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Socio-Economic Mutation and Spatial Expansion of MFOU Sub-Division, Central Region

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Abstract: The issue of the spatial expansion of cities remains relevant in any society. Today, cities are expanding at an exponential rate towards their peripheries under the influence of a set of factors including urban growth. Third world cities, and particularly Cameroonian cities, are characterized by their strong spatial growth. This situation is mainly due to the strong population growth but also to the multiplication of human activities. It is in light of this observation that we have oriented our research on the socio-economic changes and spatial expansion of the Commune of Mfou. The objectives are to analyze the spatial growth of the study area, to identify socio-economic activities, consequences and analysis tools. To achieve this objective, we started from the general hypothesis that the spatial growth of the Commune of Mfou is linked to population growth, the development of construction, economic activities, etc. We have of course relied on documents to approach this study, but most of the work has been done in the field where direct observation, etc. have been effective tools for the completion of this research. Landsat images and shapefiles have also been used, etc. The results of our field surveys show that the study area experienced strong spatial growth between 1995 and 2023. In 1995, the forest occupied an area of 49,070.16 ha and the built-up area 987.74 ha. In 2010, the built-up area increased from 987.74 ha to 2,035.74 ha, the forest from 49,070.16 ha to 48,022.16 ha. In 2023, the built-up area occupied an area of 4,144.69 ha and the vegetation to 45,913.21 ha. This spatial growth without this increase in the built-up area is explained by the increase in the population in the Commune of Mfou. It should also be noted that a large number of elements have led to this spatial dynamic, including activities such as the development of housing and basic social services, the creation of markets, the development of trade, the administrative center, etc.

Keywords: *Landsat Images, Spatial Extension, The City.*

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I. CONTEXT OF THE STUDY

In cities in developing countries, urban growth, mainly linked to rural exodus and natural increase, is a reality. The convergence of populations towards urban centers is mainly linked to the opportunities offered by cities (employment, housing, security, education, health, etc.). This urbanization is accompanied by an increased development of socio-economic activities at the origin of the dynamics of land use. Nowadays, in several cities, vegetation has given way to buildings. This is how in cities in southern countries, we observe a profound spatial change and an unprecedented urban sprawl. But today, anthropogenic factors such as population growth, urbanization and the growth of economic activities (agriculture, livestock, fishing, trade) are increasingly taking an important place (Arlaud and al , 2013). In tropical countries such as Yaoundé, urban growth, which is closely linked to rural exodus and the natural growth rate, is accelerating at an exponential rate, leading to the spatial expansion of cities towards the periphery. The dynamics of land use is linked to a combination of physical factors (relief, soil type, hydrography and anthropogenic factors such as urbanization (Kamga, 2017). In Cameroon, the economic and spatial transformations of the territories located around large cities such as Yaoundé, Bafoussam and Douala have led city dwellers from the middle and poor social classes who, not having the possibility of obtaining a plot of land in the city, migrate to the outskirts where land is available at a lower cost. This makes the Commune of Mfou today the scene of games of interest with a diversity of actors who find in these spaces places conducive to the development of a certain number of land practices such as the development of economic activities, housing, cultivation. This satisfaction is at the origin of various changes in land use (Koagne 2022). Population growth, human pressure on land, agricultural systems and The nature of certain modes of exploitation is accompanied by a transformation of the environment.

The issue of land use dynamics is more evident in large cities than in small towns. The Mfou District Municipality is one of the areas where this study was probably conducted in order to confront the realities on the ground. Land use

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dynamics are a reality in Mfou in that it is faced with exponential population growth and accelerated urbanization leading to spatial expansion towards its peripheral areas causing several problems including land disputes, insecurity, degradation of vegetation cover. In addition, information on land use becomes essential; because it allows us to approach the reality on the ground and understand development issues.

II. MATERIALS AND METHODS

➢ *MFOU District Municipality*

Located in the Mefou -et- Afamba Division , the District Municipality of Mfou extends over an area of 50,057.77 hectares. The study area is made up of 92 neighborhoods including Awae II and III, Okong , Ekombitié , Abi Mo'ah , Abang , Koumou , Ekali I, Ekali II, Ekali III, Koumou II , Ndong , Nkongoa , Ngoantet , Vian, Lobe, Nkolngock , etc. (PCD, 2014).

Mfou District Municipality is home to a population of approximately 10,533 souls (BUCREP, 2005). Geographically, it is bordered to the northwest by the Yaoundé V and Bikok District Municipalities, to the southwest by the Bikok and Mbalmayo District Municipalities, to the northeast by the Yaoundé V, Nkolafamba and Dzeng District Municipalities and to the southeast by the Dzeng and Mbalmayo District Municipalities (Figure 1).

Mfou District Municipality located in the city of Yaoundé is influenced by the humid tropical transitional climate characterized by bimodal rainfall with four distinct seasons (Suchel , 1987):

- a long rainy season that runs from March to June;
- a short rainy season which lasts from September to October but is more intense;
- a long dry season from December to February;
- a short dry season that runs from July to August.

The average annual temperature is around 23.5°C and the average annual rainfall is around 1,565 mm (Suchel , 1987). This is a climate that is favorable to the development of socio-economic activities.

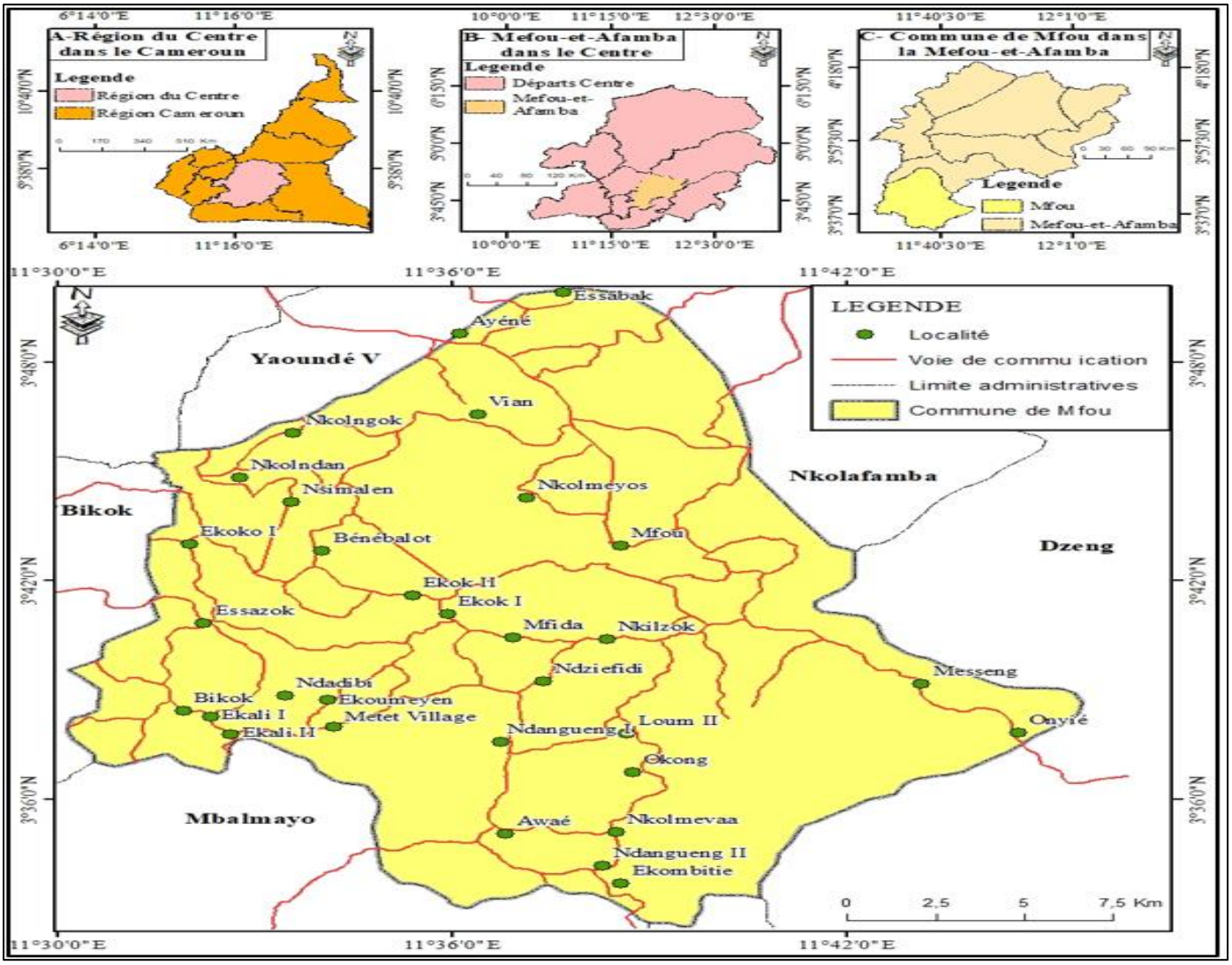

Fig 1 Location of the Study Area
Source: Shapefile INC, 2020

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Topographically, the Mfou District Municipality is hilly and has interfluves separated by marshy valleys (Figure 2). With an average altitude of 652 m, the lowest areas of the study area are located at an altitude of 377 m while the highest are at 927 m (the northern part of the study area). It is in the low altitude areas that socio-economic activities (housing, businesses, basic social services, administrative structures, etc.) have developed significantly to the detriment of vegetation.

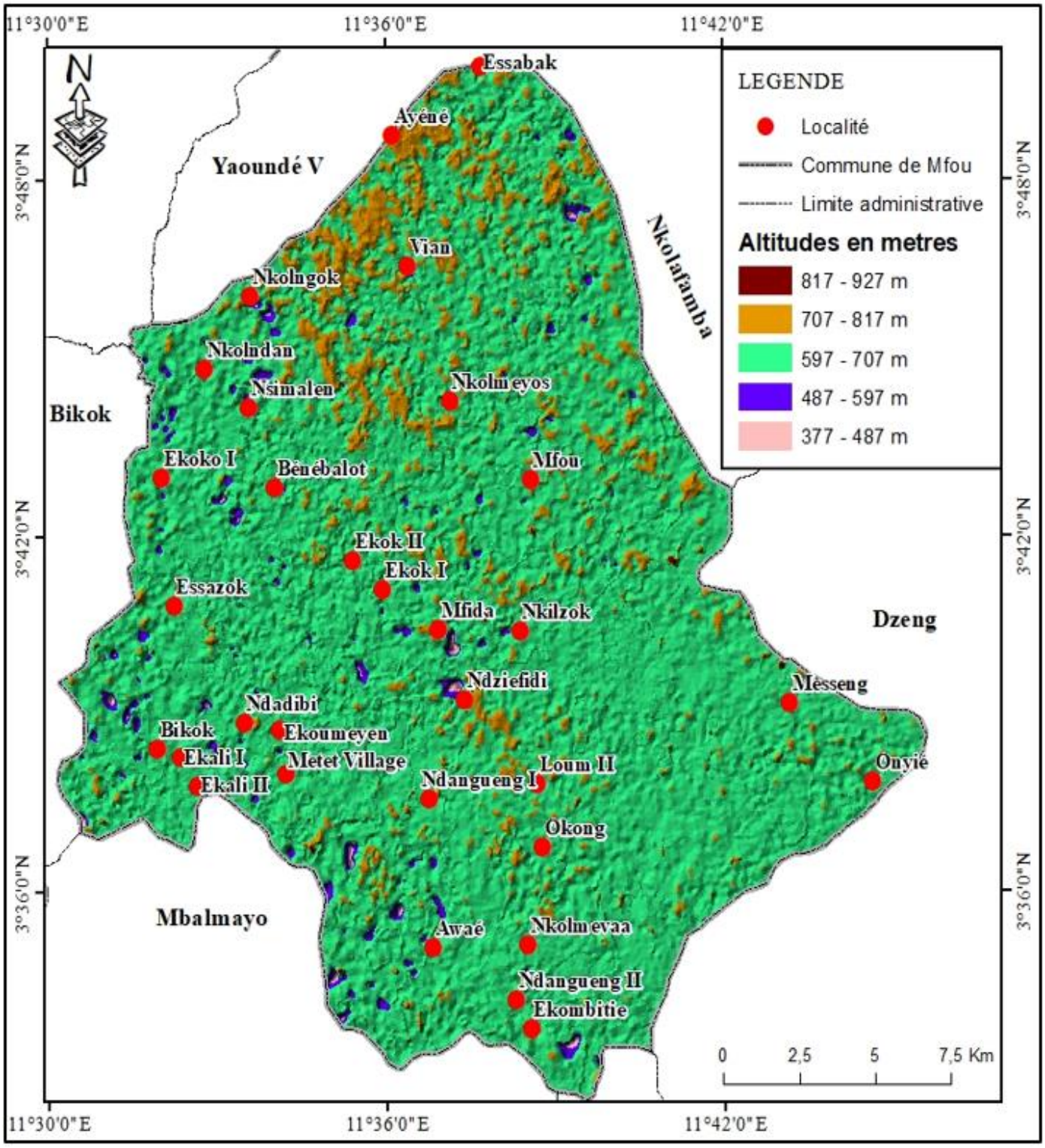

Fig 2 Altimetry of MFOU Municipality
Source : Digital Terrain Model, 2018 and Shapefile INC 2020

It should be noted that in areas with low slopes, where human populations are crowded, the cost of access to land is affordable. Generally speaking, the relief of the study area makes it possible to distinguish areas with steep slopes, areas with medium slopes and areas with low slopes.

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Mfou Municipality is watered by several rivers, the most important of which are: the Mefou , the nsoh , Meben , Olo'o , Etoa , Osomvele to name a few, where fishing is practiced (PCD, 2014). Observations made in the field have shown that the hydrographic network collects runoff water and ensures the sanitation of the study area. In general, waterways serve as natural outlets for all the waste generated by the inhabitants. The flow of wastewater follows the topography. In the lowlands, the populations have developed market gardening and food crops. During flood periods, homes and plantations located along the waterways are invaded by river water. The analysis of land use shows that the Mfou District Municipality is in the process of densification due to its proximity to the city of Yaoundé. Thanks to the creation of communication routes linking the city of Yaoundé and the study area, some city dwellers working in Yaoundé preferred to settle in Mfou and travel to their places of work. The dwellings are piled up from the center of the study area to the outskirts. Land use does not comply with urban planning standards, because the populations settle in an anarchic manner. In steep areas where the price per square meter is affordable, the populations inherited housing under the passive gaze of the local authorities. Field visits revealed that individual dwellings dominate, generally built on very large areas. A distinction is made between high, medium and low-end dwellings. High-end dwellings are those built by senior civil servants and businessmen working in the city of Yaoundé and residing in the study area. Low-end dwellings are owned by residents working in the informal sector for the most part (Drabo and al, 2003).

➢ *Data Collection*

The realization of this study combined data from secondary sources (documentary, cartographic and remote sensing data, namely image processing, etc.) and primary sources (field observation, interviews and field surveys). The documentary research focused on work on socio-economic changes and the effects on vegetation cover in cities in third world countries in particular.

The cartographic data that we used in our work are of several types, namely shapefiles , base maps of the study area and GPS data.

In order to determine the spatial expansion of the study area , images from the Landsat sensorSatellite images from three different periods were used that we obtained are those from downloads on the Earth Explora website. They concern three periods namely Landsat ETM+ (1990), Landsat TM (2001) Landsat OLI from 2023.

Landsat sensor satellite image is known for its many applications in land use analysis and diachronic study. The images of the collection of data from primary sources, based on field observations, made it possible to identify not only socio-economic activities such as housing, basic social services, agriculture, trade, transport, etc. but also the consequences on the vegetation cover. During this phase, we took photographs to illustrate the highlights that cannot be faithfully reproduced in writing. During this phase, we used a Global PositioningSystem (GPS) for the localization of social economic activities . Interviews with local authorities (Regional and Local Authorities and decentralized services of the State), resource persons and focus groups with local populations made it possible to assess their perception of the degradation of the vegetation cover in recent decades. These data were supplemented by a survey of 207 households representing 5% of the total number of households (21,550) in the District Municipality of Mfou.

The map data were processed using ArcGIS 10.4 and Adobe Illustrator CS software to generate maps for the analyses. The software was used for statistical data processing using SPSS 18 and Excel 2010 software to obtain tables and charts for the analyses.

III. RESULTS

Mfou District , socio-economic changes linked to individual, private and state actions are increasingly intense and contribute to the expansion. They concern school and health infrastructures, public lighting, water points, housing, etc.

➢ *Social Changes in the Study Area*

Social changes in the Mfou District Municipality concern the development of housing, basic social services, etc.

- *Development of Basic Social Services*

In the study area, schools, health facilities, water supply networks, churches, etc. have been established. These social services have increased over the years.

✓ *Construction of School Facility*

In the study area, a distinction is made between public and private schools.

▪ *State Educational Establishments*

Mfou District Municipality has led to the creation of public primary and nursery school facilities (public schools of Ekali I, Ekali II, Endoum , Essazock , Koumou I, Ndangueng II, Ngouantet , Nkassoma , Nkol'oveng , Nkolmefou I, etc.) and secondary schools (the Essazock high school , Nkolda I , Nkolda II, Nkongoa , Nsimalen , Awae II, Mekomba , Ndangueng III, Nkol'oveng , etc.). The study area has 45 public primary and nursery schools and 13 secondary schools, including 6 general high schools, a technical high school, 5 CES and 1 CETIC (Figure 3). Vocational training schools have also emerged, particularly in urban areas. There is also a Sar/ sm . When the study area was created, only a few public nursery, primary and secondary schools had been established. Over the years, several other schools have been created. Schools are concentrated in the centre to the detriment of the peripheries. This unequal distribution pushes populations to travel long distances to access education.

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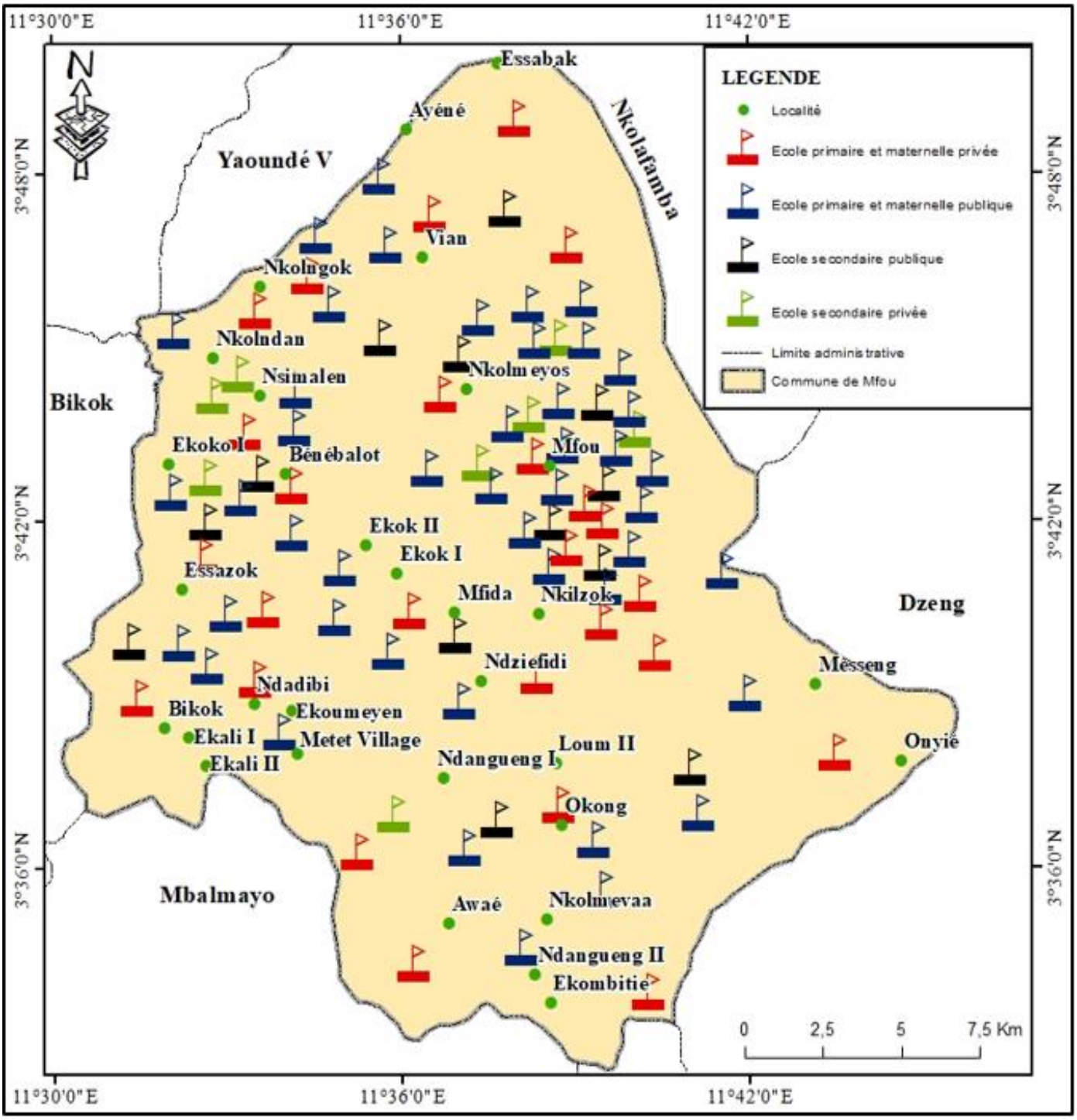

Fig 3 Schools in the Study Area
Source: GPS Surveys 2024 Plus PCD 2015

- *Private Schools*

In the Mfou District Municipality, several private nursery, primary (primary and nursery schools of Minkan, Ndong, Nkolnda I, Nkolnda II, Zalom, etc.) and secondary schools have been built in Minkan, Ndong, Mekomba, etc. There are about thirty private nursery and primary schools and 18 private secondary schools. Private schools are educational establishments that are not managed by the State and which therefore retain the right to select their students and are financed, in whole or in part, by the tuition fees that they charge their students. Very large forest areas have been destroyed for the benefit of these educational establishments in both urban and rural areas. It should be noted that the increase in private establishments is linked not only to the strong population growth in the study area but also because of the State's inability to build educational establishments.

Surveys and field observations show that several private schools were built by people from the city of Yaoundé. This is the case of the Laic bilingual school groupMfegue (Cf. Photo 21) whose owner is an operator

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✓ *Construction of Health Infrastructure*

Mfou District Municipality, there is a distinction between private and public health facilities.

- *Private Hospitals*

Mfou District Municipality , private health facilities have been built (9) alongside public hospitals by elites and economic operators (Plate 1). These health care facilities facilitate access to health care for the population. They are concentrated for the most part in the center of the study area (Cabinet de Soins la paix, Cabinet Médical saint Frank Olivier, etc.). In the outskirts, only a few private health facilities are present. The creation of these health facilities is mainly due to population growth in the study area.

Photo Kengmoé Emmanuel, 2024

Picture 1 : Private hospital in the Nkolnda **Picture 2 : Private hospital in the Awae**

Plate 1 Private Health Centers in the Commune of MFOU

- *Public Hospitals*

The chronological and spatial evolution of the provision of care highlights the dynamics that determine their distribution. The provision of public health care in the Mfou District Municipality is the result of a long process rooted both in the history of its development and health policies.

The distribution of health facilities induces inequalities, limiting the possibilities of populations, particularly those living in remote villages, to access health care. Indeed, health facilities are concentrated in the center of the study area. Apart from the Awae district hospital, there are 13 Integrated Health Centers (Figure 4) constituting the health system of the study area.

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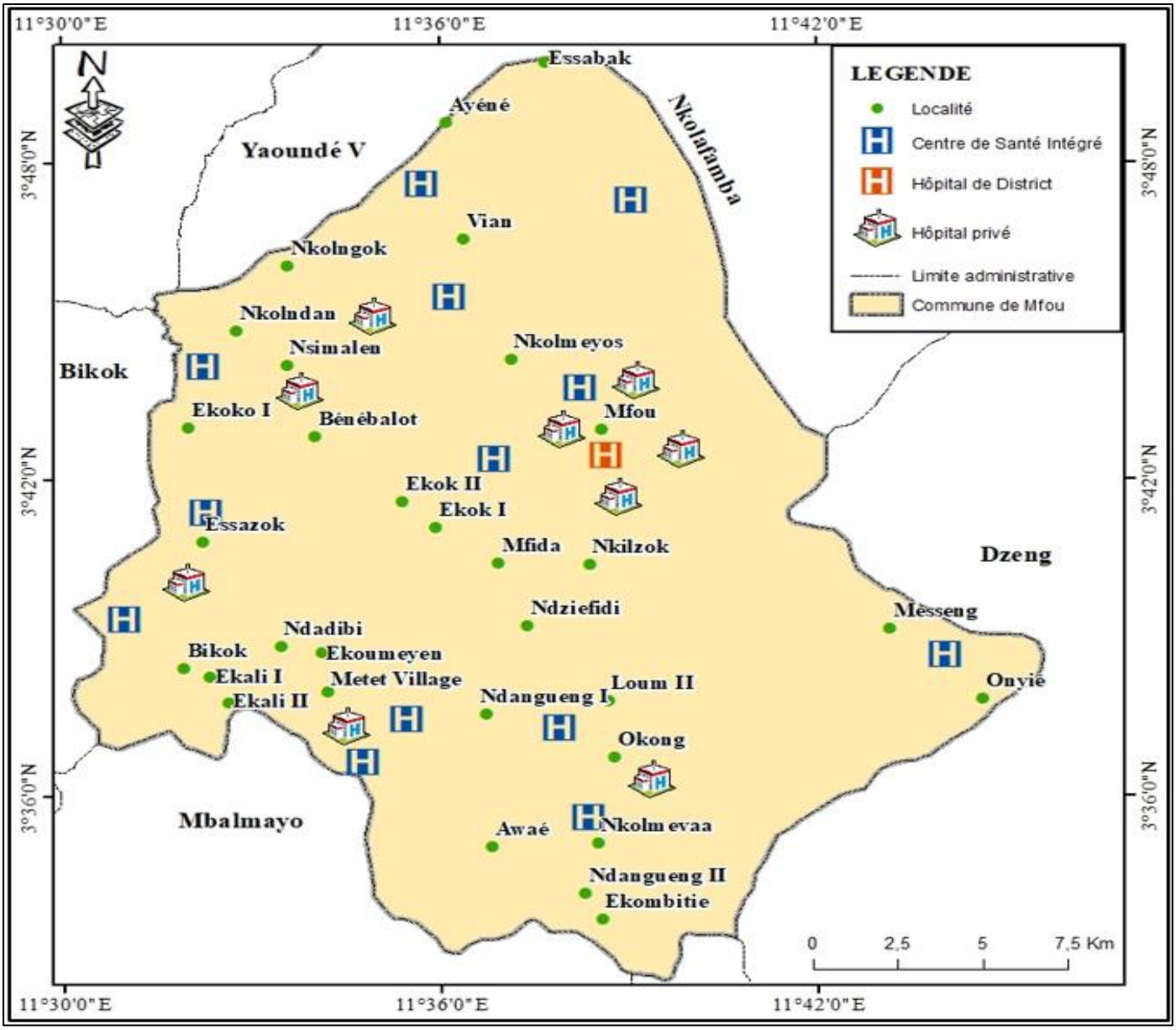

Fig 4 Health Facilities in the Study Area
Source: GPS surveys 2024 Plus PCD 2015

- *Electricity Supply in the Study Area*

The extension of the supply of electricity and public lighting (Cf. Plate 11) in the District Municipality of Mfou is essentially linked to the expansion of housing. The populations having developed housing in the peripheries of the study area, the latter were supported in their implementation by the State through ENEO which electrified most of the urban districts and villages. The populations of the study area have benefited for several decades from electrical energy from the electric posts offered by the State. Nowadays, some lines are out of use due to lack of maintenance. More than half of the villages do not benefit from quality energy and consequently languish in the dark. The populations use alternative energies such as wood fires and hurricane lamps.

In some districts of the study area, local authorities (Councils and decentralized state services) have installed solar panels (Plate 2) to provide public lighting. The villages that have benefited from this form of lighting are those with low electricity supply. These are villages such as Ziti , Ezabi , Ebolowo , Oman, etc.

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Photo Kengmoé Emmanuel, 2024

Picture 3 : Public lighting in Oman Picture 4 :Public lighting in Ziti

Plate 2 Solar Panels in the Study Area

Mfou District Municipality benefit from electric energy all year round.

✓ *Construction of Churches and Mosques*

Mfou District Municipality, population growth has led to the creation of several Protestant and Catholic churches, revival churches, etc. These places of belief are frequented in most cases on Sundays by the local population. Several mosques have also emerged thanks to the strong presence of the Muslim community.

Other basic social services such as water supply , boreholes, wells, playgrounds (football, handball, volleyball stadiums , etc.) have also emerged.

✓ *Construction of Housing*

The analysis of housing in the study area focuses on the occupancy status and the standards of the housing.

▪ *Housing Occupancy Status*

In the study area, housing is becoming denser from the city center to the outskirts. According to the results of field investigations, housing development is mainly marked by single-family homes, which leave relatively little room for rental housing. The housing occupation status is dominated by owners. They represent 69.12% compared to 27.88% of tenants. There are a few people housed for free. They represent 3% (Figure 5) of residents. Note that the predominance of owners is explained by easy access to plots of land.

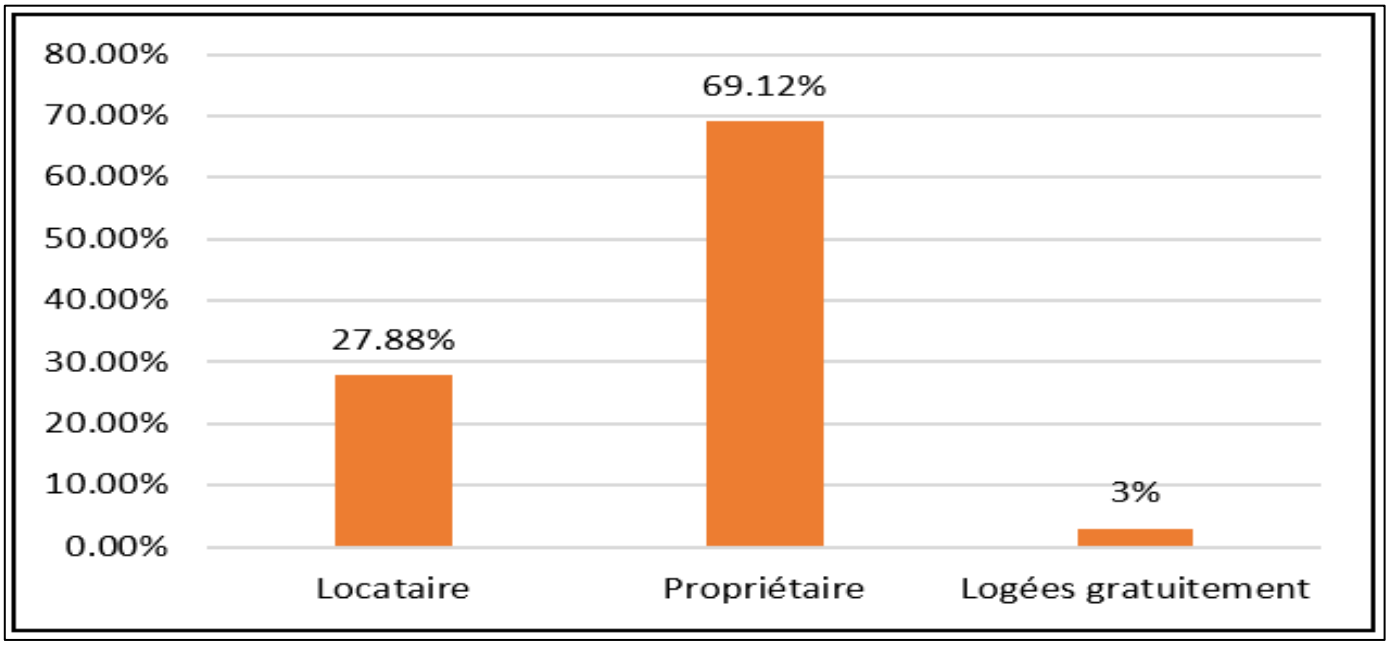

Fig 5 Occupancy Status of Housing in The Study Area
Source: Field Surveys, 2024

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- *Standard of Accommodation*

Housing in the study area was built on gently sloping plateaus. Housing development was favored by the proximity of the study area to the city of Yaoundé. The densification of housing and its expansion favored the creation of new roads, particularly in the outskirts, to the detriment of vegetation cover. Indeed, in the center of the study area, constructions are mostly mixed (high, medium and low-end housing). In the outskirts of the study area, high-end villa-type housing has developed.

Photo Kengmoé Emmanuel, 2024

Picture 5: High-end housing **Picture 6 : Low-end housing**

Plate 3 High and Medium-End Housing in The Study Area

Throughout the study area, dwellings are scattered in space and were set up by the inhabitants themselves. In the urban area where high and medium-end dwellings are found, housing is grouped (Cf. Plate 8).

In the study area, low- and medium-end housing is dominant because most of the housing is built by poor people working mostly in the informal sector. High-end houses are poorly represented. Low-standard houses represent 32.68% compared to 46.65% for medium-end houses. Very high-end houses are rare. They represent 0.56% (Figure 6).

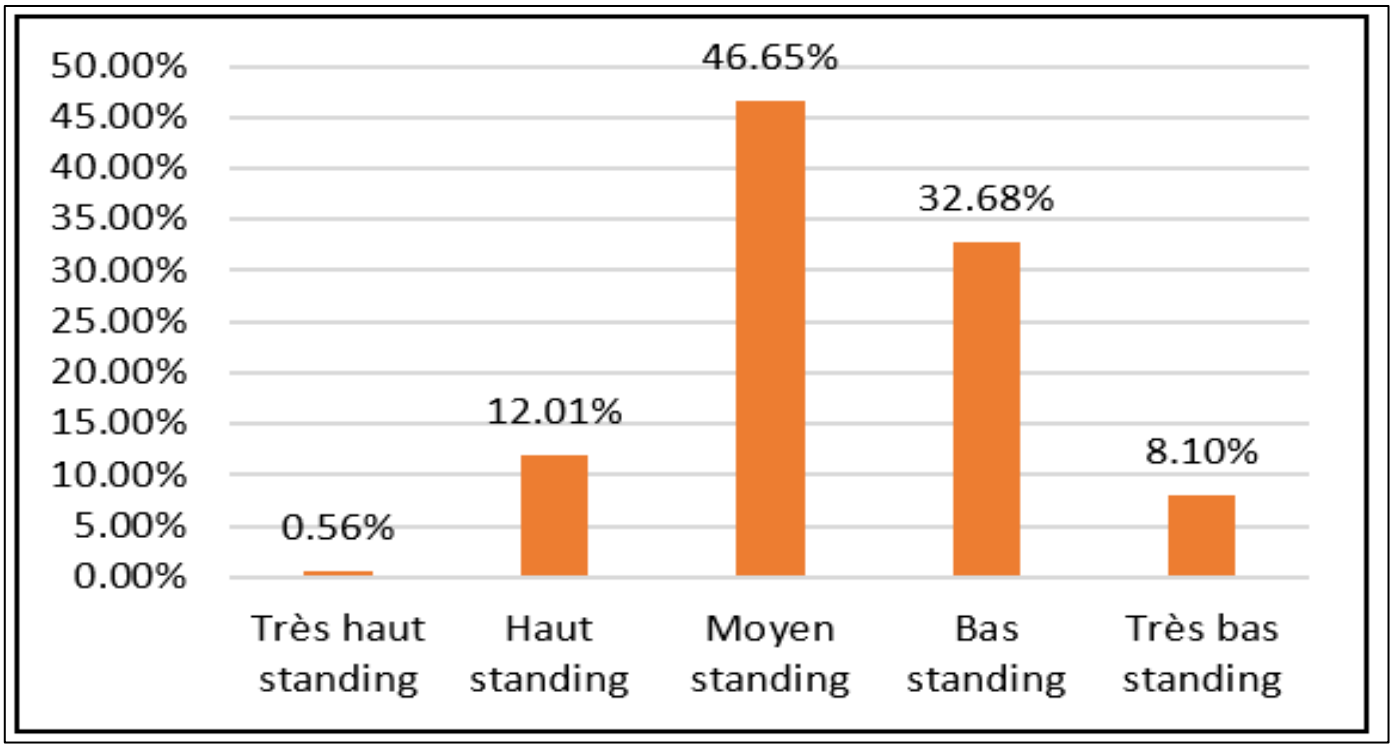

Fig 6 Standing of Houses in the District of MFOU
Source: Field surveys, 2024

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➢ *Economic Changes in The Study Area*

In the District Municipality of Mfou , economic changes concern the dynamics of activities in the primary, secondary and tertiary sectors.

The projects carried out by the CTD concern the creation of communication routes, the installation of solar panels, the construction of boreholes, etc.

- *Development of Primary Sector Activities*

In the study area , agriculture constitutes not only the basis, but the very substance of economic life. It plays a central role in economic development because the majority of inhabitants of the study area derive their livelihood from the soil. The agricultural sector also constitutes a major source of capital for modern economic growth. In the study area, agriculture is developed in rural areas with low population density. It should be noted that agricultural activity is practiced by indigenous people and non-indigenous people residing in both urban and rural areas. Some farmers reside in Yaoundé.

Subsistence agriculture, given its importance, constitutes a source of food resources in the study area. Agriculture plays several roles at the same time, first and foremost the production of food. Food products from plantations are intended to meet the needs of families and surpluses are marketed on local and urban markets.

Photo Kengmoé Emmanuel, 2024

Picture 7: Corn cultivation in AwaePicture 8 : Cassava cultivation in Nkilzok

Plate 4 Food Crops in the Study Area

Some farmers practice mixed farming consisting of corn, macabo , taro, etc. intended for self-consumption or marketing. Following field investigations, 37.69% of respondents practicing subsistence farming are non-natives and 62.31% are indigenous (Table 1).

Table 1 Owners of Agricultural Plantations

Private School Owners	Effective	Percentages (%)
Allogenes	78	37.69
Natives	129	62.31
Total	207	100

Source: Field Surveys, 2024

It should also be noted that some farmers have invested in poultry and livestock farming (goats, sheep and oxen). These agricultural activities have greatly contributed to the dynamics of the plant cover.

- *Development of Secondary Sector Activities*

In the District of Bafoussam I secondary activities are based on industries. This is the production of goods through the transformation of raw materials or materials that have already undergone one or more transformations and the exploitation of energy sources. In the study area, we identified during field investigations, a multitude of industries such as soap production, furniture manufacturing and agro-industries.

- *The Growth of Tertiary Sector Activities*

The tertiary sector covers a vast field of activities that extends from commerce to administration, including transport, financial and real estate activities and services. The study area has experienced a strong economic change in recent decades.

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Fig 7 Road Network In MFOU Municipality
Source Shapefile INC 2020 plus PCD 2015

✓ Development of Transport Activities

Since the increase in population linked to the proximity of the study area to the city of Yaoundé, several main, secondary and tertiary roads have been created and others have been developed. These roads facilitate the movement of people, goods and trade between the study area and neighboring cities. Most of the communication routes are in poor condition (Njouonang, 2018).

The means of transport used are private cars, transport buses, motorcycle taxis, taxis or walking. The number of private cars is quite limited. The motorcycle taxi is the mode of transport used by the vast majority of the populations in our study area. The motorcycle taxi allows people to travel from remote neighborhoods to the city center. It is favored by low prices and the state of the roads which does not allow the operation of other modes of transport. The motorcycle taxi operates mainly on a race basis. It picks up its passengers from fixed points, whether or not they are equipped, but tolerated by the city's management authorities. Several bus stations (Plate 5) have been created in the center of the study area. The development of the road has thus favored the expansion of buildings.

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Photo Kengmoé Emmanuel, 2024

Picture 9:Bus station at Mfou market Picture 10:Bus station in Awae district

Plate 5 Bus Stations In The Study Area

The creation of communication routes and bus stations contributed to the spatial dynamics of the study area. Many residents built their homes along the communication routes.

- *Creation of Markets and Development of Trade*

✓ *Construction of Markets*

The study area consists of large retail outlets, but most of the trade takes place in municipal markets. Several markets (Plate 6) have been built. The expansion of these markets is linked to urbanization. Although the road network is improving, the development of markets in other neighborhoods is timid. However, these markets operate full time as elsewhere.

✓ *The Development of Commercial Activity*

Throughout history, population growth in a city always offers opportunities for the establishment of a range of economic activities. The Municipality of Mfou is no exception to this economic rule. Indeed, the locality has recorded for several decades already a strong presence of commercial stores, grocery stores, drinking establishments, restaurants. (Plate 6).

Plate 6: Commercial activity and service in the study area

Photo Kengmoé Emmanuel, 2024

Picture 11 : Hardware store **Picture 12: Salon and hairdresser and boutiques**

Plate 6 Commercial Activity and Service in the Study Area

Note that in the study area, different services are offered such as banks, money transfers, administrative services, etc.

- *Administrative Structures*

Administrative buildings have the characteristic of being concentrated around the administrative center (Photo 13). These are the decentralized services of the State. In the study area, we find:

✓ Buildings with two or three floors at most, mainly housing services (Governor's Services, Public Works, Estates and Land Affairs, etc.),

✓ Buildings with at least two or three levels mainly housing services (Town Hall, Divisional Office and sub-divisional office, FEICOM, MINHDU, etc.).

Around these structures, the high population density has given rise to new structured neighborhoods.

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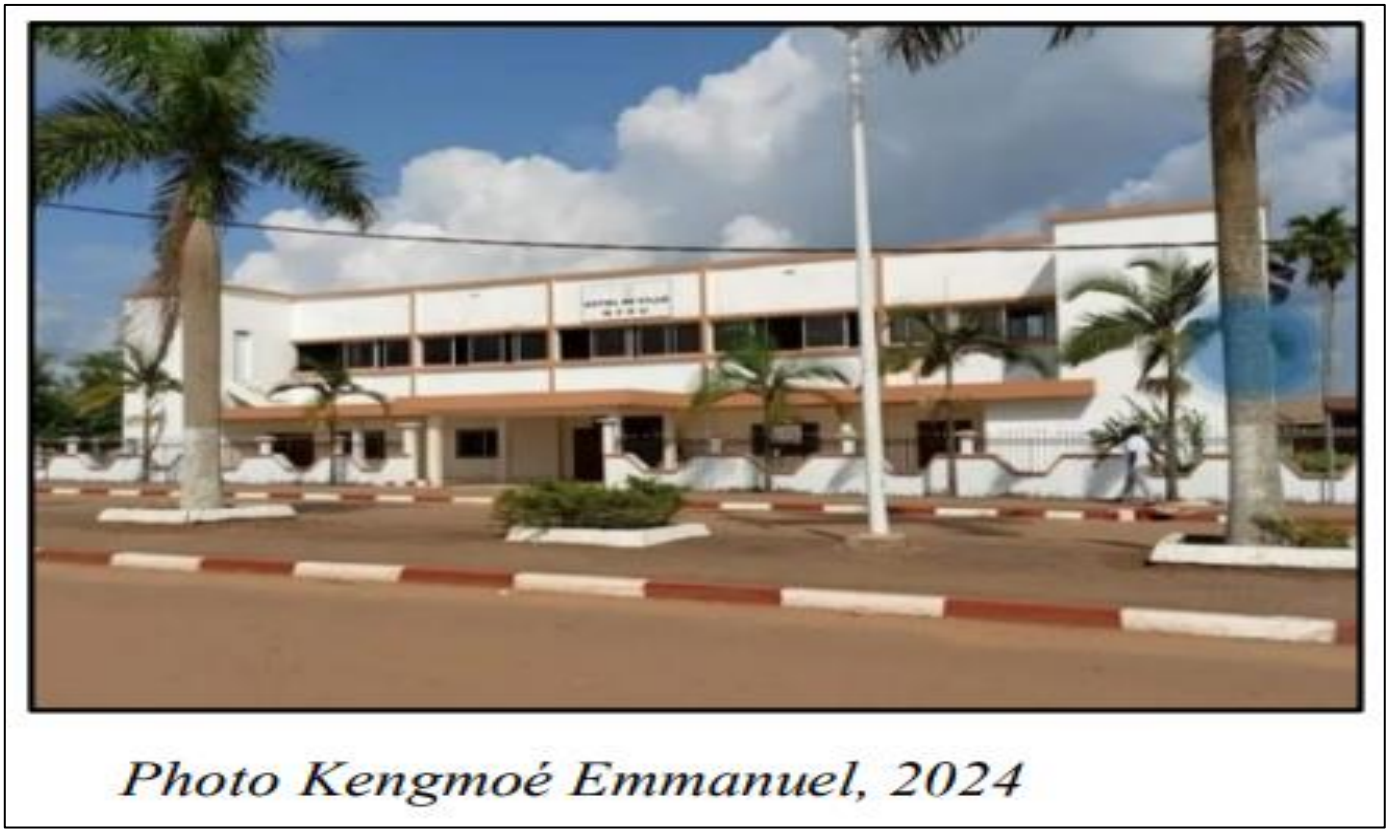

Picture 13 Town Hall of MFOU Municipality

The administrative structures essentially linked to urbanization have contributed to the spread of the Mfou District Municipality in that they have played a role of attraction on the populations.

- *Tourist Facilities and Sites*

The tourist facilities that have contributed to the spatial dynamics of the study area include hotel infrastructure and tourist sites.

In the study area, there are different hotels such as the United Hotel of Mfou which is an attractive center attracting many tourists due to its architectural beauty. It is located in the urban center. Other hotels such as Dajoll Hotel, Relax Hotels, Palace Hotels, welcome tourists. Many motels have also been built.

Plate 7 Commercial Activity and Service in The Study Area

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➢ *Effects of Socio-Economic Changes on The Spatial Extension of MFOU Municipalty*

Mfou Municipality experienced spatial growth between 1995 and 2024. To carry out this study, we used land use maps.

- *Land Use In Our Study Area In 1995*

In recent decades, Cameroonian cities have experienced an increase in their populations, mainly linked to the rural exodus and natural increase, with the effect of the spatial expansion of cities. This phenomenon is more accentuated in Mfou Municipalty because of its proximity to the city of Yaoundé. Indeed, the study area offers land opportunities pushing several city dwellers lacking space in the city of Yaoundé to settle in the Commune Mfou . The discretization of the satellite image of the study area in 1995 shows that the spatial expansion was not very pronounced. There is a high density of vegetation cover and a low density of buildings (Table 2). The vegetation includes crops, fruit trees, eucalyptus, etc.

Table 2 Types of Land Use and their Areas in 1995

Thematic classes	**Area in 1995 (ha)**
Built	987.74
Vegetation	49,070.16
Total	50057.9

Source : Landsat MSS image of the Commune of Mfou, 1995

At the end of the image processing (Cf. Figure 19), we note that the built-up area occupied an area of 987.74 hectares of the total area of the study area and the vegetation 49,070.74 hectares. The built-up area was concentrated in the districts located in the center of the study area such as Mfou and Nkolmeyos and the districts located near the city of Yaoundé such as Nsimalen , Nkolnda , Ekokok 1, etc.

- *Land Use In The City Of Mfou In 2010*

Between 1995 and 2010, the population growth in the city of Yaoundé led several city dwellers in search of space to settle in the study area. Thus, Mfou Municipality experienced an increase in buildings, a result of the development of space. In this context, spatial expansion accelerated, especially in areas located near the city of Yaoundé and in the center of the study area. This strong urban growth had effects on the vegetation cover.

The analysis ofThe 2010 Landsat image shows that the vegetation cover is clearly declining in our study area (Table 3).

Table 3 Types of Land use and their Areas in 2010

Thematic classes	**Area in 2010 (ha)**
Built	2,035.74
Vegetation	48,022.16
Total	50 057.9

Source: Landsat ETM + Image of the Commune of Mfou, 2010

The built-up areas, resulting from the extension of the study area, show the decline in plant cover in favor of the growth of buildings (Figure 7). The built-up area covered an area of 2,035.74 hectares of the total area of our study area in 2010 and the vegetation cover 48,022.16 hectares.

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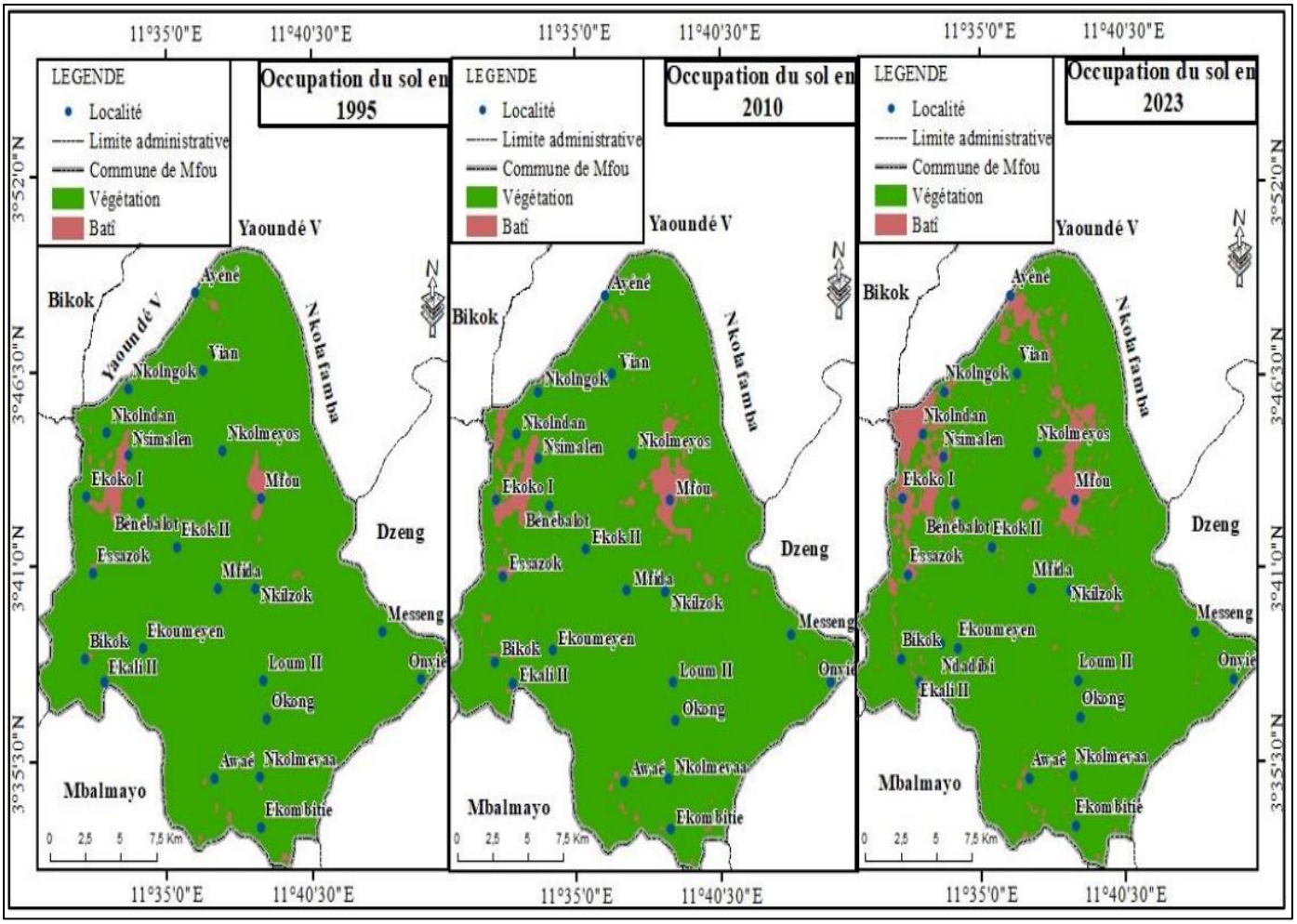

Fig 8 Evolution of Land Use in Mfou Municipality
Source: Landsat images of the Commune of Mfou 1995, 2010 and 2023

- *Land use in Mfou Municipality in 2023*

In order to better illustrate the phenomenon of the spatial extension of the study area, the processing of a third image was necessary (Figure 6). The discretization of the Landsat image made it possible to distinguish, as in the other images (1995 and 2023), the different forms of land use in our study area. It can be seen that the vegetation cover has regressed, while the built-up area has gained space (Table 4).

Table 4 Types of Land Use and their Areas in 2023

Thematic class	Area in 2023 (ha)
Built	4,144.69
vegetation	45,913.21
Total	50 057.9

Source : Landsat Oli image of Mfou Municipality, 2023

The built-up area, consisting of housing and socio-collective infrastructure, etc., occupies an area of 4,144.69 hectares of the total area of the study area and vegetation 45,913.21 hectares. (Table 4).

The spatial extension of Mfou Municipality , which contributes to the regression of the vegetation cover by human activities, exposes the soils to water erosion by runoff. It should also be noted that agricultural activities have developed well in the peripheries to meet the needs of increasingly large populations.

IV. DISCUSION

At the end of our work, there are a few questions to ask. Can socio-economic changes lead to the spatial expansion of the study area? How have these changes evolved in recent decades? The objective of this study was to show how socio-economic changes have contributed to the spatial spread of the study area. The first results show that the Commune of Mfou has experienced strong demographic growth, particularly linked to its proximity to the city of Yaoundé. This increase in population has led to socio-economic changes. On the social level, we observe the development of primary, nursery and secondary school infrastructure. It

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should be noted that housing development constitutes the most intense form of change in the study area. On the economic level, the activities of the primary, secondary and tertiary sectors have developed over the years. These socio-economic changes have contributed to the spatial expansion of the study area. This is the same observation that emerges from the work of Ebélé in 2018, which noted that the territories located in the vicinity of the city of Yaoundé have experienced unprecedented spatial growth in recent years. According to the latter, localities such as Mbankomo, Ngoumou, Obala, etc. have continued to see their populations increase and socio-economic activities multiply, leading to the spatial expansion of these cities.

He specifies that it is the availability of cheap land that is the main factor attracting populations. The author states that in these different Communes, the status of housing occupation is dominated by property. Kamga in his thesis work in 2024 specified that the spatial extension of the city of Yaoundé beyond its borders has swallowed up the surrounding Communes, generating spatial growth in the latter. He mentions as a factor in the occupation of the territories located around the city of Yaoundé, the land available at a good price. This is also the content that emerges from Djonang's thesis work in 2018, who believes that the socio-economic changes in the Communes surrounding Yaoundé and having generated their spatial extensions are closely linked to their proximity to the city of Yaoundé. The spatial expansion of the Commune of Mfou has enormous consequences, notably the development of precarious neighborhoods, the difficulties of access to urban services by city dwellers such as water, electricity, health, education, etc.

The spatial growth of cities in poor countries contributes significantly to environmental degradation (Mbacké, 2016). The second results illustrate a clear progression of the urban fabric which is more intense in districts such as Nsimalen, Ekoko I, Nkolnda, Nkolmeyos, etc. the southern districts experience low dynamics of the built environment. The spatial extension of the Municipality of Mfou between 1995 and 2023 resulted in a slight degradation of the vegetation cover because the scale is not very significant. The results indicate a rapprochement of artificialized surfaces and a spread of agricultural and natural peri-urban areas, particularly during the period 2010-2023.

Furthermore, changes in land use show that urban expansion has been more to the detriment of crops and forests. However, peripheral green spaces make up more than 75% of the surface area of the study area. These results confirm the observation that the Municipality of town, as it expands, increasingly degrades the green spaces from the city center to its periphery Nzigou. This trend illustrates the anarchic development of urban space to the detriment of the environment in recent years according to Voundi in 2016. It reflects the spontaneity observed in the urban sprawl of third world countries, particularly on the outskirts of the city. The comparison between the three periods makes it possible to identify the main developments. Depending on the periods considered, this continuous consumption of space has been done with slightly different growth rates (± 10 ha/year). The highest urban expansion was recorded during the period 2010 and 2023. The lowest land consumption was observed during the two periods 1995-2010.

The period 2010-2023 was marked by a new acceleration in the expansion of artificialized areas as built-up areas increased from 2,035.74 hectares in 2010 to 4,144.69 in 2023. The continued spatial expansion is partly explained by the fact that the period 2010-2023 was characterized by strong urban growth. The year 2023, described as the diffusion phase, is distinguished by a form of urban expansion. It is marked by the occupation of new spaces by populations, most of whom are non-natives. Over time, the creation and development of communication routes have allowed populations to settle more. The urban expansion of the Municipality of Mfou is increasingly discontinuous and increasingly driven by the peripheries which take over and whose pace differs markedly from that of the urban core. Thus, the new artificial surfaces during the period 2010-2023 result from the continuous extension of the existing urban space following a process of polarization of the neighboring rural space.

V. CONCLUSION

It emerges at the end of this work that, demographic growth has generated socio-economic changes in the Municipality of Mfou at the origin of the spatial extension of the study area. The aim of this study was to show how the study area has evolved in recent decades using Landsat images. Our field investigations show that the Municipality of Mfou has experienced demographic and spatial growth, doubled by one between 1995 and 2023. From this situation have arisen various problems including urban sprawl. It emerges that the study area has experienced spatial dynamics in recent decades due to multiple land opportunities. These opportunities have led to waves of migration. Satellite data shows that between 1995 and 2023, the study area experienced spatial spread from the center to the periphery and from the northwestern periphery to the center. This extension of the urban fabric towards results in the invasion of green spaces and agricultural land. In 1995, the forest occupied an area of 49,070.16 ha and the built-up area 987.74 ha. In 2010, the built-up area increased from 987.74 ha to 2,035.74 ha, the forest from 49,070.16 ha to 48,022.16 ha. In 2023, the built-up area occupied an area of 4,144.69 ha and the vegetation to 45,913.21 ha. This spatial growth without this increase in the built-up area is explained by the increase in the population in the Commune of Mfou. It should also be noted that a large number of elements have led to this spatial dynamic, in particular the activities of the development of housing and basic social services, the creation of markets, the development of trade, the administrative center, etc.

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