Impact of Urban Sprawl on Agricultural Development around the Fringes of Makurdi Metropolis, Nigeria

[1]Veronica Mbanengen Agaji
[2]Daniel Peverga Dam
[1&2,]Department of Geography,
Benue State University,
Makurdi-Nigeria

Abstract
The study examines the impacts of urban sprawl on agricultural development around the fringes of Makurdi metropolis, Nigeria. Data on the impacts of urban sprawl on cropping system, farm labour, crops grown and farm sizes were collected from 380 urban sprawl residents on the fringes of Makurdi metropolis using questionnaire, and physical observation. The data was analysed using descriptive and inferential statistics presented in tables, charts. The results of the study shows that crop rotation was the dominant (41.8%) cropping system in the study area 10 years ago now accounts for only 22.4%. On the hand, mixed cropping system which was least practiced accounting for 26.6% in the study area 10years ago now, accounts for 52.4%. This implies that urban sprawl has reduced agricultural land thereby making the people to plant many crops on the same piece of land for maximum output. The result also shows that family labour 10years ago accounted for 64.4% and was the dominant source of farm labour whereas at present, it has been reduced to only 49%. This implies a shift away from agricultural practices by many families which now depends on hired labour which currently accounts for 38.4% as against 25.3% 10years ago. The result shows noticeable increase in smaller farmland sizes from 37.6% 10years ago to 48.1% as at 2024 while large farm size of 5 hectares and above that accounted for 17.1% 10years ago now accounts for only 11.8%. The study underscores the need for effective urban planning and land-use policies to balance urban expansion with the preservation of agricultural land, ensuring sustainable development and food security in the region.

Keywords: Urban sprawl, agricultural development, Makurdi Metropolis, Nigeria

Introduction

The increasing rate of urbanisation globally is changing the natural landscape and impacting development differently across space (Dam et al, 2020). Cities are the epicentres of attraction for both human and economic activities thereby putting them on continuous path of physical development (Dam et al, 2021). These development may be planned, controlled or sprawl. Urban sprawl which is characterized by the uncontrolled expansion of urban areas into the surrounding countryside poses significant challenges to agricultural development. It's considered as one of the main competitors against agricultural development, manifested in encroachments over arable lands and limiting farm sizes (Iorliam et al, 2019; Iorliam et al 2017).

This phenomenon, prevalent in many developing regions, including Nigeria, has far-reaching implications for food security, land use patterns, and the socio-economic well-being of local communities. Makurdi Local Government Area (LGA) in Benue State, often regarded as the "Food Basket of the Nation," provides a compelling case study to explore these impacts. According to Bren d'Amoura, Reitsma, Baiocchi, Barthel,

Guneralp, Erb, Haberl, Creutzig, and Seto (2016), unplanned urbanization is usually associated with negative short and long-term consequences that have direct impacts on farm sizes and agricultural development in general. Urban land uses contend strongly with agricultural development for space, and because they generate higher rents, they always edge out agriculture except, where there are strong and practical land policies that favour agriculture over such land use types (Cohen, 2005; Iortyom *et al*, 2020). Agricultural activities around the fringes of urban areas has continue to experienced drastic changes affecting farming systems, agricultural land and marketing (UN-WWAP, 2015).

Sprawl in Nigeria consists of rapid physical development including informal housing developments on land that is mostly privately owned, and sold in single small plots at the urban fringes (Chunwate *et al*, 2019). All cities in Nigeria are experiencing sprawl, especially metropolitan cities where the scale or magnitude of uncontrolled physical development is rapidly taking over agricultural productive lands. Within the past decades, most of the physical development in Nigeria's cities burst outward in an explosion of sprawl that consumed former agricultural lands at a break- neck pace (Bureau of the Census, 2000; Chunwate *et al*, 2019, Babalola, Oso, Fasina and Godonu, 2011). These agrarian lands were regarded as an important source of staple food supply to the urban inhabitants. However, in recent years, a gradual reduction in agricultural produce has been observed from the supply chain to urban areas including some processing plants in Benue state (Shabu *et al*, 2011).

Iortyom *et al*, (2020) submits that urban centres often expand over nations' most productive agricultural land. Most urban centres grew from areas with existence of highly fertile soil. This could account for why Makurdi LGA, a fertile land in the Lower Benue River Basin is witnessing unprecedented urban growth. Makurdi LGA used to be a producer of horticultural crops, especially fruit crops like oranges, mangoes, cashew, pawpaw and guavas; the farmers also produce different varieties of other crops such as yams, cassava, rice, soya beans, guinea corn and groundnuts, among others (Iortyom *et al*, 2020). Similarly, the people also raised livestock like goats, pigs, birds, cattle and a host of other domestic animals (National Population Commission of Nigeria, 2006; National Bureau of Statistics, 2016). However, with the increasing uncontrolled urban development encroaching on agriculture may have some quantifiable impacts on agriculture, which this study sought to determine.

Generally, there is a lack of compiled evidence-based information on the effect of urban sprawl on farm sizes in the study area. Some studies have been conducted on the urban sprawl and its attendant effects on agricultural lands in Makurdi. Iortyom *et al*, (2020) studied spatial expansion of urban activities and agricultural lands encroachment in Makurdi LGA, while Bakoji *et al*, (2020) investigated urbanisation and its impacts in growing cities in developing countries: a case study of Makurdi, Benue State, Nigeria. Shabu *et al*, (2021) also investigated and assessed the impact of urbanisation on agricultural land in Makurdi Local Government Area of Benue State, Nigeria using GIS from 1997-2017.

Several studies have assessed the impact of urban activities on agricultural lands in Makurdi LGA. Iortyom, Semaka and Abawua (2020) found out that there is a continuous decline in the total amount of farmlands in Makurdi from 1999-2012. Specifically, it was found that in 1999, farmlands covered 43% of the study area while in 2012 it was reduced to 22%, indicating that spatial expansion of urban activities has been on the increase and may result in absolute loss in cropland with other sustainability risks and threats of livelihoods if not appropriately managed. Similarly, Shabu, Fate and Ukula (2021) reported that urbanization has significant effects on farmland in the study area and these effects include; decreasing farm sizes and reducing agricultural activities. Recently, Iortyom, Semaka and Kargbo (2022) investigated the effects of urban sprawl on peripheral agricultural lands in Makurdi City over the period 1999-2012. They revealed that despite the adverse impact of urban sprawl on peripheral agricultural lands in Makurdi town, its socio-economic impact has led to the establishment of infrastructural facilities such as roads, electricity, markets, and parks. However, from the literatures, nothing has been reported on the impacts of urban sprawl on changing farming or cropping systems in the study area. The previous studies have not addressed particularly, the impacts of urban sprawl on farming or cropping systems as it affects agricultural practice in relation to agricultural development generally. This creates a research vacuum; hence need to understand the structural dynamics of urban sprawl, particularly its impact on farm sizes in Makurdi LGA over the years. This research therefore seeks to fill this identified gap, especially in view of the fact that urban sprawl impacts in different ways reducing available farmlands for sustainable food production, which subsequently endangers food security among other negative consequences. The study will also help in proffering solutions, through the formulation of sound and effective urban policies that will promote organized, well- coordinated and effective

urban planning that integrates sustainable agricultural development strategies that will enhance food productivity for socio-economic growth of the people.

Material And Methods

Study area

Makurdi LGA is located on the flood plains of the River Benue in the Benue Trough (Bakoji *et al*, 2020); in the heart of the Guinea Savannah zone of Central Nigeria. It is the administrative headquarters of Benue State and Makurdi LGA. It lies between latitude 7° 43'.48'' N and 7° 45'.47'' N of the equator and longitude 8° 31'.48 E and 8° 33'40 E of the Greenwich meridian. The urban area is defined by a 16 kilometre radius with the central geographical point coordinates of latitudes 07°44.30 North and longitude 08°31.24 East, located within the premises of the general post office and represented on the ground by survey pillar number GMC [Gazette No 50] (Ministry of Land and Survey Office Makurdi, Unpub. data; Iorkyaa, 2018). It is strategically located on both banks of the River Benue at the point where the Federal Trunk 'A' road passes, as well as the geographical North and South part of the country divides (Shabu, Fate and Ukula, 2021; Bakoji *et al*, 2020; Iorkyaa, 2018). It shares boundaries with Guma LGA to the North, Gwer to the West, Tarka to the East. The population of Makurdi is estimated at 300,377 persons (NPC, 2006) (See map of the study area in figure 1).

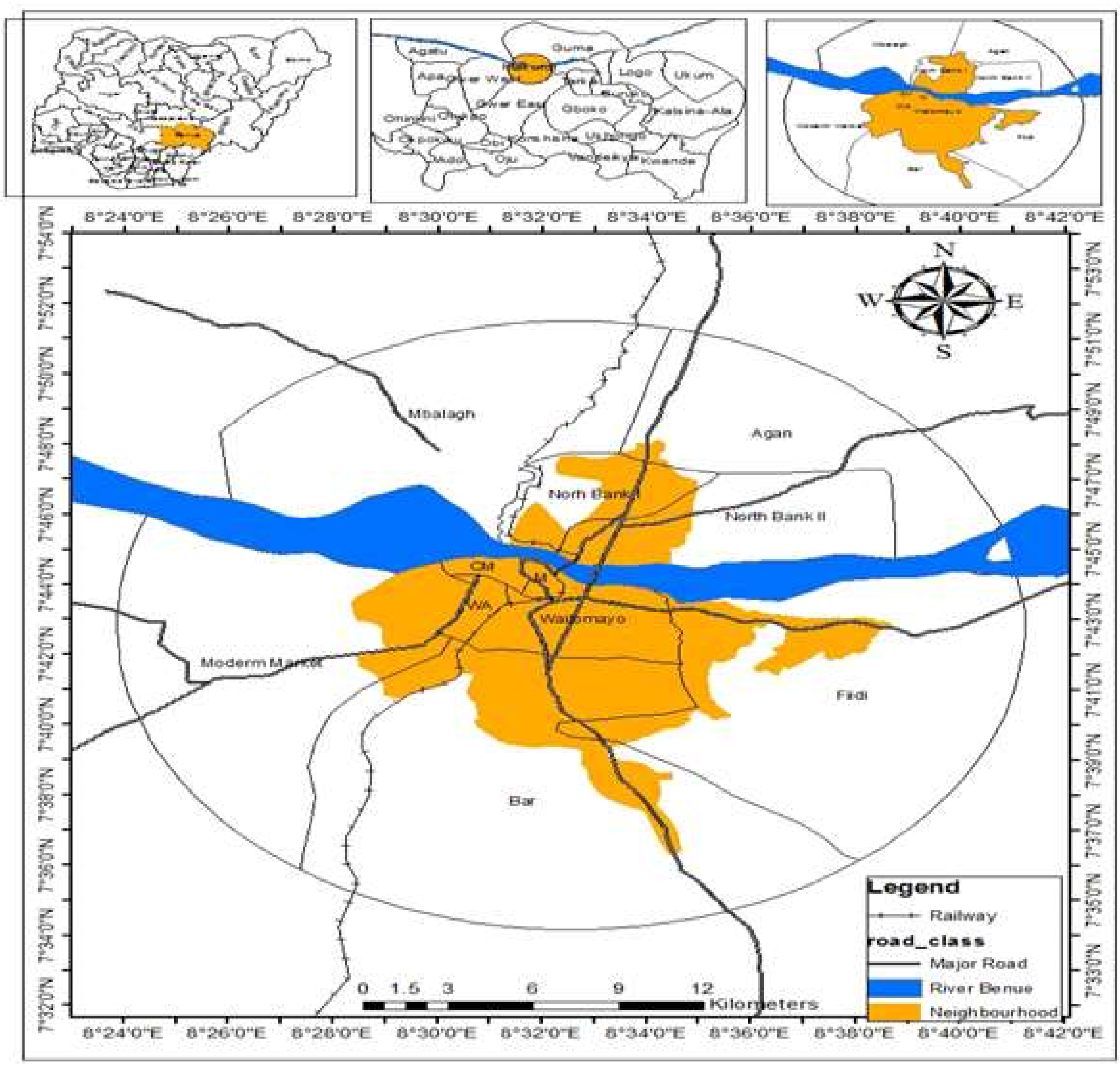

Figure 1: Makurdi Local Government Area
Source: GIS Laboratory, Benue State University, Makurdi

Methods

The study adopted a field survey research design. Data was collected from 380 urban sprawl residents and farmers on the fringes of Makurdi metropolis using questionnaire, physical observation and key informat interview was conducted with the General Manager, Urban Development Board Makurdi, Director of Lands, Ministry of Lands and Survey, Makurdi. Data was collected on the demographic characteristics of the respondents; impact of urban sprawl on farm sizes, cropping system, farming system, farm labour as well as marketing of farm produce. The data was analysed using descriptive statistics and presented in tables, charts.

Results And Discussion

Demographic characteristics of sprawl areas in the study area

The socio-demographic characteristics of sprawl area residents in Makurdi LGA focusing on specific variables including age, marital status, religion, education, occupation, monthly average income and ethnicity. The result of the field survey is analysed and presented in table 3.1

Table3.1: Demographic characteristics of urban sprawl residents in the study area

Characteristics	Frequency	Percentage	Characteristics	Frequency	Percentage
Sex			**Occupation**		
Male	250	65.1	Farming	183	47.7
Female	134	34.8	Civil service	113	29.4
Total	*384*	*100%*	Trade/business	71	18.5
			Others	17	4.4
Age			*Total*	*384*	*100%*
40 years and below	195	50.8	**Household Size**		
41years and Above	189	49.2	Below 3 persons	48	12.5
Total	*384*	*100%*	3 – 5 persons	76	19.8
Marital Status			6 – 9 persons	185	48.2
Single	89	23.2	10 Above persons	75	19.5
Married	198	51.6	*Total*	*384*	*100%*
Divorced/separated	28	7.3	**Monthly Income**		
Widow/widower	69	18.0	Below N30,000	99	25.8
Total	*384*	*100*			
Religion			N30,000 – N50,000	91	23.7
Traditional	77	20.1	N51,000 – N70,000	118	30.7
Christianity	265	69.0	Above N70,000	76	19.8
			Total	*384*	*100%*
Islam	42	10.9			
Total	*384*	*100%*	**Ethnicity**		
Education			Tiv	186	48.4
Non-Literate	22	5.7	Idoma	74	19.3
Primary	37	9.6	Igede	62	16.1
Secondary	108	28.1	Hausa	12	3.1
Tertiary	217	56.5	Igbo	8	2.1
Total	*384*	*100%*	Jukum	31	8.1
			Yoruba	11	2.7
			Total	***384***	***100***

Source: Researcher's Field Work, 2024

The information from table 3.1 shows that, sprawl areas of the study area is dominated by males accounting for 65.1%, with age group of 40years below accounting for 50.8%, while marital people form the dominant group with 51.6%. Furthermore, the study discovered that sprawl residents of the study area are majorly Christians by religion accounting for 69%. Literacy level in the study area is high with tertiary graduates accounting for 56.5%, though farming remains the dominant occupation with 47.7% of the total workforce; average income of majority of sprawl resident is found to be between N51,000-N70,000 accounting for 30.7%. The cosmopolitan structure of the sprawl areas show the presence of different ethnicity with Tiv being the majority with 48.4%, whereas the dominant household size group is 6-9persons accounting for 48.2%.

The implications of these socio-demographic characteristic findings show graduate transition of the areas from predominantly rural to urban settlement with high literacy, cosmopolitan and plurastic occupational structure which is evident of urbanisation processes and influences.

Impact of urban sprawl on cropping System in the Study Area

The study assessed the impact of urban sprawl on cropping system around the fringes of Makurdi Makurdi metropolis, Nigeria, the result of the field survey is presented in Table 3.2

Table 3.2 Changing type(s) of cropping system over time in the study area

	10 years Ago		Currently as at 2024		
Cropping Method	**Frequency**	**%**	**Frequency**	**%**	**% Change**
Mono Cropping Only	120	31.6	96	25.3	-6.3
Mixed Cropping Only	101	26.6	199	52.4	+25.8
Crop Rotation	159	41.8	85	22.4	-19.4
Total	**380**	**100**	**380**	**100**	

Source: Researcher's field work, 2024

The information in Table 3.2 shows that crop rotation (41.8%) was the dominant cropping system in the study area 10 years ago while at present, it account for only 22.4%. On the hand, mixed cropping system which was least practiced accounting for 26.6% in the study area 10years ago now, accounts for 52.4%. This implies that urban sprawl has reduced agricultural land thereby making the people to plant many crops on the same piece of land for maximum output. This clearly shows shift from mono-cropping to mixed-cropping system implying economics of space. This finding is in line with Coulibaly and Li, (2020) who reported in their study conducted in Sebougou, Mali that, urban sprawl has influencing impacts on the livelihood of farmers as a result of the large loss of agricultural land, reduction in agricultural output, and a decrease in farmer's income. Furthermore, the finding is in corroboration with Diallo and Zhengyu (2010) Aduah and Baffoe (2013) Youssef (2019) and Nuhu (2020) who found that the impacting effects of urban sprawl negates not only the farming system of nations but diverse agro-allied sectors within the ecosystem.

Types of crops in the study area

The study examined the current types of crops planted in the study area as shown in figure 3.1 indicating that yam (31%), rice (23%) and cassava (17%) were the dominant crops under cultivation in the study area.

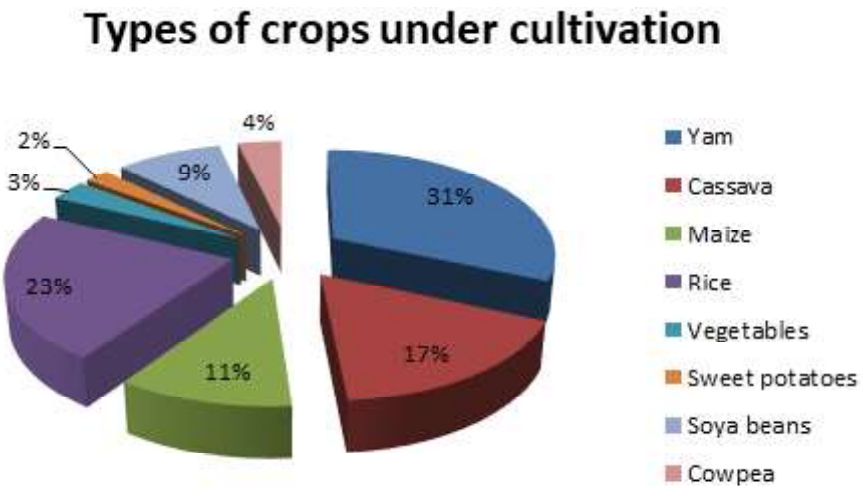

Figure3.1: Types of crops under cultivation in the study area

Effect of urban sprawl on farm labour in the study area

The study also sought to determine the effects of urban sprawl on farm labour and the result of the field survey is shown in Tables 3.3.

Table 3.3: Changing source of farm labour (10 years ago and now 2024) in the study area

Source of Farm Labour	Frequency				
	10 years Ago	%	Now as at 2024	%	% Change
Hired labour	96	25.3	146	38.4	+13.1
Family labour	245	64.4	186	49.0	+13.3
Communal labour	39	10.3	48	12.6	+2.3
Total	**380**	**100**	**380**	**100**	

Source: Researcher's Field Work, 2024

The information on Table 3.3 shows that family labour 10years ago accounted for 64.4% and was the dominant source of labour whereas at present, it has reduced to only 49%. This implies a shift away from agricultural practices by many families which now depends on hired labour which currently accounts for 38.4% as against 25.3% 10years ago.

Impact of urban sprawl on farm sizes in the study area

The impact of urban sprawl on farm sizes in the study area was examined. The result of the field survey is presented in Table 3.4.

Table 3.4: Change of size of farmland 10 years ago and current size of farmland

	Size of Farmland 10 years Ago		Current Size of Farmland as at 2024		
Size of Farmland	**Frequency**	**%**	**Frequency**	**%**	**% Change**
Less than 1 hectare	143	37.6	183	48.1	-10.5
1 – 2 hectares	92	24.2	102	26.8	-4.6
3 – 4 hectares	80	21.0	50	13.1	7.9
5 hectares and above	65	17.1	45	11.8	-5.3
Total	**380**	**100**	**380**	**100**	

Source: Researcher's Field Work, 2024

The information in Table 3.4 shows a noticeable increase in smaller farmland sizes from 37.6% 10 years ago to 48.1% at 2024 while large farm size of 5 hectares and above accounts for 17.1% 10years ago now accounts for only 11.8%. This shows that urban encroachment on agricultural land in the study area is drastically reducing farm sizes as most of the indigenous inhabitants have sold out their formerly farming lands which are now converted to housing units among other land uses. This finding of the study as regards to reduction in farm sizes is consistent with findings from studies in other regions experiencing urban sprawl. Urban expansion often results in the fragmentation of farmland, particularly smaller plots, as agricultural land is converted for urban development (Seto et al., 2011). The reduction in small farm sizes can be attributed to the pressure of land conversion for non-agricultural uses, a phenomenon observed in various studies (Lambin & Meyfroidt, 2011). Furthermore, Jimoh, Mustapha, Bejide and Ojeifo (2020) also reported from their study findings that urban sprawl causes decrease or decline in agricultural farmlands. These shifts highlight the need for policies to manage urban growth while protecting agricultural land around cities.

Test of Hypothesis/Assumption

The hypothesis of the study was tested to know whether urban sprawl has no significant impact on agricultural development in the study area. Chi-square test was used to test the hypothesis at 0.05 level of significance in table 3.5. HO**:** Urban sprawl has no significant impact on agricultural development in the study area.

Table 3.5 Chi-square Analysis of Impact of Urban Sprawl on Agricultural Development in Makurdi Local Government Area of Benue State Nigeria

Responses	**Observed Frequency**	**Expected Frequency**	***P*-Value**	**Df**	**x^2 Cal.**	**Decision**
Impact	223	96.0				
No Impact	161	96.0	0.000	3	43.720^a	Ho Rejected

Source: Researcher's Field Work 2024

Table 3.5 showed Chi-square calculated value 43.720^a at 3 degree of freedom; P=0.000 is less than 0.05. With this result, the null hypothesis, which states that 'urban sprawl has no significant impact on agricultural development around the fringes of Makurdi metropolis, Nigeria' was rejected. This can be interpreted to mean that urban sprawl (the independent variable) has significant impact on agricultural development (the dependent variable) in study area. This is to say that urban sprawl has affected the agricultural systems of nations, especially by changing farming and cropping systems; reduced farmlands as well as

fostered a negative influence on the traditional farming techniques, particularly among the developing nations of the world. Aregheore (2005) and Bill Gates Foundation (2011) confirmed this finding by stating that the rate of global food production has not kept pace with nations population growth occasioned by increasing urban sprawling, which by implication, affects the agricultural land and development of countries. The finding also aligned with Shabu et al. (2011) who stated that in recent time, a gradual reduction of agricultural produce has been observed from the reduction in supply chain to some processing plants especially in Benue state because of urban sprawl.

Conclusion and Recommendations

This study highlights the significant impact of urban sprawl on agricultural development in the fringes of Makurdi metropolis, Nigeria. The findings reveal that urban sprawl has led to noticeable changes in cropping systems, farm labour and reduction in farm sizes, particularly smaller plots, which are increasingly converted for urban development. This reduction in farm size is associated with decreased agricultural productivity and income, posing a threat to food security and the socio-economic well-being of the local population. The study underscores the need for effective urban planning and land-use policies to balance urban expansion with the preservation of agricultural land, ensuring sustainable development and food security in the region. The research recommends the following:

i. Implementation of land-use policies: The government should formulate and enforce land-use policies that prioritize agricultural land preservation while accommodating necessary urban expansion. Such policies should include zoning regulations that restrict urban development on fertile agricultural lands.
ii. Promotion of sustainable urban planning: Urban planners should integrate agricultural considerations into urban development plans to minimize the adverse effects of sprawl on farm sizes. This could include the creation of green belts and the promotion of peri-urban agriculture.
iii. Support for farmers: Farmers affected by urban sprawl should be supported through compensation, provision of alternative livelihood sources or incentives to adopt more intensive farming practices on smaller plots. This support could help mitigate the loss of farmland and ensure continued agricultural productivity.

References

Babalola, T. S., Oso, T., Fasina A. S., and Godonu, K. (2011). Land evaluation studies of two wetland soils in Nigeria. *International Research Journal of Agricultural Science and Soil Science.* Vol. 1(6) pp. 193-204 August 2011. Accessed 7/6/23 at http://www.interesjournals.org/IRJAS

Bakoji, Y. M., Elijah, E., Philip, A. H., Isa, M. S. and Umar Jauro Abba, U. J. (2020). Urbanization and its impact on agricultural lands in growing cities in developing countries: a case study of Makurdi, Benue state Nigeria. *International Journal of Economy, Energy and Environment* 2020; 5(4): 41-46. https://www.sciencepublishing group.com/j/ijeee

Bren d Amoura, C., Reitsma, F., Baiocchi, G., Barthel, S., Guneralp, B., Erb, K. H., Seto, K. C. (2016). *Future urban land expansion and implications for global croplands*. Proceedings of the National Academy of Sciences, 114(34), 201606036. Accessed on 5/6/23 at https://doi.org/10.1073/pnas.1606036114

Chunwate, B. T., Yahaya, S., Amankwe, C. O., Samuel, A. and Madaki, B. R. (2019). Assessment of urban sprawl using geospatial techniques in Awka town, Anambra state, Nigeria. *Journal of Geographic Information System*, 2019, 11, 359-370 http://www.scirp.org/journal/jGIS

Coulibaly, B. and Li, S. (2020). Impact of agricultural land loss on rural livelihoods in peri-urban areas: empirical evidence from Sebougou, Mali. *Land Use Journal 2020, 9, 470; doi:10.3390/land9120470* www.mdpi.com/journal/land

Dam, D. P., Hundu, T. W., Kwanga, G. M., & Anule, P. T. (2021). Spatio-temporal analysis of urban expansion and land use, land cover change in Katsina-Ala Town, Benue State-Nigeria.

International Journal of Arts Humanities and Social Sciences Studies (IJAHSSS), 6 (7), 93-102.

Dam, D. P., Iorliam, S., Kwaghsende, F., Anule, P. T., Mngutyo. I., Atser. J., Adaaku, E., Alaci, D., Ujoh, F., & Gyuse, T. (2020). Emerging urban systems in the Benue Basin of Nigeria. *American Journal of Rural Development (AJRD), 8 (1), 17-27.* Doi:10.12691/ajrd-8-1-3

Iorliam T.S., Kwaghsende, F., Mngutyo, I., Anule, T.P., Adaaku, E., Dam, D.P., Ujoh, F., Alaci, D.S., & Gyuse, T.T. (2019). Governance and quality of infrastructure/services in the peri-urban settlements of the Benue Basin, Nigeria *IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT), 13 (3), 42-53.* Doi:10.9790/2402-1303024253.

Iorliam, T.S; & Dam, D.P. (2017). Spatio-temporal analysis of landuse and landcover change of Makurdi *Journal of Environmental Design (JED), 12 (2), 31-41*

Iortyom, E.T., Semaka, J.T. and Abawua, J.I. (2020). Spatial expansion of urban activities and agricultural lands encroachment in Makurdi metropolis. *European Journal of Environment and Earth Science.* 1. www.ej-geo.org.

Jimoh, B.A., Mustapha. D., Bejide, O.I. and Ojeifo, D.O. (2020*). Effects of urban encroachment on rural agricultural land: a case study of Ibie-Nafe community of Edo State, Nigeria.* https://doi.org/10.20448/*journal*.506.2020.71.35.40

Shabu, T., Fate, S. and Ukula, M.K. (2021). Impact of urbanization on agricultural land in Makurdi local government area of Benue state, Nigeria. *NASS Journal of Agricultural Sciences.* Vol. 03. Issue 01, January 2021. http://ojs.nassg.org/index.php/NJAS

Youssef, A.F. (2019). *The challenges of urban sprawl and its impacts on the fragmented agricultural lands: A case study of Tersa, Giza*. Master's Thesis, the American University in Cairo. AUC Knowledge Fountain. Accessed 5/6/2023 at https://fount.aucegypt. edu/etds/750