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URBAN SPRAWL AND CHANGES IN AGRICULTURAL AND FOREST AREAS IN THE EASTERN PERIPHERY OF YAOUNDÉ, CAMEROON

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Abstract:-
The Eastern periphery of Yaoundé is an agro-forestry area counted among the agricultural basins that supply the markets and inhabitants of the city of Yaoundé with food. This article focuses on the spread of the city of Yaoundé towards the eastern periphery and the changes over agricultural and forest areas, and has enables us to analyze the impact of urban growth on agricultural and forest areas. The methodology used consisted firstly of documentary research, then the acquisition of satellite images and the administration of a questionnaire to 50 households. The results show a trend in the evolution of the city of Yaoundé towards its Eastern periphery from 2001 to 2018 as well as changes in agricultural and forest areas as a result of the city's pressure. They also show that agricultural land is spreading, reinforcing the role of peri-urban agriculture in food supply to the town of Yaoundé. Finally, the results call upon public policies with the aim of the sustainable management of peri-urban areas.

Key word:-*Peri-urbanization, Peri-urban agriculture, forest areas, agricultural production, sustainability.*

Résumé:-
La périphérie EST de Yaoundé, est une zone agro-forestière comptée parmi les bassins agricoles qui ravitaillent les marchés et les populations de la ville de Yaoundé en denrées alimentaires. Cet article centré sur l'étalement de la ville de Yaoundé vers la périphérie Est et les mutations sur les espaces agricoles et forestiers nous a permis d'analyser l'impact de la poussée urbaine sur l'espace agricole et forestier. La méthodologie utilisée a d'abord consisté en la recherche documentaire, ensuite l'acquisition des images satellitaires et l'administration d'un questionnaire à 50 ménages. Les résultats montrent une tendance de l'évolution de la ville de Yaoundé vers sa périphérie Est de 2001 à 2018 ainsi que les mutations des espaces agricoles et forestiers à la suite de la pression de la ville. Ils montrent par ailleurs que les terres agricoles s'étendent, renforçant le rôle de l'agriculture périurbaine dans l'approvisionnement de la ville de Yaoundé en denrée alimentaire. Enfin, les résultats interpellent les politiques publiques dans la perspective d'une gestion durable des espaces périurbains.

Mots-clés:-
Périurbanisation, Agriculture périurbaine, espaces forestiers, productions agricoles, durabilité.

INTRODUCTION

A continent of contrast, Africa nowadays seems to be the theatre of extremes in terms of rurality and urbanization. While this continent is thought to be the most rural in the world, the pace of urbanization, particularly in some large cities, is counted among the most important in the world. This is the case with the town of Yaoundé, which "*now competes with the large African agglomerations south of the Sahara, whereas its economic and demographic growth dates back to just the 1950s*" (Tchékoté and Kaffo, 2012: 93). However, if the Western countries with the largest urban areas in the world manage to control their growth, and consequently the spread of their cities, Yaoundé, like many African cities, has a poorly controlled process due not only to its strong capacity to polarize a hinterland where agriculture seems to be in crisis, but also to the absence of urban policies based on a truly inclusive land use plan. There are insoluble problems of all kinds (economic, social, and political), particularly in the management of basic infrastructure (health, housing, transport) and the supply of basic necessities, in a context of continuous and unplanned sprawl of the city (Tchékoté and Ngouanet, 2015). It is understandable, as Schilter (1987) pointed out, that African societies have not been "*prepared*" for rapid urbanization and consequently for urban sprawl.

In this context of rapid urbanization and sprawl, one of the major problems facing large cities in Africa, and particularly Yaoundé, is that of food supply. Indeed, as Nassa (2010: 1) pointed out, "*the high concentration of the population in urban areas to the detriment of the countryside revives the worries of governments on the issue of the supply of food products to urban areas*". However, in the specific case of Yaoundé, in addition to remote agricultural basins, peripheral agricultural areas are presented as an alternative to supplying the city with food because, in the immediate hinterland of Yaoundé, cocoa production is practiced in association with the commercial food supply for peri-urban and urban markets (Tchékoté and Mbarga Atékoa, 2017). Among these food products many are of forest origin, particularly Non-Timber Forest Products (NTFPs), which are highly valued by the people of Yaoundé, the city being located within a large forest zone of southern Cameroon, with a strong forest-oriented tradition among others.

However, faced with the continuous spread of the city, these peripheral agricultural and forest production areas are shrinking in favor of the city. But if the problem of spreading cities over peripheral areas is not new (Bonnin-Oliveira, 2016; Tchékoté and Ngouanet, 2015; Mancebo, 2014; Charlot et al., 2009; Le Jeannic, 1997), that of Yaoundé seems very particular in view of its rapid and spatially important evolution. How are the agricultural and forest areas surrounding the city of Yaoundé evolving in response to urban growth? Better still, what is the future of peri-urban agriculture in a context of uncontrolled sprawl in the city of Yaoundé? This research question underlying this work suggests the hypothesis that the agricultural and forest basins peripheral to the city of Yaoundé are gradually being replaced by the city, thus reducing the capacity of these peripheral areas to supply the city with food.

1. Research methodology

1.1 Choice of study area and sample

Talking about the periphery of Yaoundé, the study focused on a large part of the Nkol-Afamba subdivision, in the Mefou and Afamba division (Figure 1).

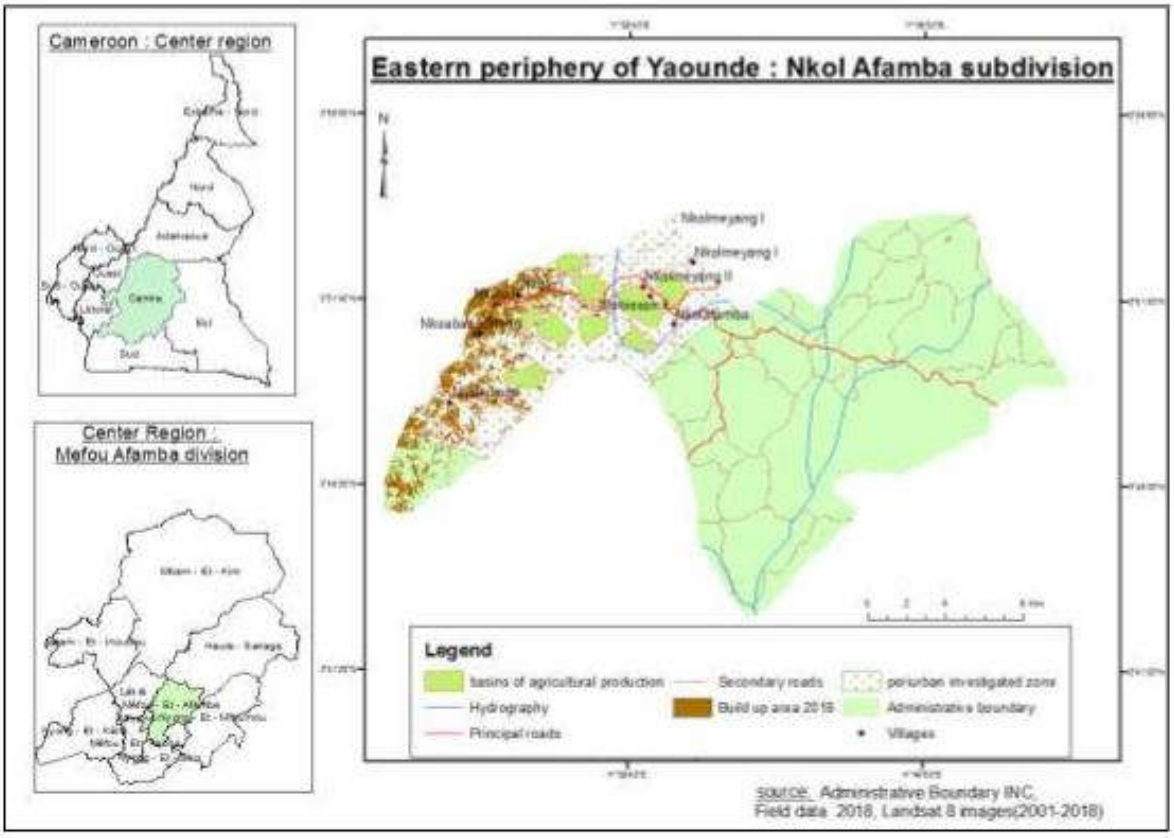

Figure 1: Location map of the study area.

The choice of the Nkolafamba subdivision as an observation unit is due, to its proximity and reliance on the city of Yaoundé on the one hand, and on the other hand, due to the city's great influence on the agricultural and forest areas of this locality where relics of forests are still found. This subdivision covers nearly 85% of the eastern periphery of Yaoundé. In terms of sampling, the random sampling method was used. It made it possible to select the villages, Nkoabang, Bitol, Nkolo, Nkolmeyang I, Nkolmeyang II, Nkolmeyang III, Nkolbisson II, Nkolafamba where the population density is highest, and the spreading speed more accentuated and recent. 50 households in these localities were surveyed, including resource persons amongst which the administrative and municipal authorities of the Nkolafamba council.

1.2 Data collection

For data collection, two types of data were essential: secondary data and primary data based successively on documentary research and the collection of survey data and field observations, namely: the producer survey questionnaire, interviews with resource persons and the acquisition and processing of satellite images.

1.3 Data processing

The data collected were processed using statistical software, namely SPSS (statistical program for social sciences) and Microsoft Excel. The Geographic Information Systems (GIS) software, namely Quantum gis, Arcgis and Envi, was used first to assess the evolution trend of the city of Yaoundé towards its Eastern periphery, secondly to highlight the different changes in agricultural and forest areas in the eastern periphery of Yaoundé between 2001 and 2018 and finally to propose a new method of spatial organization in Cameroon in general and in the Eastern periphery of Yaoundé in particular.

2. Results

2.1 Urban growth: trend in the evolution of the city of Yaoundé towards its periphery

Peri-urban territories are facing nowadays continuous spatial expansion of cities. When observing the city of Yaoundé, this phenomenon is very striking in the eastern periphery of Yaoundé where over the years; the city of Yaoundé has remarkably developed on its eastern hinterland. There is a continuous evolution of the city towards the surrounding countryside, with villages such as Biteng, Nkollo II and Nkoabang, which are now highly urbanized, whereas they were real villages 10 years ago (Plate 1).

Plate 1: The face of rurality in Nkoabang in 2007

Apart from these localities directly adjacent to the city of Yaoundé, the villages of Nkobisson II, Nkolmeyang I, II, III and NkolAfamba, about 25 km from Yaoundé in the rural hinterland, once considered as bastions of cocoa production at the gates of Yaoundé, are gradually becoming residential areas for city workers and areas of peri-urban food farming practices (plate 2 and 3).

Plate 2: Urban habitat at the forefront of agricultural and forest areas in the peri-urban area While habitat takes the place of agricultural areas, the latter in turn move towards the hinterland to the Detriment of forest areas.

Plate 3: Agricultural areas attacking forest areas.

Plate 3 shows that large areas of forest are being transformed into agricultural land, with a tendency to modernize practices.

In the analysis, two major periods have marked this recent evolution of the city of Yaoundé, particularly on its Eastern periphery. From 2001 to 2008, building has evolved towards the eastern hinterland over a considerable distance of nearly 3km. In terms of density, buildings occupied about 1% of the territory, compared to 14% in 2008 (Figure 3).

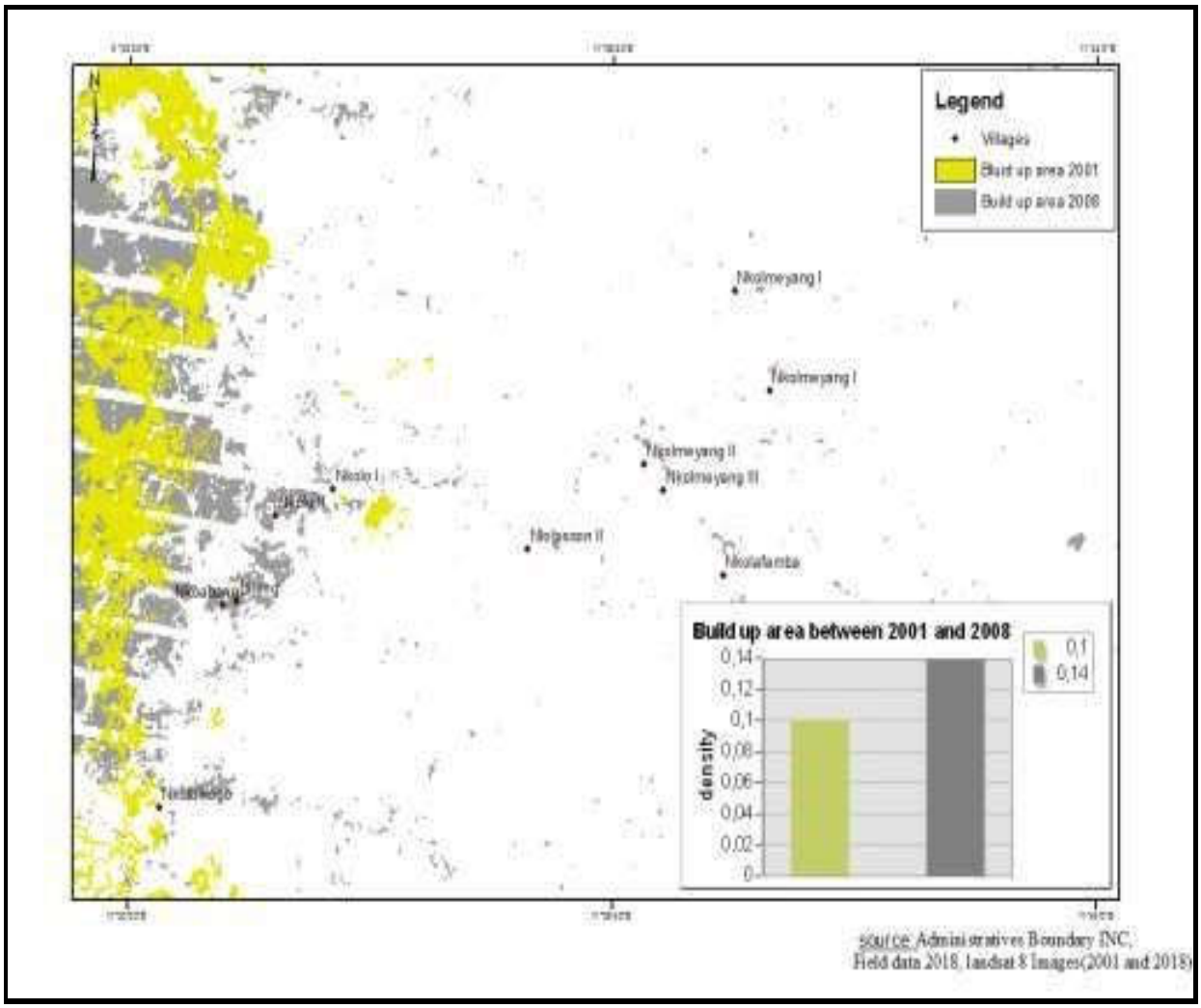

Figure 2: Evolution of the Eastern periphery of Yaoundé between 2001 and 2008

From 2008 to 2018, the trend towards urbanization in terms of buildings increased from 14% of the territory in 2008 to 19% of the territory in 2018. (Figure 4)

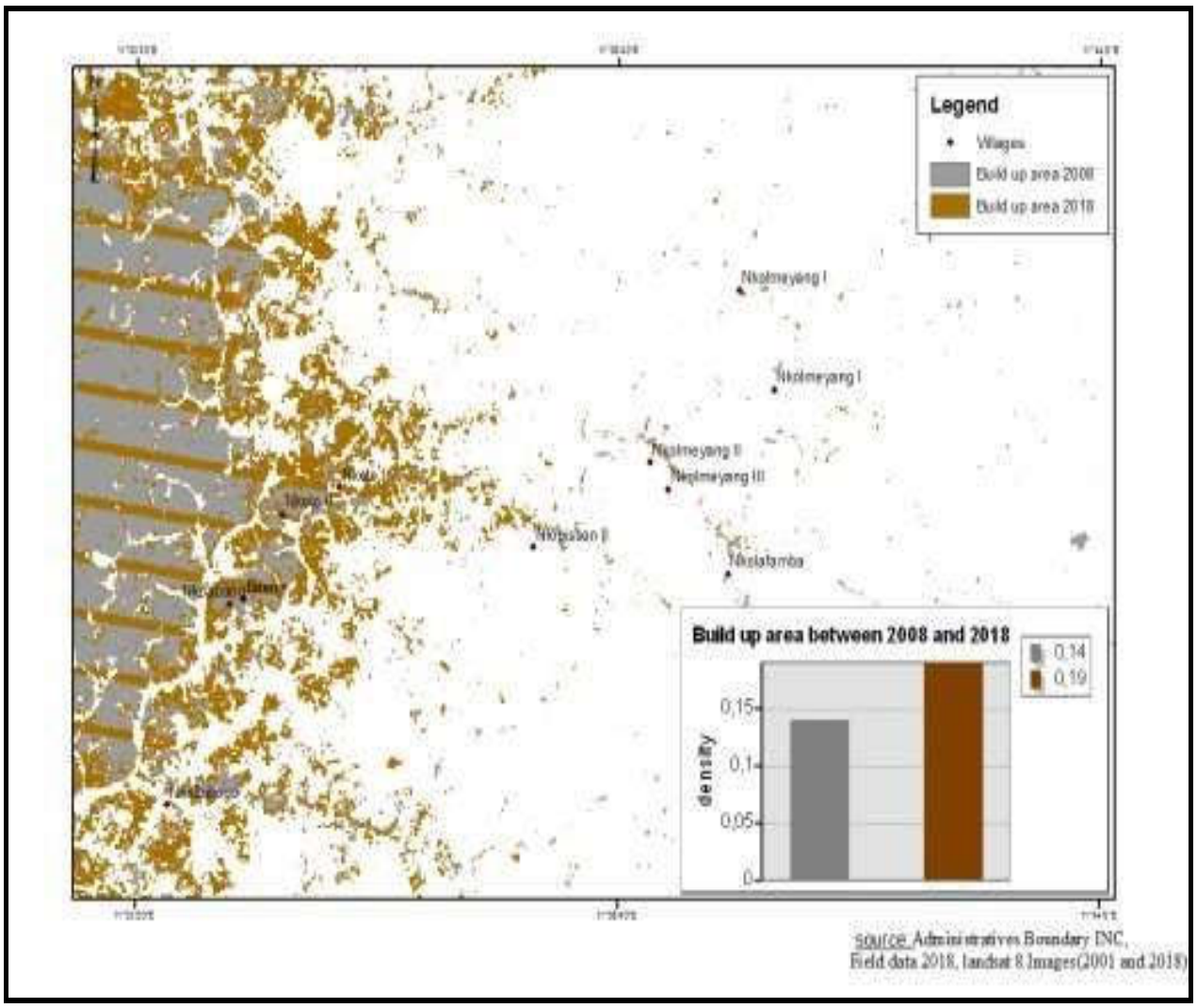

Figure 3: Evolution of the eastern periphery of Yaoundé between 2008 and 2018.

What is remarkable is that the villages of Nkoabang, Biteng, Nkolo and Nkolbisson II, which in 2008 were still rural, are now considered part of the urban space and are therefore urban villages (plate 4).

Plate 4: Nkoabang Crossroads in December 2018

Plate 4 shows a set of attributes of the city in these areas that were still rural just a decade ago. Petrol stations, taxi transport, supermarkets, are now part of the daily life of the populations of these localities. Moreover, it is important to note that on the basis of the spread of the city of Yaoundé on its periphery, the eastern part located in the department of Mefou and Afamba particularly the Nkolafamba subdivision which covers as noted above 85% of this part of the territory seems to be the most affected by urbanization, unlike the Soa, Okola, Mbankomo and Bikok subdivisions. Even if the capitals of the other neighboring boroughs seem to be invaded by the city today, the trend towards a shift towards the east of the city is more marked in terms of the spread of the city over the last two decades (Figure 4).

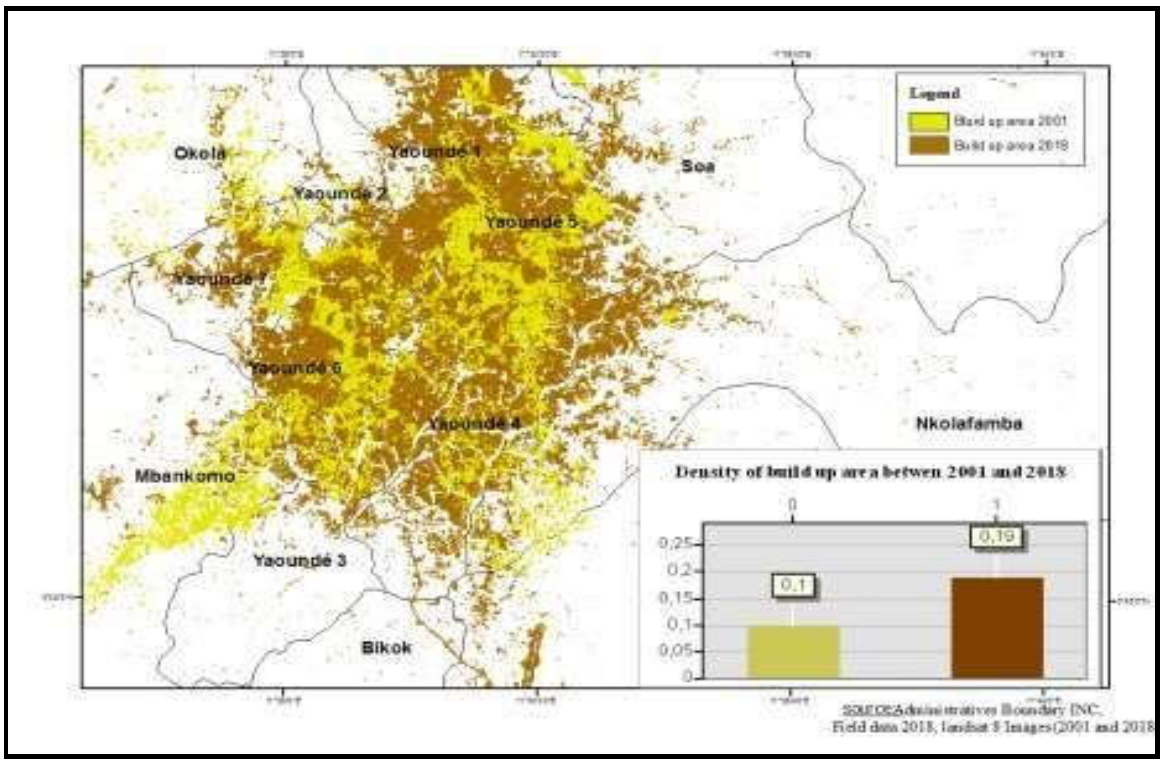

Figure 4: Map of urban space evolution from 2001 to 2018.

Figure 4 shows that the built up area has increased significantly in 17 years, from a density of 0.10 in 2001 to 0.19 in 2018 in the eastern periphery. More specifically, between 2001 and 2008 the density of buildings increased by 0.04 (4%) and between 2008 and 2018 it increased by 0.05 (5%). Overall, between 2001 and 2018, there was a change in density from 0.10 (10%) to 0.19 (19%) for an average of 0.04 (4%) per year. The building has therefore gradually invaded the peripheral rural area, probably under pressure from the ever-increasing population. A dynamism whose consequences are the transformation of agricultural and forest areas.

3.2 Changes in agricultural and forest areas in the eastern outskirts of Yaoundé

The Nkolafamba subdivision is an important agricultural and forestry basin at the gateway to Yaoundé. This basin has been decomposing and recomposing for nearly two decades as urban space advances in the rural hinterland.

3.2.1 The eastern periphery of Yaoundé: an agricultural and forestry basin at the gateway to Yaoundé

The Eastern periphery of Yaoundé is part of the agricultural basins in the hinterland close to the city. The morphology of the relief, made up of hills and swampy lowlands, makes this area a basin for the production of multiple commodities, from cash crops to market gardening and food crops. These production areas share the rural space with the forest areas, which are now severely degraded (Figure 5).

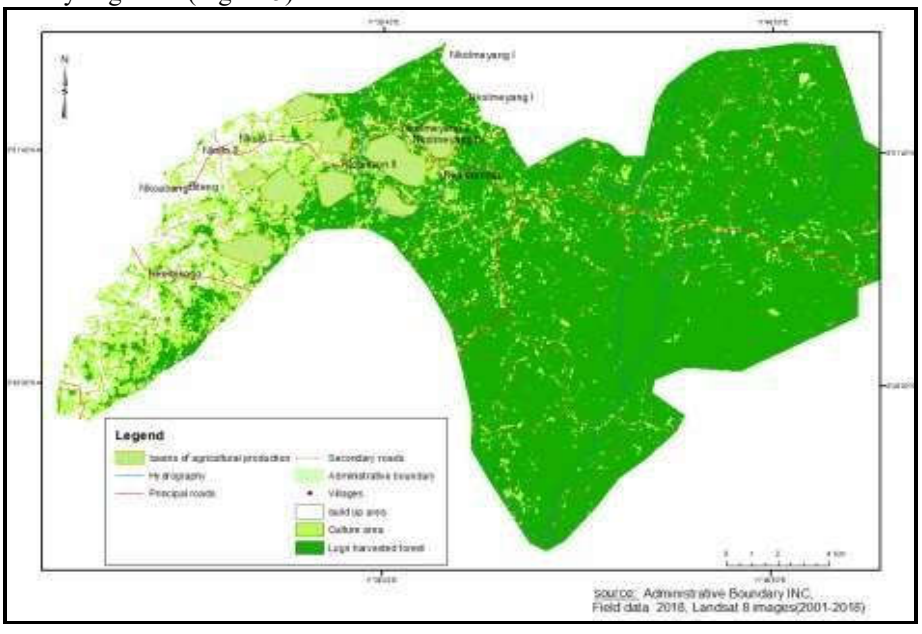

Figure 5: Representation of large agricultural production areas.

In this locality as in the whole periphery of Yaoundé, the plots are reserved for food crops, market gardening, oilseeds, roots and tubers, cash crops and fruit trees. These agricultural areas, which alternated with the forest and whose roles are no longer to be demonstrated, both as a source of food supply for the city and as an indispensable source of food, medicines, raw materials and monetary income for rural populations, particularly with regard to the forest, have undergone remarkable change in recent decades.

3.2.2 Relocation of vegetation cover and agricultural areas between 2001 and 2018

With the forwarding of urban habitat in the hinterland, vegetation cover and agricultural areas shifted between 2001 and 2018. Indeed, in 2001, the territory was still occupied by a significant part of the forest areas (Figure 6).

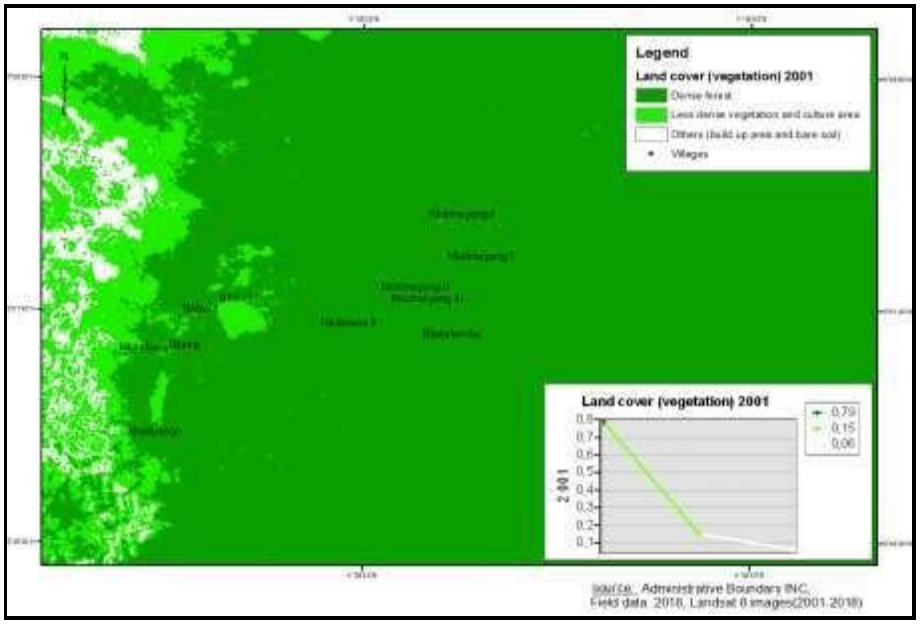

Figure 6: Plant cover and agricultural areas on the eastern outskirts of Yaoundé in 2001.

Figure 6 show that dense vegetation occupied most of the area with an index of 0.79 or 79% of the territory. The less dense vegetation had an index of 0.15 or 15% of the territory. It is important to note that, being a cocoa growing area, and following the fact that cocoa is grown in the region in association with trees or agroforestry, it is possible that the vegetation index, which represents 94% of the territory in 2001, is an association between dense, less dense vegetation and cocoa cultivation. A typical association of the rural landscapes of the localities of the Centre-South-East regions highlighted by rural producers.

In 2018, it can be noticed that these agricultural and forest areas have gradually moved towards the hinterland, with mainly a degraded landscape (Figure 7).

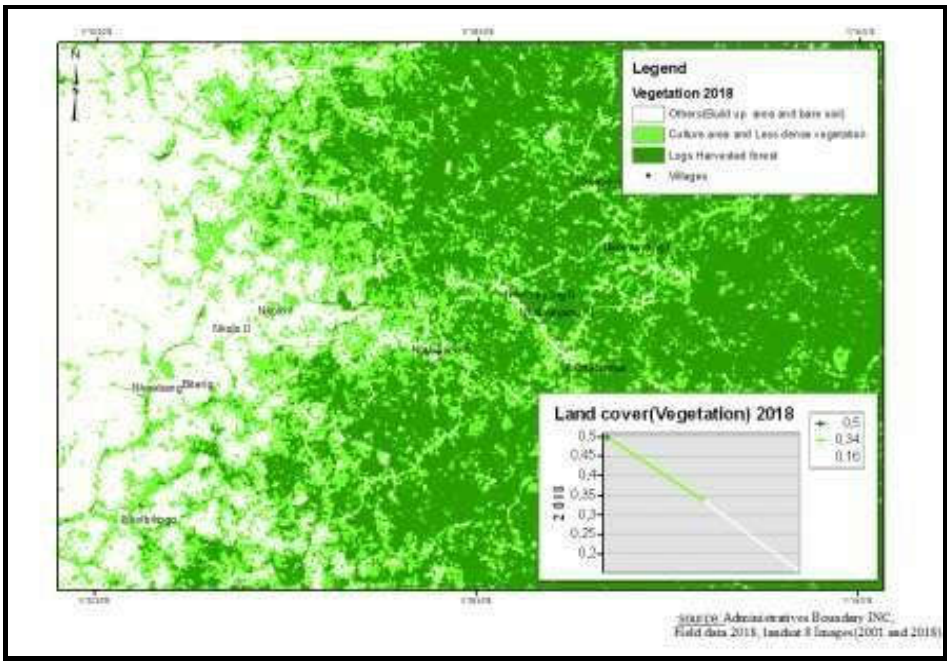

Figure 7: Vegetation cover and agricultural areas on the Eastern periphery of Yaoundé in 2018.

With regard to Figure 7, it can be seen in 2018 that the dense vegetation now only represents a density of 0.5, or 50% of the territory. At the same time, the less dense vegetation has increased from 15% to 34% of the territory. Overall, green spaces, which represented 94% in 2001, now represent only 84%, a decrease of 10 points. What is important to note is that within this dynamic, the cultivated areas have undergone a very strong mutation as they move towards the forest hinterland (Figures 8 and 9).

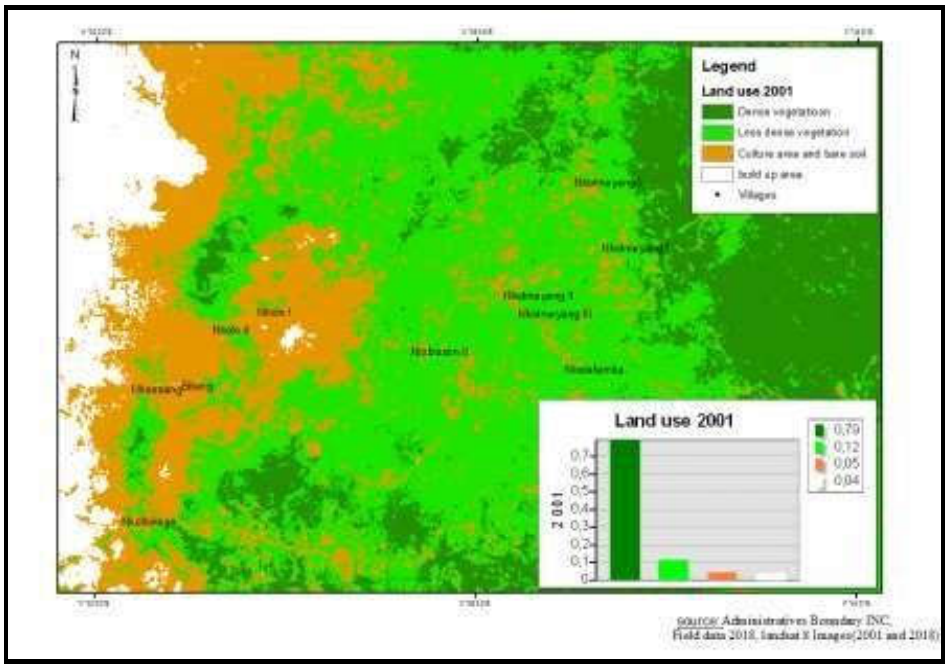

Figure 8: Land use in 2001.

Looking at the cultivated areas, Figure 9 shows an index of 0.05%, or about 5% of the territory, and probably cocoa farming area of close to 12% of the territory in 2001. These areas have evolved by nibbling in 2008 on heavily vegetated areas (Figure 9).

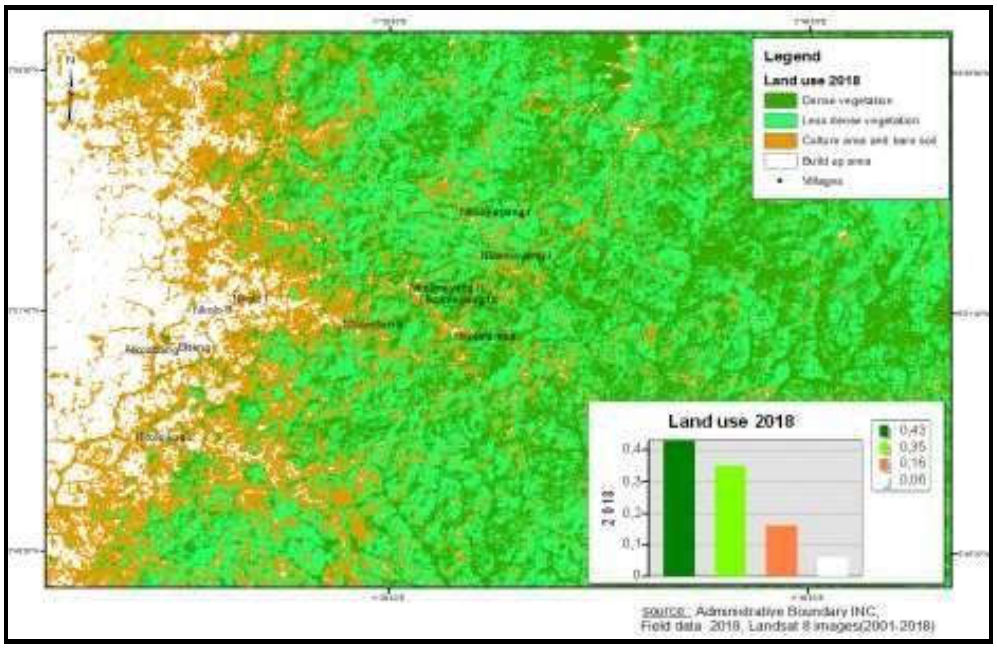

Figure 9: Land use in 2018

Figure 10 shows that in 2018, agricultural land and bare soil ranged from a density of 0.05 or 5% of the territory in 2001 to 0.16 or 16% of the territory in 2018. Also, two remarkable facts have emerged:

- Heavily vegetated areas are shrinking, from 79% in 2001 to 43% in 2018.
- Agricultural land, which increased from 5% of the territory in 2001 to 16% in 2018, has shifted towards the hinterland at the detriment of highly vegetated areas.

Moreover, while vegetation and agricultural areas are retreating towards the hinterland, peri-urban agriculture is developing more and more at the gates of a large metropolis.

4. Discussion

In Cameroon, the effect of urbanization on peripheral areas is not yet considered as a priority in the frame of sustainable development. From the case of the eastern periphery of Yaoundé, we notice the rapid and continuous extension of the city towards peripheral agricultural and forest areas, depending on land practices, mainly driven by local populations. The trend towards a shift in the spread of the city of Yaoundé towards its eastern periphery is therefore undoubtedly linked to a stronger dynamic of land supply chains in this locality (Tchékoté and Ngouanet, 2015).

Moreover, the more built up spaces and major development projects are put in place, the more peri-urban natural and agricultural spaces are not endangered. This is what Prost (1994) pointed out when he noted that where urban pressure is strongest, agriculture is left out because expansion begins with confrontation where the last urban conquest stops, around the last subdivision, at a peripheral crossroads, near the nearest village. Thus, any non-urbanized territory contiguous to the city is subject to potential annexation by the city, indifferent to the nature of this territory, interested only in its urban value. The peripheral space is then only a space awaiting occupation at the rhythm of the land needs expressed by the city. However, in the case of some countries such as France, sustainable urban development policy advocates the densification of housing by giving priority to the protection of agricultural and natural areas, with the objective of restricting the possibilities for the construction of agricultural buildings and housing for farmers (Nougarèdes, 2010). In this sense, economic development and protection of peri-urban natural spaces would be combined by questioning peri-urbanization and sustainability, with the necessary inversion of perspectives and the search for equilibrium between the two spaces (Serrano J., 2005; Mancebo, 2014).

Finally, one of the results shows the tendency of agricultural land to crumble can be qualified, because not only does this agricultural land move towards the hinterland on forest land, but it also expands and gains in area. It is understandable that as the density of the city increases, the demand for food, especially fresh food, increases. In addition, peri-urban agriculture seems to be an alternative to making fresh food products available to urban populations (Fleury and Donadieu, 1997; Peltier, 2010; Nassa, 2010; Duvernoy and Lorda, 2012; Tchékoté and Mbarga
Atekoa, 2017)

5. Conclusion

The city of Yaoundé is nowadays undoubtedly one of the most dynamic cities in terms of spreading out over its periphery. The work, focused on the eastern periphery, showed that this part of the territory is the most affected by urban sprawl, which has not only particularly affected agricultural and forest areas, but also shows an extension of agricultural areas towards the hinterland and forest areas. In view of the above, the hypothesis underlying this research, according to which the agricultural and forestry basins peripheral to the city of Yaoundé are gradually being replaced by the city, thereby reducing the capacity of these peripheral areas to supply the city with food, is partially met. While peripheral agricultural and forest areas are shrinking, the capacity of peripheral areas is gaining grounds with the expansion of agricultural land in the rural hinterland and a greater role for peri-urban agriculture in supplying the city with fresh food.

The influence of urban sprawl on peripheral lands, and the environmental problems that result from it, call upon public policies to take into account peripheral areas from the perspective of their sustainable management.

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