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ANALYSIS OF AGRICULTURAL LAND USE DEPLETION IN KEFFI URBAN AREA, NASARARA STATE

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ABSRACT

This paper identified the agricultural land use depletion in keffi urban area, ArcGIS software was used in time series mapping of agricultural land use changes in keffi urban area between 1990 to 2020 to detect the gradual changes in agricultural land uses that has taken place between these period in order to identifies the prospects and challenges of agricultural land use depletion. In late 19th century up to later 2000 keffi was a small urban area surrounded with vast agricultural land but these land are being taken yearly by urbanization there by putting at risk the food production as well as the benefit of green areas within the urban area. The methodology of this research entails the acquisition of satellite imageries of keffi urban area for 1990, 2000, 2010 and 2020 respectively from the google earth software; the imageries were imported to ArcGIS environment and geo-referenced, digitized and overlaid individually and collectively over one another in order to detect gradual depletion or changes on agricultural land uses. The result of the study shows that in 1990 the agricultural land use was 12.22 km^2 after the period of ten years in 2000 the agricultural land uses reduced to 10.8 km^2 also in year 2010 agricultural land use declined to 8.07 km^2 however in the year 2020 agricultural land uses was 7,30 km^2 . The result of the work show that rapid increase in agricultural land use depletion was between 2000 and 2010, it is also observed that the rapid increase in build-up area was between 2000 to 2010 which resulted to the rapid agricultural land used depletion between these years. At the end of this research recommendation such as preparation of master plan to include agricultural land uses in the plan were made alongside others in order to achieve an agriculturally sustainable urban area.

Keywords: agricultural land use, land use depletion, satellite imagery, urban area.

1.0 Introduction

Agricultural land use is one of the several existing land uses among residential, commercial, public, semi-public and open space among others, it allow us to harness the productivity of our domesticated and wild life animals, crops and forest which provide oxygen which clear our air (james A. Harris et al 2007). Urban agriculture plays a significant function in improving and enhancing city food protection by providing direct access to home-produced food to household and to the informal market. Since urban center always depend on rural production for food supply and distribution and the supply continued to increasing and do not reach the demand, particularly of the low income of the population. The agriculture land also provides readily available fresh and safe food especially fruit and vegetable to the urban population as well as easy access to consumer market. Urban agriculture also contributes in improving local as well as regional economy, poverty alleviation and also means of source of livelihood especially to urban poor. Acevedo (A. Kelsey K.J (2009). However cultivated urban agricultural land are use as green areas which contribute toward greening the city (open space and green areas such as vegetation) for aesthetic outlook of urban area. Urban agricultural land aid in protecting wetland and watershed areas and reduces the risk to flooding and also contribute to urban waste management and pollution control through the use of manure and absorption of access carbon dioxide emitted by industries as well vehicle which reduces the effect of global warming.

However, K. & Gibson, C.C.(2006). Ever increasing population which results to urbanization has been seen as an important mechanism for improving economic growth and reducing regional variation and wealth disparities in developing countries. Despite that, different studies have brought about a wider range of harmful effects concerning to the

man's environment system especially in sprawled urban centers. A conflict exists between urban sprawl and farmland management frequently, because urban sprawl is unavoidably at the expenses of clearing surrounding fertile farm lands, which were once important to the urban agricultural market.

1.2 Statement of research problem

Agricultural land use within keffi urban area is being taken up yearly by developers for different purpose which includes residential, commercial, public among others. In late 19th centuries up to latter 2000, keffi was a small urban center surrounded with vast agricultural land uses. Continues conversion of agricultural land use to build-up area in keffi shows the emergence of agriculturally un-sustainable city, therefore there is need to control and check the conversion.

2.0 Conceptual Framework and Literature Review

2.1 Some of the important of urban agriculture:

2.2 Food security and nutrition: Mainly the cities in developing world are not capable to produce sufficient (official or informal) revenue opportunity for the fast increasing population the World Bank (2000) estimates that about 50% of the poor live in urban area (25% in 1988). In urban settings, lack of income interprets further directly into lack of food. The cost of supplying and distributing food from country area to the urban area or to bring in food for the cities are increasing continuously, and it is anticipated that the urban food uncertainty will augment (Sawio, 1998). Urban agriculture can advance together food ingestion (enhanced access to an economical supply of proteins) and the eminence of the food may advance (poor urban families concerned in farming consume additional fresh vegetable than other families in the same may income group). The contribution of urban agriculture to food security and healthy nutrition is probably its most important asset.

2.3 Economic impacts Growing your possess food keeps family spending on food; unfortunate community in poor countries usually spend a considerable part of their revenue (50-70%) of food (work bank, 2000). Increasing the comparatively luxurious vegetables consequently save capital as well as on bartering of manufacture. Advertising manufacture (fresh or processed) transports in cash.

-in **Addis Ababa,** above-normal profits are earned the smallest-scale backyard producers with very low capital (Staal 1997).

-in **Nairobi** in the untimely 1990s, agriculture supplied the maximum self-employment earnings amongst small-scale ventures and the third uppermost earning in all of urban Kenya (House et al. 1997).

2.4 Social impacts: Urban agriculture might function as a significant approach for poverty alleviation and communal integration. It can serve as a means for job opportunities for the urban farmers and the urban poor. Numerous instances exist of municipalities or NGOs like RUAF (Research center for urban agriculture land food insecurity problems) that contain commenced urban agriculture schemes that engage underprivileged groupings such as orphans, disabled people, women, recent immigrants without employments, or aged people, and the urban unfortunate through the aim to incorporate them more strongly into the urban system and to supply them with a polite livelihood. The members in the scheme may experience enriched by the opportunity of effective beneficially, structure their society, operational jointly and in addition urban producing. Food and additional products for consumption and for sale, as well as urban and peri uraban farms may take on an significant position in providing leisure opportunities for society (entertaining routes, food trade and meals on the farm, visiting services) or having educational purposes (bringing in contact with animals, education concerning ecology, etc)

2.5 The creation of open spaces/green zones: Urban agriculture may also absolutely impact ahead the greening and cleaning of the city by revolving open spaces into green zones and maintaining buffer and preserve zones free of housing. Degraded open places and unoccupied land are frequency used as casual waste dumpsites and are a source of offense and physical condition difficulties. When such zones are turned in to green spaces, not only a detrimental circumstance is vacant, but also the neighbors or vigorously take pleasure in the green area.

2.6 Reducing the effects of global warming and atmospheric pollution: Urban agriculture can assist and contribute in reducing the net relese of CO_2, one of the gases causing to global warming, from actions in cities. If more cities were to fabricate food within their limitations, bringing position of manufacture and markets closer to each other, the convey of crop can be decrease; this would supply to reducing

discharge CO_2 and other polluting gasses. Urban agriculture is also a means for reducing the net releases CO2, since plant and trees detain CO2.

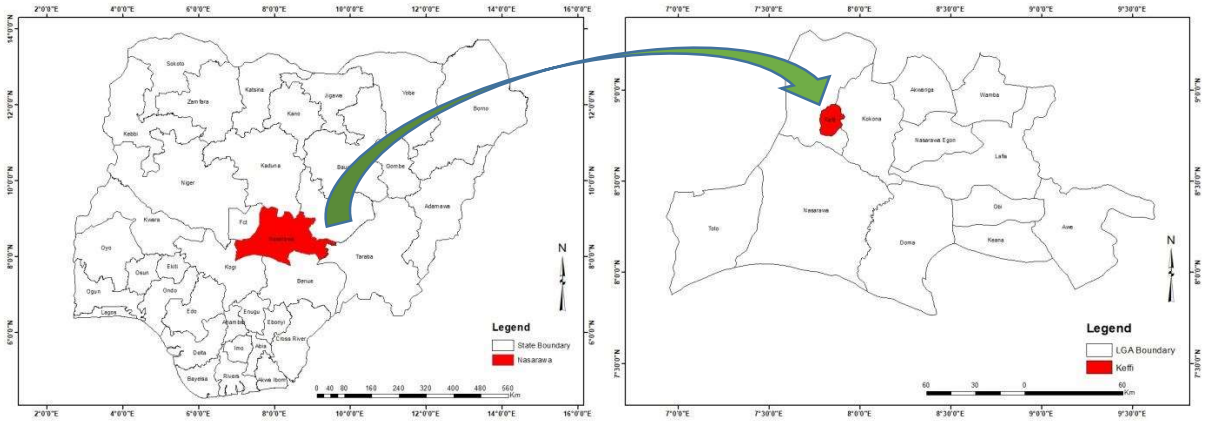
2.7 The productive reuse of urban waste urban agriculture is element of the urban environmental scheme and can play a significant function in the urban ecological management scheme. A growing city will create further and more waste water and natural wastes. For nearly all cities the removal of such difficulties by removing treated waste in to a prolific resource (Manure).

2.8 Methodology

For the purpose of this research work, landsat and google earth images of keffi were acquired for four epochs, 1990, 2000, 2010 and 2020. All landsat satellite imageries are obtained from the global land cover facilities (GLCF), on the four images conversion of agricultural land use is observed over different time series. The imageries are geometrically corrected using universal transverse mecator (UTM) coordinated system. ArcGIS 10.0 was used for Geo-referencing, Digitizing and overlay of the imageries.

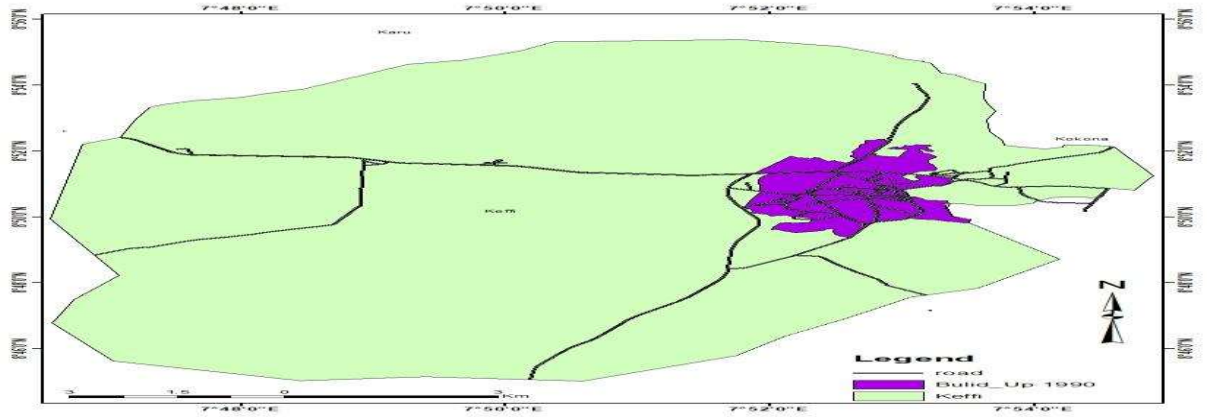
4.0 Result and discussion

Fig 4.0 Map of Nigeria showing Nasarawa State and Nasarawa Showing Keffi Urban Area



Source: Research 2022

Fig 4.1 Map of keffi Urban Area, 1990



Source: Global Land covers facilities/ GIS 2022

Table 4.0 Agricultural and other Land use Depletion in Keffi urban area, 1990

	1990	
LAND USE CATEGORY	**AREA**	**AREA**

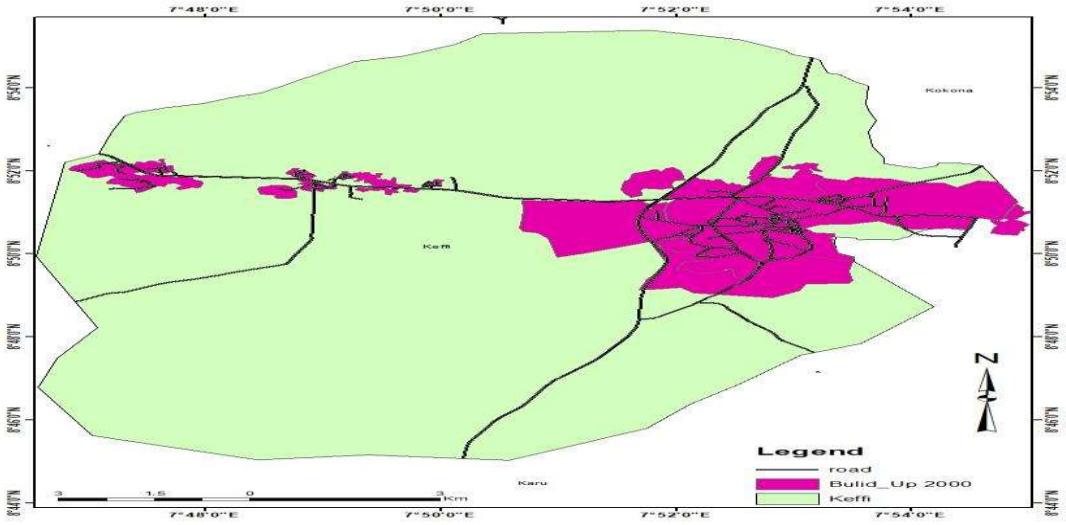
	(Sq km)	(%)
Bare land	**8.9586**	**15.3315**
Agricultural land	**12.2238**	**20.9195**
Built up	**6.3603**	**10.8849**
Light Vegetation	**15.1452**	**25.9191**
Dense Vegetation	**15.7446**	**26.9449**
Total	**58.4325**	**100.0000**

Source: GLCF 2022

4.1 Agricultural Land Use Change As at 1990

The fig 4.1 is the 1990 digitized map of development in Keffi overlaid on the agricultural land uses map. In 1990 agricultural land uses was calculated to be 12.2238 km which is equivalent to 20.919% of the total land use in Keffi urban area while build-up area takes 6.3603 km which is 10.8849% respectively, however at this period there was less development in keffi urban area and hence little depletion of agricultural land use was detected. Agricultural land uses during this period was depleted mostly by residential, commercial and less public and semi-public land uses. The above table shows the categories of different land uses and area covered.

Fig4.2 Map of Keffi Urban Area 2000



Source: GLCF/GIS 2022

Table 4.1 Agricultural and other Land use Depletion in Keffi urban area, 2000

	Year 2000	
Land use category	**Area**	**Area**
	(Sq km)	**(%)**

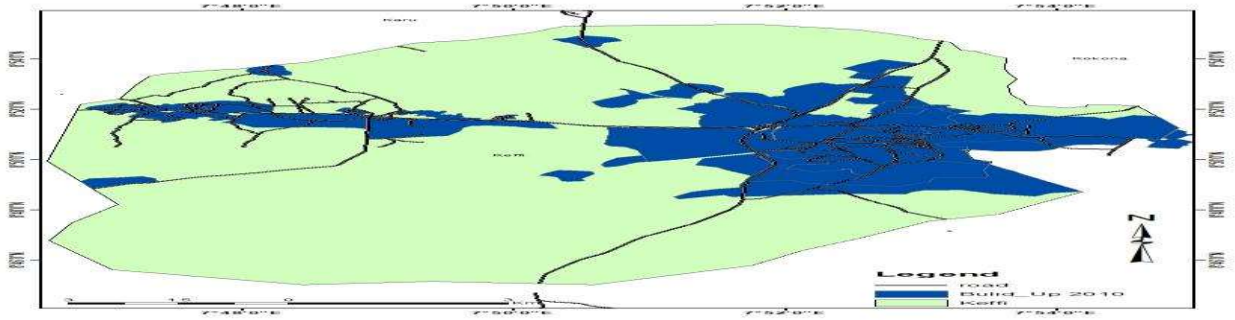
Bare land	**15.1695**	**25.9609**
Agricultural land	**10.8342**	**18.5414**
Built up	**7.9137**	**13.5433**
Light Vegetation	**14.8968**	**25.4940**
Dense Vegetation	**9.6183**	**16.4605**
Total	**58.4325**	**100.0000**

Source: GLCF 2022

4.2 Agricultural Land Use Change as at 2000

The fig 4.2 is the 2000 digitized map of development in keffi overlaid on the agricultural land uses map. In 2000 agricultural land uses was calculated to be 10.8342km which is equivalent to 18.5414% of the total land use in keffi urban area while build-up area takes 7.9137 km which is 13.5433% respectively, during this period there was less agricultural land use depletion in keffi urban area.

Fig 4.3: Map of Keffi Urban area, 2010



Source: GLCF/GIS 2022

Table 4.2 Agricultural and other Land use Depletion in Keffi urban area, 2010

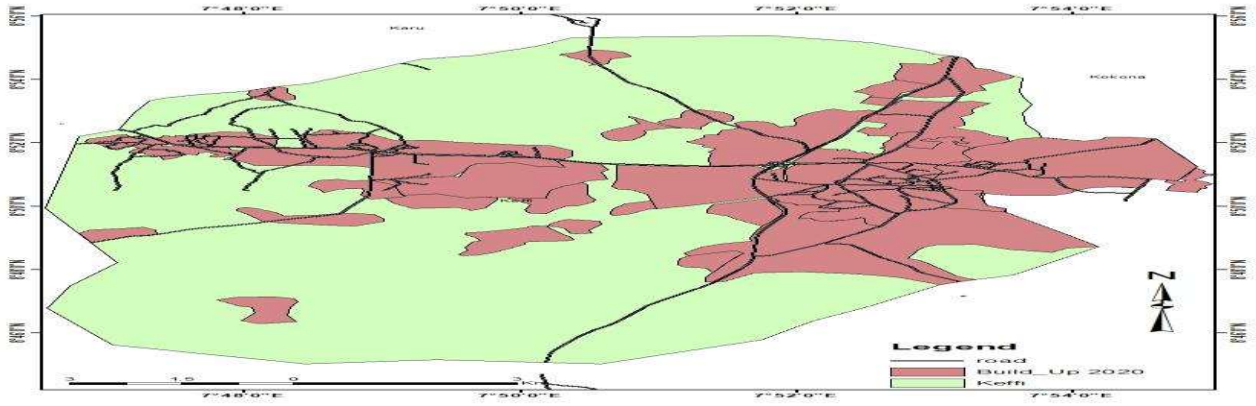
	Year 2010	
Land use category	**Area (Sq km)**	**Area (%)**
Bare land	**11.6613**	**19.9404**
Agricultural land	**8.0760**	**20.6495**
Built up	**10.0640**	**13.7891**
Light Vegetation	**15.6197**	**23.2891**
Dense Vegetation	**13.0599**	**22.3319**
Total	**58.4325**	**100.0000**

Source: GLCF 2022

4.3 Agricultural Land Use Change as at 2010

Fig 4.3 is the 2010 digitized map of keffi urban area showing the changes in agricultural land uses as the result of urban expansion, in 2010 the total agricultural land was declined to 8.0760km and 20.6495% while built-up area is 10.0640 and 13.7891% respectively, the total loss of agricultural land use depletion in 2010 was 2.7582km this shows the higher percentage of agricultural land use depletion in year 2010 as the result of increases in build-up area which include residential, commercial, public and semi-public among others

Fig 4.4 AGRICULTURAL LAND USE CHANGE AS AT 2020



Source: GLCF/GIS 2022

Table 4.3 Agricultural and other Land use Depletion in Keffi urban area, 2020

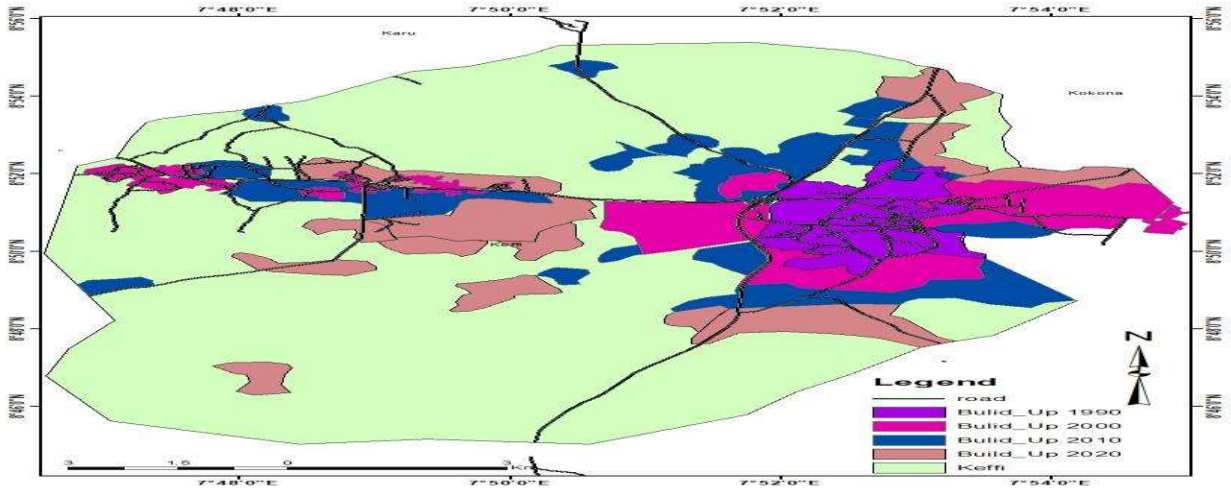
	Year 2020	
Land use category	**(Sq km)**	**Area (%)**
Bare land	**15.4989**	**26.5245**
Agricultural land	**3.3163**	**5.6754**
Built up	**10.5599**	**18.0720**
Light Vegetation	**16.8156**	**28.7778**
Dense Vegetation	**12.2418**	**20.9503**
Total	**58.4325**	**100.0000**

Source: GLCF 2022

4.3 AGRICULTURAL LAND USE CHANGE AS AT 2020

Fig 4.4 is the 2020 digitized map of keffi urban area showing the changes in agricultural land uses as the result of urban expansion, in 2020 the total agricultural land was declined to 3.3163 km and 5.6754% while built-up area was 10.5599 and 18.0720% respectively, this period experienced higher rate of agricultural land use depletion.

Fig 4.5 overlay 1990, 2000, 2010 and 2020 maps of Keffi urban expansion on agricultural land use



Source: GLCF/GIS 2022

SUMMARY OF FINDINGS

1. Keffi as an urban area has no master plan to guide the development of the area, were land use allocation is done traditionally.
2. Government both state and local government has less power to the land, especially with regard to allocation, 80% of the land in Keffi are allocated by private individual.
3. It is also been observed that the rate of agricultural land use depletion is moving at faster rate due to lack of agricultural land use policies that will guide the agricultural land use from depletion.
4. The period from 2000 to 2010 experienced the highest level of depletion which is 60% of the total depletion are due to the fact that several areas were developed within this period as a result of construction of houses to accommodate ever increasing population.
5. There is no policy to back up urban agricultural land use within Keffi urban area neither there is no efficient growth management in Keffi urban area.
6. There is strong relationship between expansion of build-up areas and agricultural land use depletion.

Conclusion and Recommendation

CONCLUSION

Due to lack of master plan, there is no single policy guiding agricultural land use in keffi urban area. The absence of supporting policies only means that agricultural land would continue to deplete until drastic measures are taken to prevent its depletion. It is critical that environmental managements start recognizing the important of city farming in the affluent combine of actions that characterized keffi urban area. As keffi urbanize consistently, greater local food self- reliance using nutrients aspect of sustainable development of keffi urban area together with inhabitants on power effectiveness, high supply efficiency and policies for containing urban expansion, urban agriculture has significant contribution toward influential future of keffi.

RECOMMENDATION

1. **Creation of favourable Urban Agricultural Policy for the reservation of agricultural land in keffi urban area**

The 2001 agricultural policy should be reviewed to involve urban agricultural; urban agriculture should be formally included in the mainstream of urban land use planning as a land use a distinct land use in keffi urban area through zooning regulation and by laws. It should include involving viable policies including and supported by stakeholders such as land managers, town planners, public, politicians and legal practitioners

2. **Issuance of agricultural land use certificate**
   Famers within keffi urban area should be issued land use certificate by the local government to legalize their use of land for agricultural purpose within keffi urban area. This will protect agricultural land from excessive depletion.
3. **Urban Sprawl Control via Compact and High rise Development**
   It is recommended that the availability land within the developed area of keffi urban area be further developed into smaller unit of compact dwellings. High rise buildings are also recommended to be developed in order to encourage vertical expansion and reduce horizontal widespread expansion so as to preserve agricultural land.
4. **Layout plan should be prepared for vacant plots**
   The keffi local government in collaboration with ministry of land and urban development should prepare layout plans for the vacant plots for construction and development purposes and make it available for the buyers and developers so as to limit way and manner in which agricultural land is depleted.
5. **The adaptation of urban growth boundaries strategy for growth management by the keffi local government authority to mitigate physical expansion and preserve agricultural land.**
   Growth management strategies according to Erik D.K (1993), to limit spatial growth and conserve agricultural land can be adapted. The Keffi local government authority can adapt the urban growth boundary strategy of growth management to limit the extend of physical expansion of the build-up areas so it doesn't encroach into agricultural lands and green areas. It

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requires that the local government authority would prepare local plans and implementation strategies that include growth boundaries of the built-up area over series or interval of yeas, boundaries for permanent agricultural zones that should not be encroached and monitoring strategies to ensure that the boundary line remain.

6. **Provision of master plan**

Preparation of Keffi master plan which will adequately provide room for zooning regulation that will control haphazard development. It is recommended that keffi local government should be prepare with master plan in collaboration with office of ministry land and urban development to involve the spatial dynamism including the area of urban agriculture within Keffi urban.

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