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Migration and Dynamics of Land Occupation around the Manigri-Beterou Axis in the Communes of Bassila and Tchaourou in Benin

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Abstract

The scale of migratory movements in recent years around protected areas is exerting unprecedented pressure on natural resources. Therefore, this study analyzes the evolution of the North-West sector of the Wari-Maro classified forest in relation to the massive influx of rural migrants.

The methodological approach used includes documentary research, socio-economic surveys, processing of planimetric and socio-economic data for the sector from 2005 to 2020, analysis and interpretation of the results following a cartographic approach.

The exploration of rural migrations and their involvement in the dynamics of land use were carried out along the two axes Oubérou-Wari-Maro-Kikélé and Wari-Maro-Manigri bordering the FCWM. Given the natural potential that abounds in the sector, it is one of the most coveted landscapes by 72% of rural migrants, mainly made up of Yom and Lokpa socio-cultural groups. Agriculture, pastoralism and forestry are the main rural activities. The diachronic analysis of the occupation using satellite imagery (2005-2020) reveals a reduction in natural areas in favor of an increase in agricultural and inhabited areas. It is therefore urgent to encourage natural resource conservation methods in the northwestern periphery of the Wari-Maro Classified Forest.

Keywords: Benin, North-West of the FCWM, rural migrations, dynamics of land use, cartographic approach

1. Introduction

Humanity as a whole is increasingly confronted with the problems of protecting natural resources because of population growth and poverty (Bourdial, 2001). As a result, safeguarding the environment has today become one of the major concerns of the international community. This awareness was born from the advanced degradations experienced by the environment (Akiyo, 2004).

According to FAO (1996), several natural areas are disappearing at an accelerated rate. Thus, the damage caused to ecosystems is impressive: 20 million km2 of land are on the verge of desertification and 40% of the plant cover is destroyed at an annual rate of 80 million hectares. For Faaki (1996), the degradation of biodiversity is linked to the increase in the human population, which appropriates a large part of the biological productivity of the globe with an excessive, unsustainable consumption of natural resources. This finding was confirmed by the FAO (2000) which estimates nearly 70,000 ha of deforestation, i.e. an annual loss of 2.31% of forest cover between 1990 and 2000. This situation is due to the fact that migratory movements in the area savannas south of the Sahara are part of a long tradition of peasant mobility.

Indeed, in Benin it is now established that 200 million hectares of forests disappeared only during the year 1998 on the scale of our planet earth, that 80% of the original forests were either cut , either fragmented or degraded (MEHU, 2002). According to the latest study by Allé (2009), the rate of degradation and clearing of the forest area increased to nearly 120,000 ha each year between 1998 and 2006. We also note the combined action of overgrazing and trampling which leads to a regressive evolution of the plant cover (Gibigaye. 2003). Several studies (Tenté, 2005; Yédomonhan, 2002; Arouna, 2002 and Guédou, 2001) on the flora have shown that human actions degrade dense or open wooded formations and lead to the establishment of fields and fallows.

Thus, the multiple contributions to the management and conservation of natural resources require an assessment of the effects of human pressure on the natural resources of the Manigri-Bétérou axis because of the seriousness of the problem of accelerated degradation of soil resources. and forestry which could lead to desertification and the precariousness of arable land if drastic and effective measures are not taken in time.

2. Material and method

2.1. Presentation of the study area

The study area extends between the parallels 8° 55' 35' and 9° 20' 50" of north latitude, on the one hand and between the meridians 1° 39' 23" and 2° 21' 15 " East longitude, on the other hand. It is a sector that overlaps two Arrondissements of the Commune of Bassila (Bassila and Manigri) in the department of Donga and one Arrondissement of the Commune of Tchaourou (Bétérou) in the department of Borgou. It takes into account two axes: the Oubérou-Wari-Maro-Kikélé axis and the Wari-Maro-Manigri axis. Most of the work was done through the camps and hamlets located along these two axes. Figure 1 presents the geographic location of the study area.

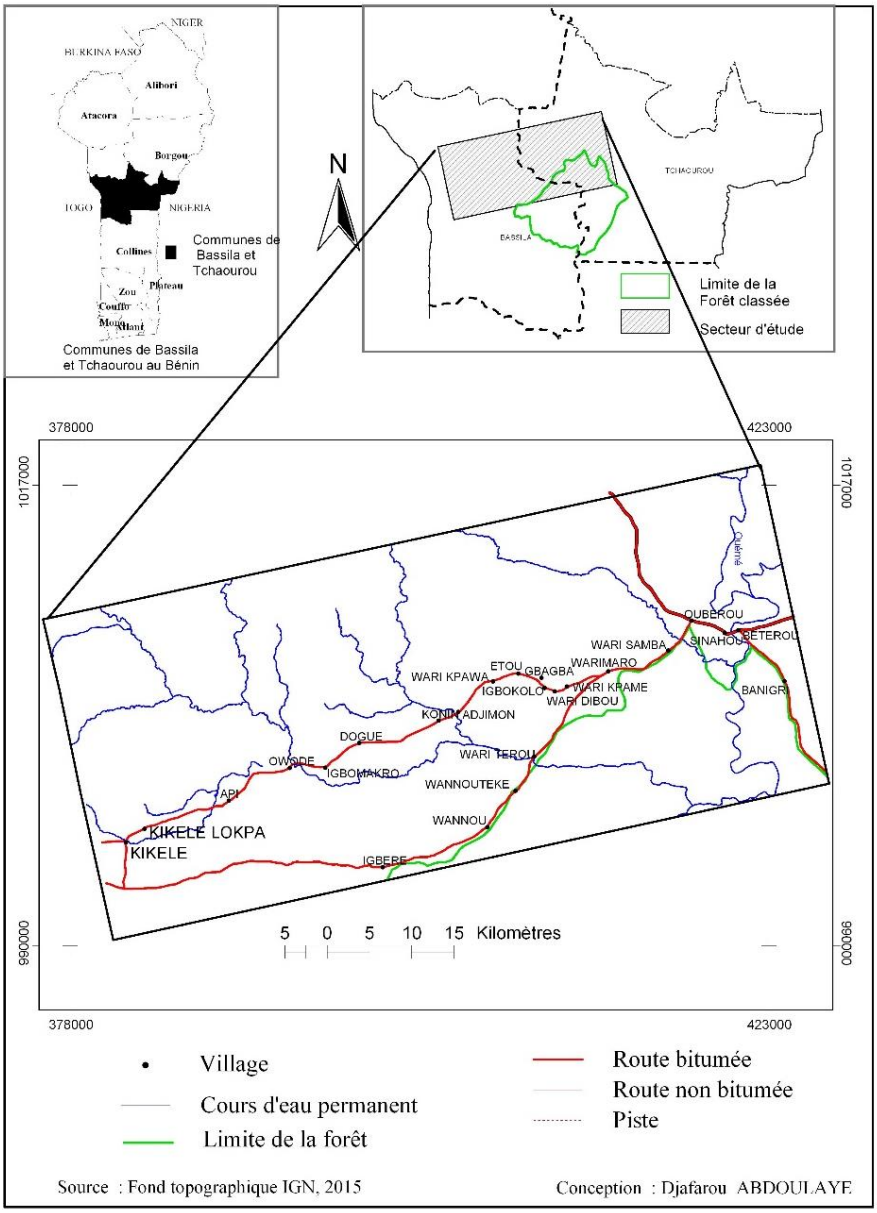

Figure 1: Location of the research environment

2.2. Planimetric documents and software used

The planimetric documents used consist of a topographic sheet map of Djougou Id at a scale of 1/20000, produced by ORSTOM (1969); and the soil reconnaissance map of 1989 Djougou sheet at 200,000. Landsat satellite images of 2005 and 30 meters resolution; Landsat OLI satellite images of 2020 with a spatial resolution of 30 meters.

2.3. Hardware and software

The equipment used in this research consists of Garmin 60 GPS (Global Positioning System) for the collection of geographical coordinates relating to the inventory of hamlets and camps; a questionnaire for farmers; an interview guide to collect information from technicians and rural development agents working in the agricultural sector; GPS coordinates survey sheet and

maintenance guide. Software such as Erdas Imagine 8.5, for the digital processing of satellite images, and Arc View 3.2, for the production of the various thematic maps were used.

2.4 Socio-economic surveys

The main technique used is the Active Method of Participatory Research (MARP) which allowed to focus on the daily realities of migrants before having their perceptions on the reasons for their displacement. 200 households were identified and then interviewed. It should be noted that an interview was given to rural development officers from the research community. Ultimately, the collection is based on careful observation, interviews (direct or indirect), interviews, and public consultation (focus-group) for the acquisition of data and information. All the different data collected have been processed using appropriate tools.

2.5 Processing of socioeconomic data and analysis of results

Several statistical, cartographic and analytical methods were used in this study. The data collected was analyzed manually. The survey sheets were counted and verified. They were analyzed using Excel software. The results are presented in the form of tables and figures.

2.6 Processing of planimetric data

The combination of the data collected on the planimetric documents and on the ground allowed the production of the land use maps of 2005 and 2020. The evaluation of the areas of the land use units was possible at the Arc extension trace of ArcView 3.2. The assessment of the evolution of the land occupation units made it possible to assess the evolution of the land occupation units at different periods. To this end, by considering as U1 the area of a unit of land occupation in 2005 and U2 the area of the same unit of land occupation in 2020 and □U, the variation in the area of this unit of land use between 2005 and 2020, the different scenarios are as follows:

$\Delta U = U2-U1$
if $\Delta U = 0$ then there is stability;
if $\Delta U < 0$ then there is a decrease in this unit;
if $\Delta U > 0$ then, there is an extension of this same unit.

Compared to natural vegetation, there is a regressive evolution in the event of contraction and progressive evolution in the event of an extension. This technique made it possible to follow the evolution of the different land use units and to assess the spatial dynamics in the research area. At the end of this methodology, the results were obtained.

3. Results and Discussion

3.1 Socio-economic foundations linked to the host environment of migrants

The study area is one of the most coveted agro-ecological zones in the country because of the enormous potential it has. Indeed, the parameters that come into play here are: the availability of fertile land, the hospitality of the indigenous populations, the low density of the environment and the existence of market infrastructures. Figure 2 shows the distribution of hamlets and camps traveled during fieldwork in the study area

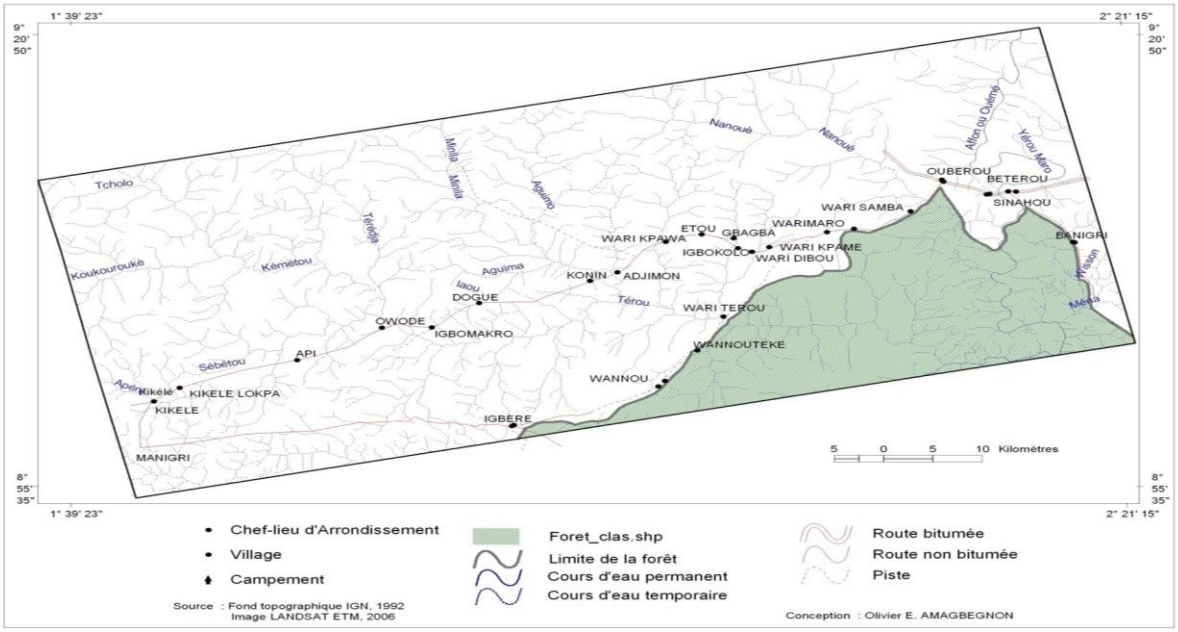

Figure 2: Distribution of camps and hamlets in the study area

This figure shows the location of the hamlets and camps along the two axes located at the edge of the FCWM. Human settlements are clearly visible on either side of the study axes. We also note the presence of a few camps inside the FCWM.

3.1.1 Availability of fertile land and hospitality of indigenous populations

This sector offers vast expanses of fertile land thanks to its proximity to the forest massif of Wari-Maro. As a result, it benefits from significant edaphic assets of the plant cover. It is an environment that has not yet suffered too much anthropogenic pressure until recently before the installation of rural migrants.

The populations of this geographical area are characterized by their hospitality. Rural migrants once arrived in this environment are welcomed by the indigenous populations and are guided by the latter who grant them land under the authority of the land chief "Baalê" in the local Nagot language. During socio-economic surveys, 99% of rural migrants declared that they have access to land by donation.

3.1.2 Density of the research environment

Due to its "landlocked" situation, it is an environment that was once little frequented because of its difficult access. Apart from the villages of Wari-Maro, Wannou, Igbèrè, Manigri, Doguè, Igbomakro, and Kikélé, human settlement dates back less than two decades. On the Wari-Maro-Manigri axis, the construction of the bridge over the Térou River has greatly encouraged the settlement of rural migrants. On the side of the Wari-Maro-Kikélé axis, Wari-Kpawa appears to be the largest of the hamlets created by migrants (Orékan, 2006).

3. 1. 3. Socio-cultural characteristics of rural migrants

In the North-West sector of the FCWM, investigations in the real environment have made it possible to know the sociolinguistic groups that make up rural migrants. Indeed, the populations of the latter are made up of Yom mostly from Djougou and its surroundings, Lokpa from Ouaké and surroundings, Berba from the regions of Tanguiéta and surroundings, then come the Ditamari from the regions of Natitingou and surroundings. Then the other groups more or less negligible as a whole. Figure 4 provides information on the places of origin of the different socio-cultural groups of rural migrants in the study area.

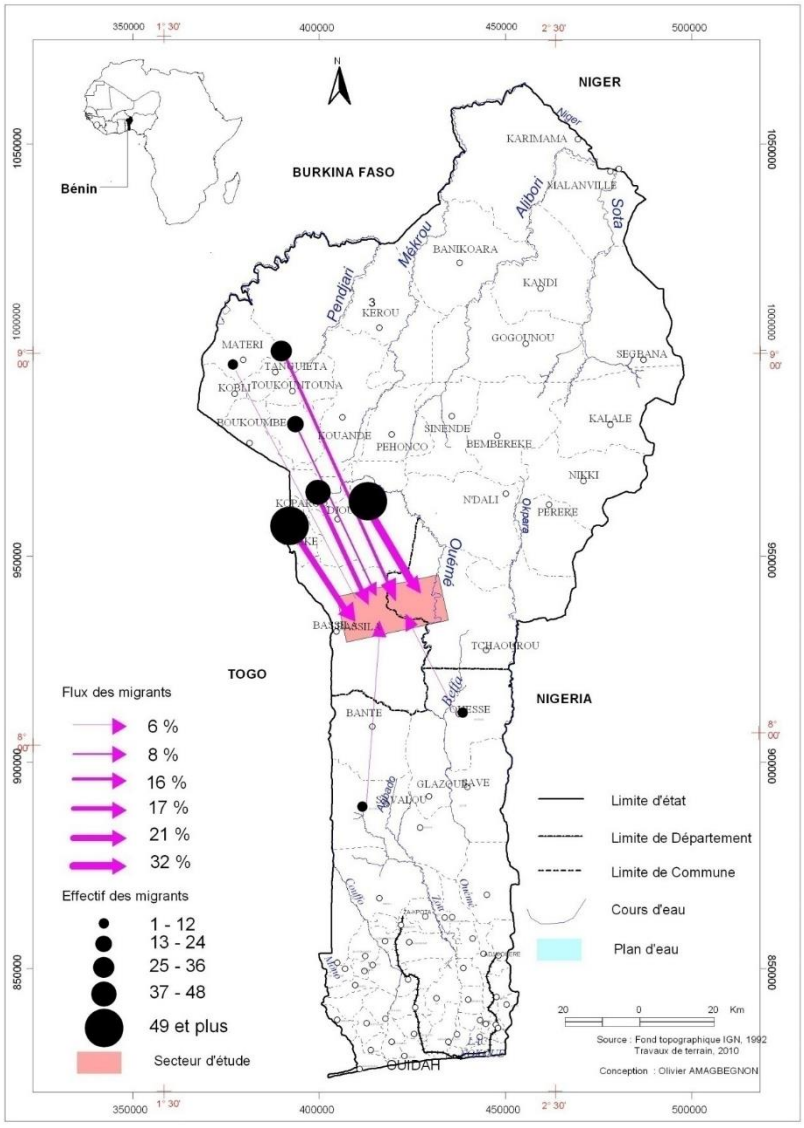

Figure 4: Flow of rural migrants in the study area

From the analysis of this figure, it appears that the Communes of Djougou and Ouaké come first with a size of approximately 50 migrants whose corresponding flow is 32%. The detail of the proportions is presented and analyzed in figure 5.

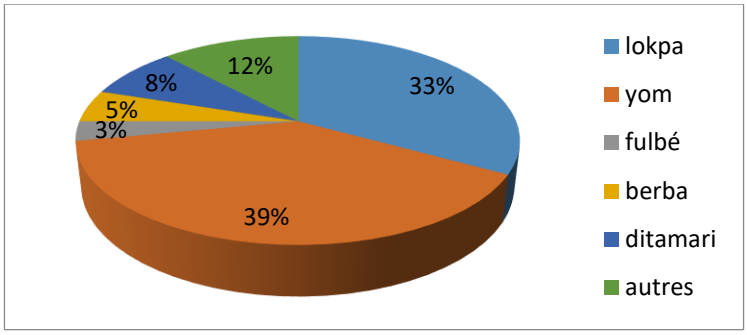

Figure 5: Socio-cultural groups of rural migrants

From the analysis of this figure, it should be noted that the socio-cultural group Yom occupies the first place with 39%. it is followed by the Lokpa group (33%). These two sociocultural groups are respectively the largest of the population in the study environment. These groups are some of the real farmers and loggers in the area. Thus, they actively participate in the development of the resources of their host environment but also in the degradation of its landscape. However, to better understand the actions of these migrants, it is important to take a look at their socio-professional characteristics.

3. 2. Dynamics of land occupation

3.2.1 Land cover and use in 2005

The land cover units identified after interpretation of the images show eight units namely: dense forest; gallery forest; open forest and wooded savannah; wooded and shrubby savannah; saxicolous savannah; planting; crop mosaic and fallow and agglomeration as shown in Figure 6.

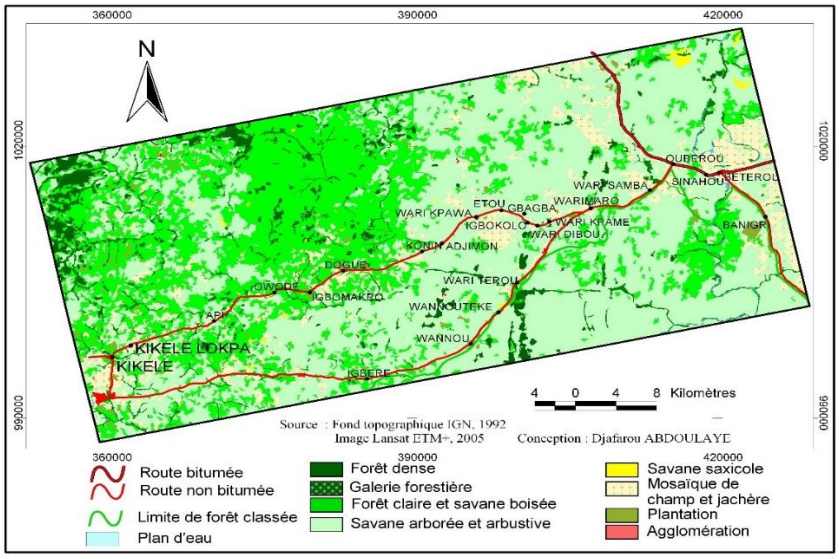

Figure 6: land occupation units in 2005

From the analysis of this map, it should be noted that the natural formations made up of dense forest; gallery forest; open forest and wooded savannah; tree and shrub savannah and

saxicolous savannah occupy 85% of the area of the research environment, the details of which are presented in Table 1.

Table I: Areas of land occupation units in 2005

Land use	occupation	Land Areas (ha)	%
Natural formations	Dense forest	9217	6,17
	Gallery forest	3345	2,23
	Open forest and wooded savannah	68364	45,77
	Tree and shrub savannah	12826	8,58
	Saxicolous savannah	94	0,06
	Subtotal1	**93846**	**62,81**
Agricultural training Plantation	Cultivation and fallow mosaic	55264	37
	Subtotal 2	**55264**	**37**
Agglomerations	Agglomeration	240	0,16
	Subtotal 3	**240**	**0,16**
Total		**149350**	**100**

Source: Image processing results from 2005

Analysis of Table I shows that natural formations occupy 62.81% of the mapped portion. Then come agricultural training with 37% given the importance of agricultural activities in the area and finally the agglomeration with 0.16%.

3.2.2 Land cover and land use in 2020

The land use units identified in 2020 are identical to those of 2005, namely: dense forest; gallery forest; open forest and wooded savannah; wooded and shrubby savannah; saxicolous savannah; planting; crop mosaic and fallow and agglomeration as shown in Figure 7

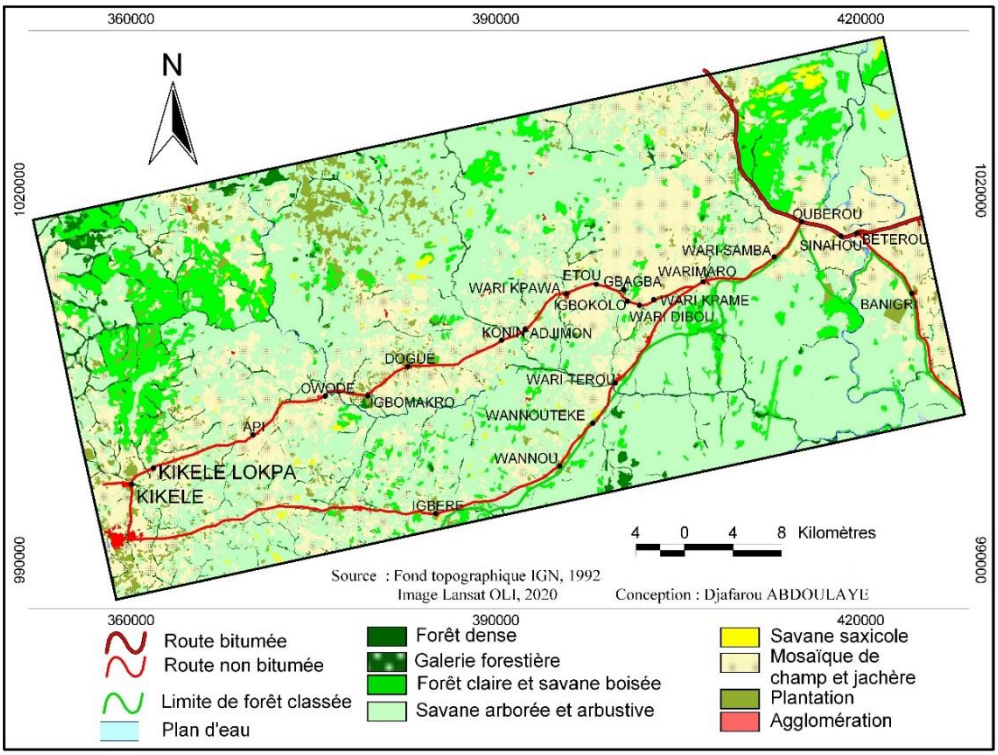

Figure 7: Land occupation units in 2020

The analysis of this figure shows the preponderance of fallow fields compared to other landscape units in the area. This demonstrates the influence of the excessive anthropization of the sector, which is nothing other than the result of the upsurge in rural migration to this preferred area for agricultural activities. The areas of the different land cover units of 2020 are mentioned in Table II.

Table II: Areas of land occupation units in 2020

Land use	occupation	Land Areas (ha)	%
Natural formations	Dense forest	961	0,64
	Gallery forest	4151	2,77
	Open forest and wooded savannah	22994	15,39
	Tree and shrub savannah	20148	13,49
	Saxicolous savannah	94	0,06
	Subtotal 1	**48348**	**32,35**
Agricultural	Plantation	132	0,08
training Plantation	Cultivation and fallow mosaic	100508	67,29
	Subtotal 2	**100640**	**67,37**
Agglomeration	Agglomeration	362	0,24
	Subtotal 3	**362**	**0,24**
Total		**149350**	**100**

Source: Image processing results from 2020

Table II presents the areas of the different spaces. Agricultural training occupies 67.37% of the study area. Natural formations and agglomeration come respectively with 32.55% and 0.24%.

At the end of this diachronic study, the synthesis of the evolution of the surfaces of the land occupation units between 2005 and 2020 made it possible to make the dynamics of the land occupation units from the statistics presented in Table III.

Table III: Land occupation and land use evolution report 2005-2020

	Occupation Units	**Land occupation in 2005**		**Land occupation in 2020**	
		Areas (Ha)	%	Areas (Ha)	%
Natural formations	Dense forest	961	0,64 %	623	0,42 %
	Gallery forest	4151	2,78 %	2049	1,37 %
	Open forest and wooded savannah	22994	15,39 %	12613	8,45 %
	Tree and shrub savannah	20148	13,49 %	9034	6,05 %
	Saxicolous savannah	94	0,06 %	87	0,06 %
	Subtotal 1	**48348**	**32,37 %**	**24406**	**16,34 %**
Agricultural training Plantation	Plantation	132	0,09 %	723	0,48 %
	Cultivation and fallow mosaic	100508	67,30 %	123785	82,88 %
	Subtotal 2	**100640**	**67,38 %**	**124508**	**83,37 %**
Agglomeration	Agglomeration	362	0,24 %	436	0,29 %
	Subtotal 3	**362**	**0,24 %**	**436**	**0,29 %**
	TOTAL	**149350**	**100 %**	**149350**	**100 %**

Source: Image processing results from 2005 et 2020

This table shows that natural formations are in sharp decline in favor of anthropogenic formations. Thus, from 1995 to 2010, there is an extension of agricultural formations (increase of 68,521 ha) and inhabited (increase of 196 ha) to the detriment of natural formations (decrease of 69,440 ha). These increases are due to the extension of fields and the reconstitution of old fallow land.

3. 3. Discussion of results

This study reveals that a number of factors favor the extent of rural migrant settlements in the northwestern sector of the Wari-Maro classified forest. Among these, we can cite: the availability of fertile land, the availability of fodder, the proximity of the classified forest of Wari-Maro, the rehabilitation of the Oubérou-Kikélé track and the construction of the bridge over the Térou river on the Wari-Maro-Manigri axis. This result is consistent with other studies which show that migratory movements in the savanna zone south of the Sahara are part of a

long tradition of peasant mobility. This mobility can be explained by the traditional reception capacity of the natives, the flexibility of land tenure, the facilities offered by the improvement and security of the communication network (Pieri, 1989). Indeed, the migrant populations are mainly made up of Yom, mostly from Djougou and its surroundings, from Lokpa from Ouaké and surroundings. They practice agriculture, agro-pastoralism, logging as revealed by the work of Orékan (2007). Once settled, rural migrants develop very degrading agricultural practices. The investigations in the real environment have shown that the plant cover of this sector remains under the permanent obsession of itinerant slash-and-burn cultivation, which is the main cultivation system adopted by the farmers of the study sector. Indeed, the yam, one of the three main crops of the study area is demanding because it is a heliophilous plant. Its cultivation requires the burning of all the trees on the portion. Similarly, it is not grown on the same plot for two consecutive agricultural seasons. It is rightly that Toko (2002) asserted that the natural ecosystems of the Sudanian domain are experiencing serious regression, the factors of which are natural and anthropogenic.

4. Conclusion

At the end of this research, it should be noted that human activities are essentially responsible for the destruction of ecosystems to which wildlife experiences great inconvenience.

The dynamics of the plant cover was analyzed through the diachronic study of land occupation and land use maps supplemented by socioeconomic surveys.

The diachronic study of the occupation of the ground in the North-West of the Classified Forest of Wari-Maro showed that the agricultural space and the inhabited space increased to the detriment of the natural space from 1995 to 2010. This evolution involved 46.5% of the entire study area. For the period, the natural area decreased and fell from 93846 ha to 24406 ha, i.e. a reduction of 49.49%. This space has undergone enormous modification, especially on the side of the open forest and wooded savannah, which has gone from 68,364 ha to 12,613 ha, i.e. a decrease or a reduction of 37.33%. This decrease is due to the increase in areas sown with yams (Dioscorea spp.), maize (Zea mays) and sorghum (Sorghum bicolor).

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