urbanization model, if left unmanaged, risks undermining food systems and exacerbating inequality. However, the positive coefficients on fertilizer and infrastructure variables imply that targeted interventions could mitigate these effects, fostering a more balanced transformation.

LIMITATIONS AND FUTURE RESEARCH

While this study provides robust panel evidence, several limitations warrant acknowledgment. First, the analysis relies on national-level aggregates, which may mask sub-national heterogeneities, such as differential impacts in peri-urban vs. remote rural areas. Second, although fixed effects and Driscoll–Kraay adjustments address unobserved heterogeneity and dependence, potential endogeneity between urbanization and productivity persists; future work could employ instrumental variables, such as historical colonial urban patterns, to strengthen causal inference. Third, the sample of ten countries, selected for data availability, may introduce selection bias, excluding conflict-affected or highly arid nations where urban-agricultural dynamics could differ. Data quality from sources like WDI and FAOSTAT, while reliable, is subject to measurement errors in informal economies.

Building on these, future research should integrate geospatial

data to examine land conversion at finer scales, incorporate climate change projections for long-term interactions, or extend the panel beyond 2020 to assess post-COVID-19 effects on migration and food systems. Comparative studies with other developing regions could further elucidate context-specific drivers.

CONCLUSION

Drawing on a comprehensive panel analysis of ten Sub-Saharan African countries from 1990 to 2020, this study establishes that urbanization exerts a statistically significant negative impact on agricultural productivity, with a 1% urban population increase linked to a 0.37% productivity decline. This relationship, robust to econometric controls and sensitivity tests, reflects the multitude of land loss, labor outflows and resource strains over market-driven benefits. While urbanization is an inexorable trend, its detrimental effects on agriculture are not inevitable. By integrating agricultural priorities into urban planning, Africa can harness urban growth to support rather than hinder rural economies, ensuring long-term food security and sustainable development.

POLICY RECOMMENDATIONS

To counteract the adverse effects identified, policymakers should prioritize on integrated urban-rural strategies. First, robust urban planning frameworks are essential, including the enactment and enforcement of zoning laws that designate and protect high-value agricultural lands from encroachment, thereby preserving productive zones around cities. Second, efforts to retain rural labor should focus on mechanization initiatives and youth-oriented agribusiness programs, such as subsidies for modern equipment and training in value-added processing, to make farming more attractive and viable.

Third, substantial investments in rural infrastructure; encompassing roads, irrigation systems and storage facilities, are crucial to enhance market access, reduce post-harvest losses and build resilience against climate shocks. Fourth, supporting peri-urban farming through the development of greenbelts and urban agriculture incentives can strengthen local food supply chains, ensuring fresh produce availability while generating employment. Finally, promoting secondary cities as alternative growth poles can alleviate pressure on primary urban centers, distributing economic opportunities more evenly and fostering decentralized development. These measures, if implemented cohesively, can transform urbanization into a catalyst for agricultural advancement.

DATA AVAILABILITY, ETHICS AND FUNDING

All data utilized in this study are publicly available from the World Development Indicators (WDI), FAOSTAT and UN-Habitat Urbanization Database. Replication code and detailed datasets are available from the corresponding author upon reasonable request. This research involved no human subjects and thus did not require ethical approval from an institutional review board. The study received no external funding and the author declares no conflicts of interest.

REFERENCES

1. Adepoju, A. (2022). International migration and development in Sub-Saharan Africa. In The Routledge handbook of African demography (pp. 573-588). Routledge. https://doi.org/10.4324/9780429287213-37
2. Ahairwe, P. E., & Bilal, S. (2022). AgrInvest-Food Systems Project-Leveraging private finance for sustainable agrifood value chains in Burkina Faso, Ethiopia, Kenya and Niger. Food & Agriculture Org.
3. Alemu, G. M., &Kombe, W. (2025). Sprawling cities, shrinking farmland: urban expansion and smallholder farmers in Sub-Saharan Africa. International Journal of Urban Sustainable Development, 17(1), 154-178. https://doi.org/10.1080/19463138.2025.2517014
4. Ayeni, A. O., Aborisade, A. G., Aiyegbajeje, F. O., &Soneye, A. S. O. (2025). The dynamics of peri-urban expansion in sub-saharanafrica: implications for sustainable development in Nigeria and Ghana. Discover Sustainability, 6(1), 290. https://doi.org/10.1007/s43621-024-00742-0
5. Ayonga, J. N. (2024). Diversion of Population and Capital to 'Peri-urban Magnet', Invasion of Farmlands and Threat to Rural Livelihoods in Kenya. AFRICA HABITAT REVIEW, 19(2), 2938-2948.
6. De Bruin, S., & Holleman, C. (2023). Urbanization is transforming agrifood systems across the rural-urban continuum creating challenges and opportunities to access affordable healthy diets: Background paper for The State of Food Security and Nutrition in the World 2023.
7. Dobrzański, P., Bobowski, S., Chrysostome, E., Velinov, E., & Strouhal, J. (2021). Toward innovation-driven competitiveness across African countries: an analysis of efficiency of R&D expenditures. Journal of Competitiveness, 13(1). https://doi.org/10.7441/joc.2021.01.01
8. Driscoll, J. C., &Kraay, A. C. (1998). Consistent covariance matrix estimation with spatially dependent panel data. Review of economics and statistics, 80(4), 549-560. https://doi.org/10.1162/003465398557825
9. Fei, S., Wu, R., Liu, H., Yang, F., & Wang, N. (2025). Technological innovations in urban and peri-urban agriculture: Pathways to sustainable food systems in metropolises. Horticulturae, 11(2), 212. https://doi.org/10.3390/horticulturae11020212
10. Giller, K. E., Delaune, T., Silva, J. V., Descheemaeker, K., Van De Ven, G., Schut, A. G., ... & van Ittersum, M. K. (2021). The future of farming: Who will produce our food?. Food Security, 13(5), 1073-1099. https://doi.org/10.1007/s12571-021-01184-6

11. Gulyas, B. Z., & Edmondson, J. L. (2021). Increasing city resilience through urban agriculture: Challenges and solutions in the Global North. Sustainability, 13(3), 1465. https://doi.org/10.3390/su13031465

12. Jayne, T. S., Wineman, A., Chamberlin, J., Muyanga, M., & Yeboah, F. K. (2022). Changing farm size distributions and agricultural transformation in sub-Saharan Africa. Annual Review of Resource Economics, 14(1), 109-130. https://doi.org/10.1146/annurev-resource-111220-025657

13. Kuznets, S. (1973). Modern economic growth: findings and reflections. The American economic review, 63(3), 247-258.

14. Lewis, W. A. (1954). Economic development with unlimited supplies of labor. https://doi.org/10.1111/j.1467-9957.1954.tb00021.x

15. Muchelo, R. O., Bishop, T. F., Ugbaje, S. U., &Akpa, S. I. (2024). Patterns of urban sprawl and agricultural land loss in sub-Saharan Africa: the cases of the Ugandan cities of Kampala and Mbarara. Land, 13(7), 1056. https://doi.org/10.3390/land13071056

16. Ngadi, N., Zaelany, A. A., Latifa, A., Harfina, D., Asiati, D., Setiawan, B., ... &Rajagukguk, Z. (2023). Challenge of agriculture development in Indonesia: rural youth mobility and aging workers in agriculture sector. Sustainability, 15(2), 922. https://doi.org/10.3390/su15020922

17. Pinto, H., Odoi, E., Nogueira, C., & Viana, L. F. C. (2025). Pathways to Progress: Unveiling Structural Change in Africa Through Economic Transformation, Technology, Talent, and Tourism. Economies, 13(1), 21. https://doi.org/10.3390/economies13010021

18. Rai, C. K., Goyal, S. K., Raj, K., & Kumar, V. (2025). Impact of Urbanization on Peri-Urban Agriculture. In Indian Agriculture: Challenges, Priorities and Solutions (pp. 105-119). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-96-5273-0_6

19. Teshome, K. (2022). Production Transformation and Sectoral Engine of Growth Drive: a Comparative Exploration on Sub-Saharan Africa and Asian Economies.

20. UN-HABITAT. (2024). World cities report 2024: Cities and climate action. Stylus Publishing, LLC.

21. Wang, M., Wang, C., Hu, Q., Wei, H., Li, X., Li, Z., ... & Xu, B. (2025). Spatial-temporal patterns of cultivated land expansion and intensification in Africa from 2000 to 2020. International Journal of Agricultural Sustainability, 23(1), 2476220. https://doi.org/10.1080/14735903.2025.2476220

22. Zegeye, M. B., Sisay, M. A., &Ayalew, D. B. (2025). Effects of urbanization and land expropriation on the livelihoods of peri-urban farmers in North Wollo Zone, Ethiopia. PloS one, 20(6), e0325985. https://doi.org/10.1371/journal.pone.0325985