



RESEARCH ARTICLE

IMPACTS OF THE DEGRADATION OF THE FOREST FORMATIONS OF THE GUESSSELBODI FOREST ON THE RIPARIAN POPULATIONS

Koroney Abdoul-Salam, Souley Issaka Mayaki, Naroua Illiassou and Garba Hamani Farouk

Université Boubakar BA De Tillabéri, Faculté Des Sciences Agronomiques. BP : 175, Tillabéri (NIGER).

Manuscript Info

Manuscript History

Received: 05 October 2022

Final Accepted: 09 November 2022

Published: December 2022

Key words:-

Forest Formations, Guesselbodi, Plant Resources, Sustainable Management, Climate Change, Niger

Abstract

The Sahel, like most arid and semi-arid environments, is clearly a geographical area where the question of the degradation of natural resources is of concern. In this context, we have initiated a study on the socio-economic and cultural impact of the degradation of dry forest formations on the local population of Guesselbodi in Niger. The methodology mainly consisted of surveys using a participatory approach with the local population and forestry agents of the municipality of Kollo. This approach has made it possible (i) to identify the climatic risks that have a greater influence on the forest, (ii) to determine the socio-economic and cultural impacts of the effects of the degradation of dry forest formations on the local populations. The results of these investigations were able to reveal the various impacts that the local population faces such as the reduction of fauna and flora, land grabbing attempts, the dumping of incinerated toxic waste, etc. As for the adaptation strategies put in place, they are very unfortunately inadequate and contribute intensely to the degradation of the forest. The study also made it possible to make a comparison of both plant and animal species that existed in the past and today. Thus, it has been identified that 30 plant species out of the 61 initially present in the forest and 20 animal species out of the 40 initially present. This drastic decrease in the fauna and flora of the Guesselbodi forest is due not only to the destruction of their habitat but also to anthropogenic pressure.

Copy Right, IJAR, 2022,. All rights reserved.

Introduction:-

In the Sahel in general and in Niger in particular, climatic, ecological and environmental conditions are constantly deteriorating. Since the 1970s, the countries of the Sahel have been experiencing water and rainfall deficits, the consequences of which are reflected in the early drying up of surface water, the lowering of water table levels in general and the degradation of the environment (Dan Mairo, 2010). In addition to these austere climatic conditions, there is galloping population growth which contributes to significant pressure on the biophysical environment. Today, the degradation of natural resources remains a major constraint to the agrosystem development of the Sudano-Sahelian zones of West Africa.

In the years of 2000s, the area of Niger's forest estate was estimated at 16,000,000 ha, or about 2% of the national territory. This area comprised 600,000 ha of classified forest, 4,400,000 ha of so-called developable forest formations and 11,000,000 ha of so-called marginal forest land (covering less than 5%) (CNEDD, 2000).

Corresponding Author:- Koroney Abdoul-Salam

Address:- Université Boubakar BA De Tillabéri, Faculté Des Sciences Agronomiques.
BP : 175, Tillabéri (NIGER).

Forest formations are of strategic importance for the well-being of the population and the maintenance of the development possibilities of the country. Most of the population meets most of its growth needs (wood, fruit, gum, fodder, etc.) from these plant resources. For illustration, 468 species, i.e. 21.8% of the plant species inventoried in Niger, are exploited by humans in areas as varied as food, health preservation, habitat construction, crafts and culture (Mahamane, 2009). In this category, 210 plant species are of great interest in the diet of the population, particularly during periods of scarcity and starvation. As far as livestock feed is concerned, 235 species are used. In traditional pharmacopoeia, 270 species are used for various purposes and 127 species are used in crafts.

Despite this importance, the precarious climatic conditions, anthropogenic pressure and the degradation of the physicochemical properties of the soil no longer allow the maintenance of the balance between the exploitation of resources and their regeneration in space and time. All these problems result in the gradual disappearance of vegetation, the reduction of arable land, the silting up of basins, the drop in soil fertility and consequently the drop in agro-silvo-pastoral production, among others (Dan Mairo, 2010).

In Niger, biological diversity, like the socio-economic sectors, is significantly affected by the impacts of climate change. This impact results, among other things, in the compromise of agricultural production and food in several regions of the country, the fodder deficit, the insufficiency of water points, the silting up of waterways, the reduction of areas of forest formations, the decrease in fish production, the disappearance of certain species and the degradation of wildlife habitats (CNDD, 2014).

In order to contribute to the sustainable conservation of biodiversity in Niger, the State has ratified and signed a whole arsenal of legal texts relating to climate change and the conservation of biodiversity.

The Classified Forest of Guesselbodi is a typical example of forest formations whose biodiversity deserves to be preserved. It contains an entire section of the history of modern forestry in Niger and in this respect, it constitutes a forest symbol whose disappearance would constitute a significant loss for Niger, the forest services and the local populations who have benefited from it for over 60 years. The degradation of this forest is also a loss with regard to the fight against climate change, the main causes of global warming, because agriculture and forest formations are essential in the reduction of greenhouse gases.

The present study concerns this classified forest of Guesselbodi (Kollo -Niger). It consisted of a participatory approach in four (4) villages selected in the study area. This approach has made it possible to: (i) identify the climatic risks that have a major impact on the forest, (ii) determine the socio-economic, cultural and environmental impacts of the effects of the degradation of the dry forest formations of the forest on the local populations.

Presentation of the study area and the classified forest of Guesselbodi

The classified forest of Guesselbodi, object of the study, is located in the municipality of N'Dounga. A municipality which gathers all the villages of the Canton of N'Dounga, except for the village of Aoula-koira. N'Dounga-Fondobon is the capital of the municipality and is located 10.7 km west of the city of Kollo and 20.7 km south of the city of Niamey on the RN5 (national road). It is bounded to the south by the Niger River, to the north by the rural municipality of Hamdallaye, to the east by the urban municipality of Kollo and the rural municipality of Kouré and to the west by the rural municipality of Liboré. It has an area of 291 km² or 20% of that of the department of Kollo (Figure 1).

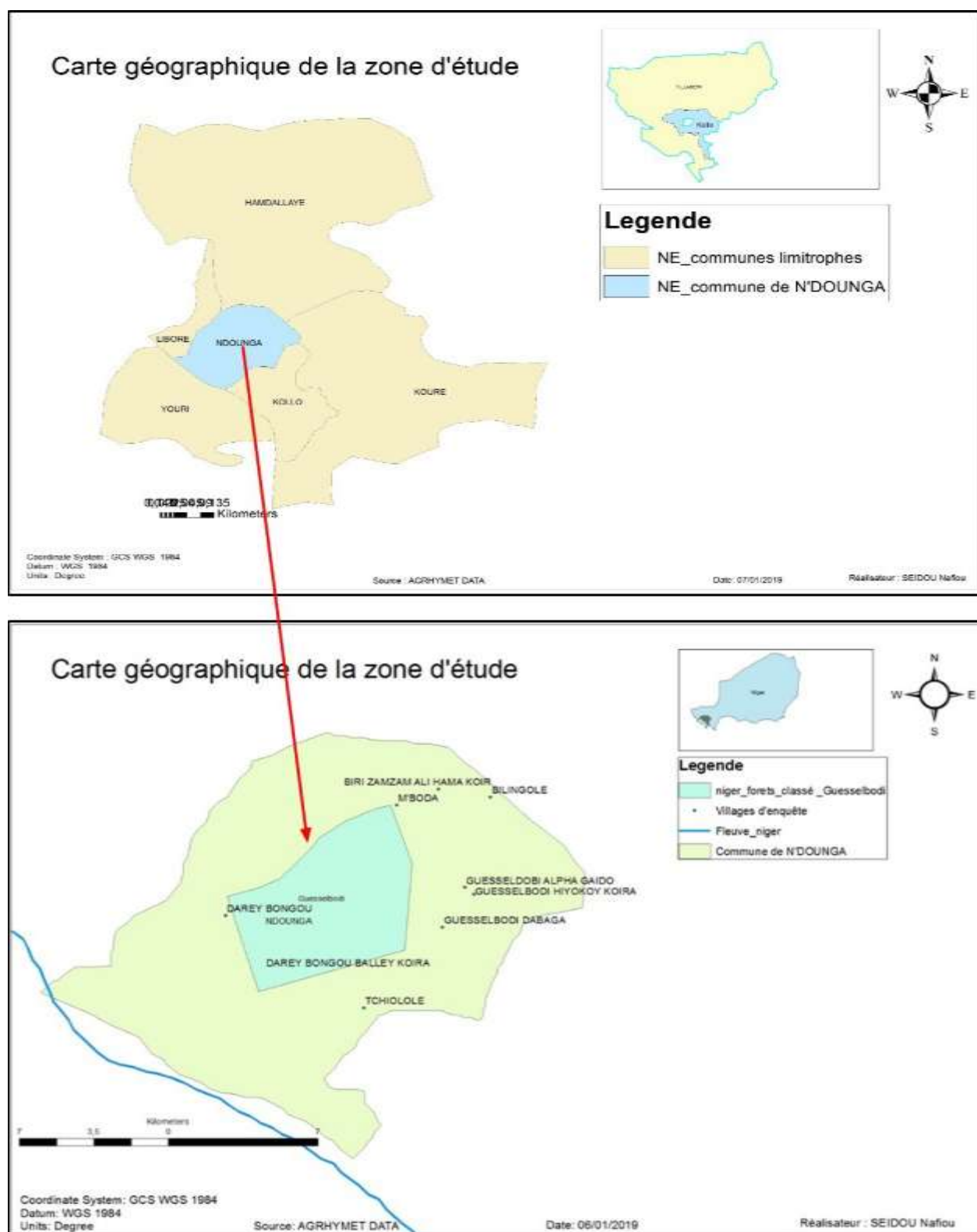


Figure 1:- Presentation of the municipality of N'Dounga, area of this study.

Guesselbodi classified forest covers an area of 5,100 ha. It was classified by decree n° 158-SE of January 12, 1948 (JO-AOF N° 2330 of January 24, 1948) on the grounds of taking charcoal wood to meet the needs of the colonial authorities. After independence, the forest was used to supply the military barracks of Niamey with wood. This forest formation is located in the rural municipality of N'Dounga, department of Kollo, about ten km southeast of the city of

Niamey. The space of the classified forest is used more or less intensely by 17 villages, including 13 in the Municipality of Niamey and 4 in the municipality of Liboré, for a population estimated in 2011 at approximately 13,500 inhabitants (Karidio et al., 2011).

The Guesselbodi forest is one of Niger's classified forests with remarkable plant diversity. Like other classified forests in the country, this forest provides firewood, service wood and other non-timber products. It plays an important role in the conservation of soil and water, helps to purify the atmosphere, to preserve biological resources (plant and animal) and to protect the capital (Figure 2) against violent winds (Zakaria, 2003).

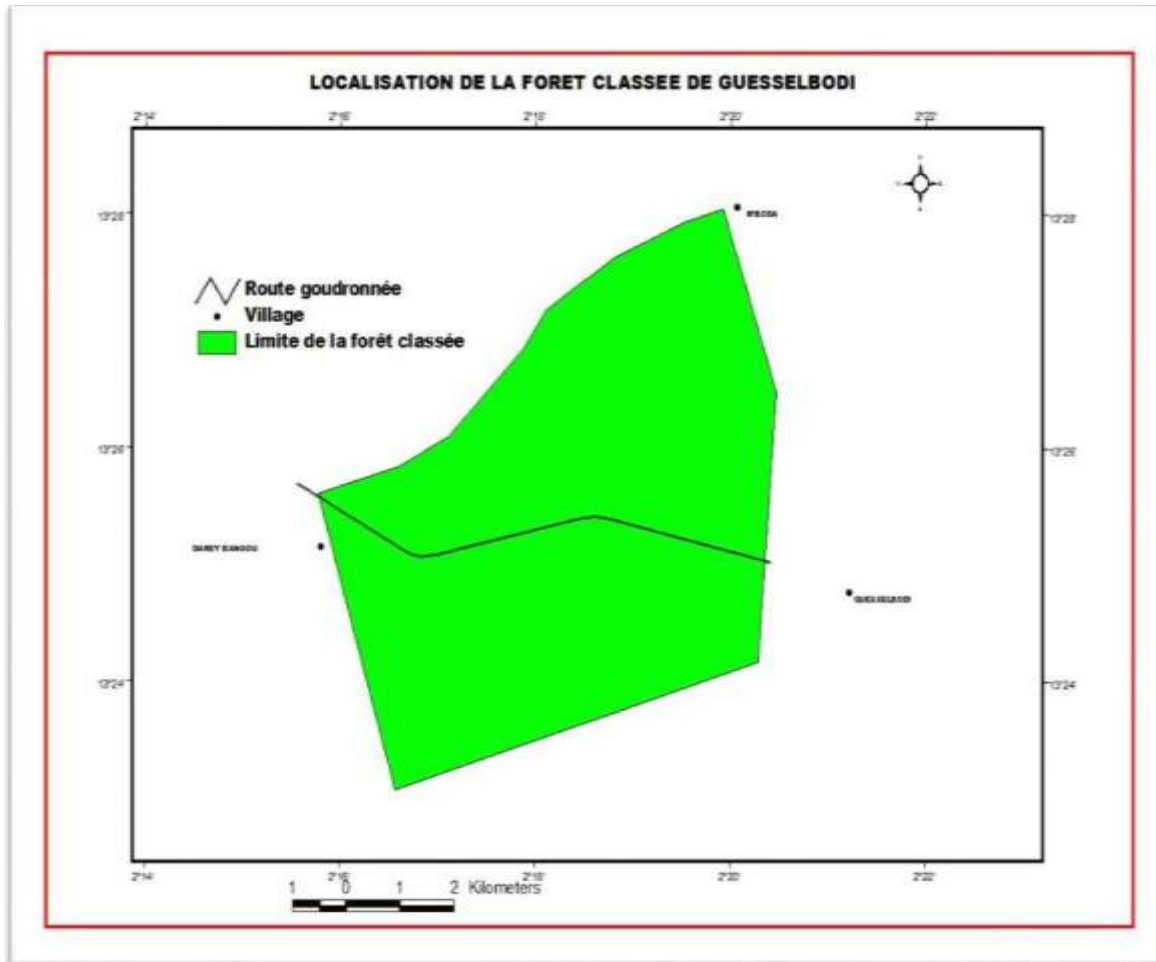


Figure 2:- Location of the Guesselbodi classified forest (DGEF, 2019).

Methodology:-

The methodology used in this study consisted of a survey using a structured questionnaire administered to the local population of the Guessebodi forest. Group interviews (focus group) as well as semi-structured individual interviews (i.e. depending on their activities) are conducted on a reasoned choice sample of resource people and groups of people who are strongly involved including chiefs of villages.

In determining the sample to be surveyed, the following criteria were taken into account:

The respondent's age, must be between 30 and 70 years old. Indeed, with this age interval, the interviewee must know the past and present situation of the Guesselbodi forest. The size of the sample surveyed is 40 participants in total, chosen according to their activities (including 10 participants in each village) with focus groups in each village; the mode of exploiting the diversity of plant resources. The behavior of the villages in relation to the forest (ie the villages were chosen spatially) since they do not degrade the forest in the same way. The study site has 9 villages namely: DareyBangou, Guesselbodi, GuesselbodiAphagaydo, Guessebodi, YokoyeKoiri, M'Boda, Tcholol, Bililgal, Birisansa and Dareyballeykoiraof which four (DareyBangou, Guesselbodi, GuesselbodiAphagaydo, M'boda) served as the targets

for field data collection. The sampling was spatially random with two villages taken on each side of the RN1. This choice was made in collaboration with the departmental forest agents of Kollo.

Results:-

Impacts of climate change and human action on the forest

At the end of the work, the main impacts linked to climate change observed on the forest and noted by the farmers of the four localities are (Figure 3):

1. increase in glazes;
2. appearance of a new pond (following the floods);
3. wind erosion;
4. water erosion;
5. ravine formation;
6. flooding of cropland (through the formation of ravines and the destruction of fields);



Figure 3:-Main consequences of climate change on the Guesselbodi classified forest: a) glazis; b) and c) water erosion; d) gully formation.

As for the consequences of the action of the local population, it was observed (Figure 4):

1. land degradation (increase in denuded areas, decrease in woody and herbaceous species, etc.);
2. excessive cutting of trees for the construction of handicraft tools;
3. land grabbing for housing or commercial purposes?
4. the construction of a railway line in the protected forest;
5. Exploiting gravel through improvised and unregulated quarries.



Figure 4:-Impacts of the action of the local population on the Guesselbodi classified forest: a) land grabbing with the installation of boundary markers; b) construction of a railway line through the classified forest; c) and d) use of wood from the forest; d) and e) gravel extraction in the classified forest.

Evolution of woody species during the period 1980-2018 in the classified forest of Guesselbodi

The identified woody species that existed before are made up of 43 species divided into 33 genera and 18 families. The dominant families are Fabaceae with 11 species, Combretaceae with 9 species, Mimosoaceae, Capparaceae, Malvaceae with 3 species each, Burseraceae and Anacardiaceae with 2 species each. All remaining families are represented by a single species (Figure5).

Currently, the woody species identified are made up of 18 species divided into 16 genera and 10 families. Thus, the dominant families are Fabaceae and Combretaceae with 5 species each. The other remaining families have only one species each (Figure5).

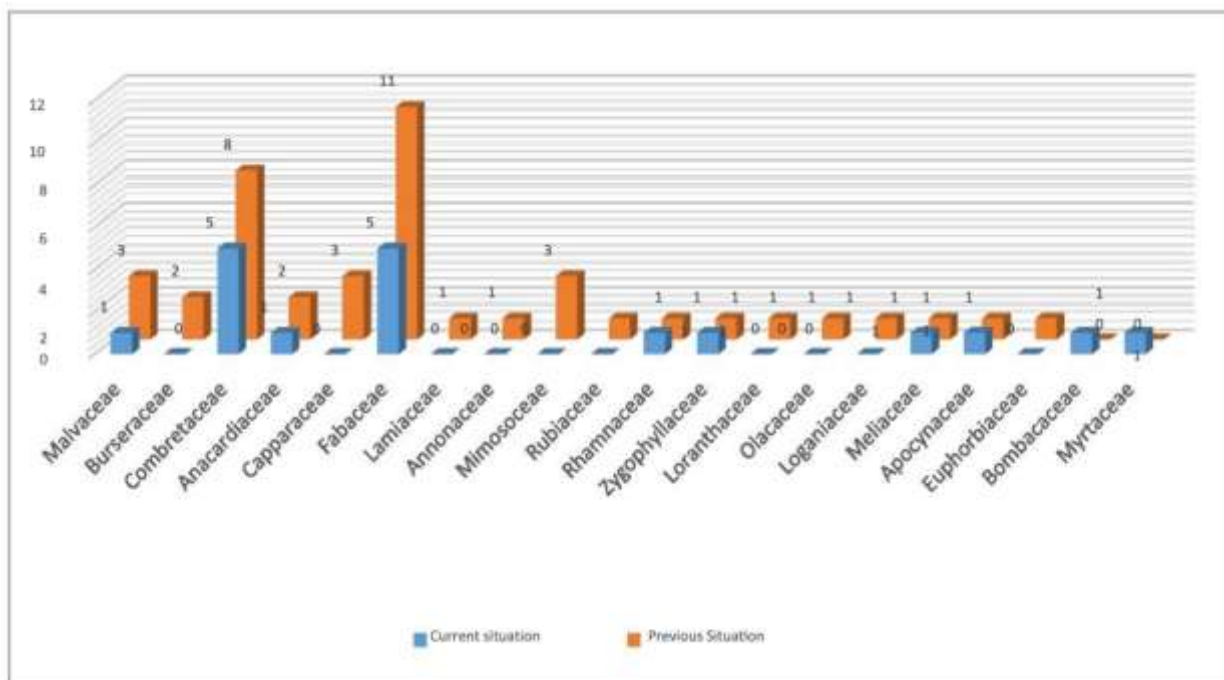


Figure 5:-The evolution of woody species in the 1980s and in 2018.

Evolution of herbaceous biodiversity between 1980 and 2018 in the Guesselbodi classified forest

The listed herbaceous species that existed before, that is to say in 1980, consist of 21 species divided into 20 genera and 8 families. Figure 4, below, gives the distribution of species according to families. Thus, the dominant families are: (i) Fabaceae and Poaceae with 7 species each and (ii) Gramineae and Euphorbiaceae with 2 species each. The other remaining families are each represented by a single species (Figure 6).

Of the 21 herbaceous species recorded in 1980, only 9 species remained in 2018, divided into 9 genera and 5 families. Table 7 gives the distribution of species according to families. Thus, the dominant families are the Poaceae with 4 species and the Fabaceae with 2 species; the other remaining families being each represented by only one species.

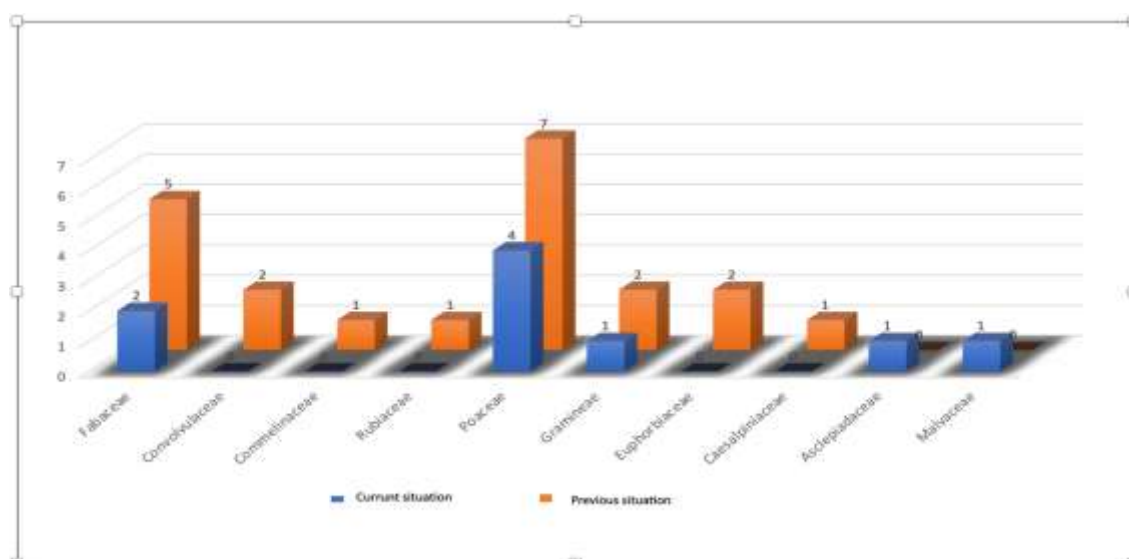


Figure 6:- Evolution of herbaceous species between 1980 and 2018.

Evolution of the fauna between 1980 and 2018 in the classified forest of Guesselbodi

The recorded animal species that existed before 1980 in the forest are made up of 40 species divided into 38 genera and 31 families. Figure 5, below, gives the distribution of these species according to the families. The dominant families are: (i) the Bovidae with 5 species, (ii) Felidae, Herpestidae, Outididae and Canidae with 2 species each, and the remaining families, represented by a single species each.

In 2018, of the 40 animal species recorded, only 20 remained, divided into 17 genera and 16 families. Table 9 gives the distribution of the said species according to the families. The dominant families are Outididae and Canidae, with 2 species each; the remaining families being each represented by a single species (Figure 7).

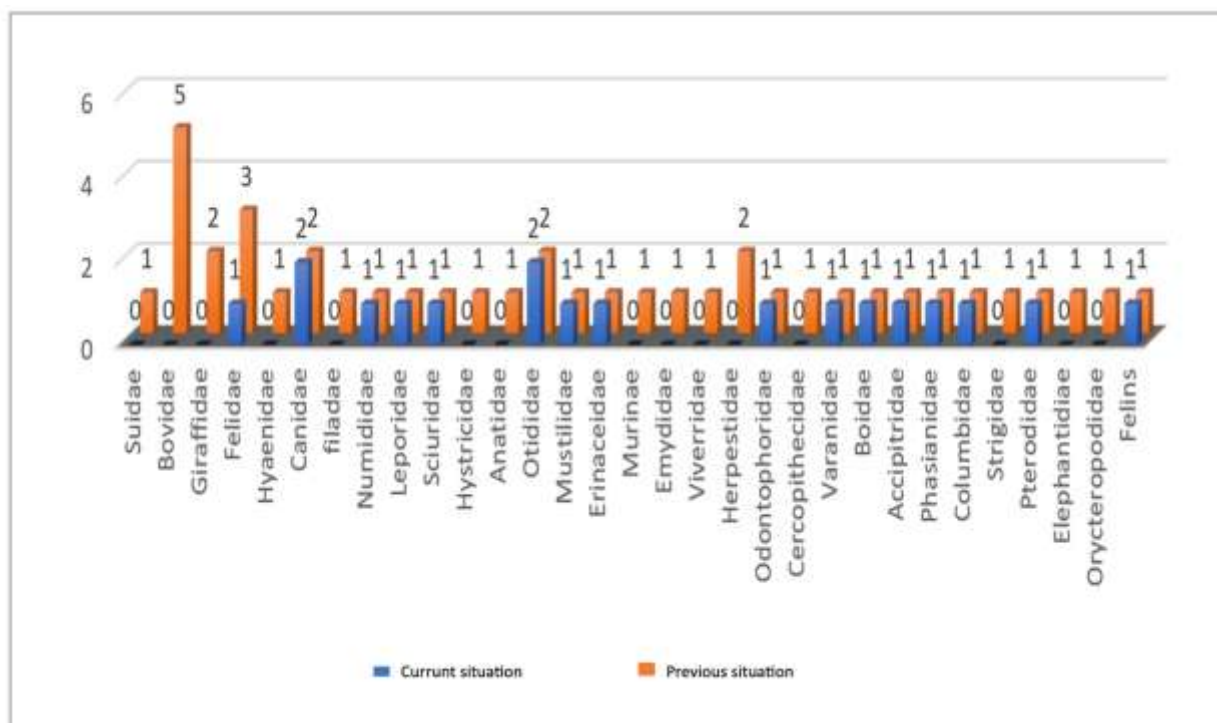


Figure 7:- Evolution of animal species between 1980 and 2018.

Discussion:-

The various interviews conducted in the villages provided a view of the forest's past. The people interviewed all reported the same comments concerning the density of the fauna and flora richness of the Guesselbodi forest. Indeed, at the time of independence (in 1960), the plant population was very dense and characteristic of the wooded savannah. The vegetation consisted of large trees and shrubs such as: *Prosopis africana*, *Entada africana*, *Diospirosmespiliformis*, *Vitellaria paradoxa*, *Combretum nigricans*, etc. Surrounding farmers do not need to travel long distances to harvest fruits, wood and herbs for the cattle. According to the local population, the pasture was very abundant and attracting transhumant herders who came from all over the country. Traders transporting and selling firewood in Niamey also obtained their supplies from this forest (Karidio et al., 2011).

The Guesselbodi forest has a remarkable plant diversity. In recent years, deforestation has led to real changes in the functioning of ecosystems and the land occupied by various plant formations. Indeed, at the time of the classification of the forest, it had a very important vegetation cover, with a forest stand dominated by *Parkia biglobosa* and *Prosopis Africana*. Today, the *Parkia* species *biglobosa* has completely disappeared from the forest. 95% of the trees surveyed in 1986 were made up of trees from the *Combretaceae* family. Of the 5,000 ha of surface area, only 2,000 ha had exploitable plant cover during the same period.

The reconstructive inventory of plant species of the forest site with the local population of Guesselbodi gave a total of 61 plant species including 18 herbaceous and 43 ligneous which existed before. These plant species are divided into 28 families including 10 herbaceous families and 18 ligneous families. At the end of the study, there were only

30 plant species left out of the 61, including 9 herbaceous and 21 ligneous. According to local residents, these plant species are divided into 13 families, including 5 herbaceous families and 8 woody families.

The information indicates that the floristic richness of the forest of the 1980's no longer existed. Indeed, in 2018 there were only 30 plant species left, divided into 29 genera and 13 families. This number is lower than that obtained by Inoussa et al., 2014 having identified, in the protected areas of the Tamou floristic reserve, 41 plant species, divided into 31 genera and 19 families. This gradual disappearance of plant species has also been revealed in the faunastation of Toukounous where animal species had passed from 57 in 2006 to 49 in 2008 (Saidou et al. 2010). At Simiri, 113 species have been inventoried, divided into 73 genera and 28 families (Karim et al., 2010).

These gaps observed would be due to the more unfavorable climatic conditions and especially to the lack of sufficient protection. They could also be explained by several other factors including: (i) the amount of rain that fell, its distribution over time and the number of rainy days in the year, (ii) climate change, (iii) the anthropogenic pressure and (iv) overgrazing etc

To limit the accelerated degradation of the Guesselbodi forest (based on the interpretation of aerial photographs that the forest has suffered a degradation exceeding 50% of its potential, the Project for Planning and Use of Soils and Forests (PUSF), undertook some activities including: (i) organizing the local population into a cooperative structure for the exploitation of firewood, (ii) planting trees (*Acacia senegal*, *Azadirachta indica*, *Acacia nilotica*), and (iii) carrying out works. Through this project, the population has benefited from many advantages including income from the sale of firewood, small domestic equipment including carts, food and cash for work through anti-erosion works and income from the sale of straw, etc. In addition to the achievements of the implementation of the PUSF, there are other plantations made by the Environmental Services of the department of Kollo and the National Institute of Agronomic Research (INRAN) of Niger which has its station housed in the forest for forestry research purposes on the various plant species (Karidio et al., 2011).

When the forest cooperative existed, it organized wood sales along the RN1 in collaboration with the villagers. From 1980 to the present day, the forest has experienced continual degradation despite multiple attempts to recover land through the intervention of various partners (water and forest services, INRAN, etc.), with degraded land recovery objectives by making half-moons to store water and the production of fodder. This was confirmed by the villagers at the time of the survey.

Attempts to reclaim land in the forest have not been successful, as most of the introduced species no longer exist and those that are present are in low proportion. The plant biodiversity of the Guesselbodi forest is mainly confronted with major problems such as low rainfall irregularly distributed over time and anthropogenic and natural activities. The once rich and varied fauna have suffered a very strong regression in its diversity and number. One would meet large mammals such as the lion, the buffalo, the hippopotamus, the hyena and the cheetah which are today entrenched in the national park of the W. As for the insects, the most frequent are the locusts, the crickets, religious mint, butterflies, termites, cicadas, bees (PDC of N' Douna, 2015).

The survey carried out on water birds makes this town a reception area for species of bird's migrant of the wet areas, are other on cattle guard (*Bubuleus*, *ibis*), the white swan (*Ciconia adendrosyngnes*), widowers (*Dendrosyngnariduata*), the crowned crane (*Balearica pavonina*) ... (PDC of N' Douna, 2015). The vegetation contained many wild animals among which there were gazelles, hyenas, buffaloes, monkeys, etc. Bird life was composed of the bustards, wild guinea fowl, etc. (Karidio et al. 2011). There is nowadays a considerable decline in the number of animals in the forest, which is due not only to the destruction of their habitat but also to the disappearance of the plant cover following the galloping demographic pressure of the local population and their activities. Despite multiple safeguarding and protection efforts, the classified forest is today exposed to many threats among which are the agricultural expansion by the installation of crops, overgrazing, the excessive cutting of trees, gravel quarrying, the installation of villages and hamlets and finally the attempts at fragmentation or development of certain parts of the forest. The latter is described by illegal land encroachments and sales.

Conclusion:-

The study made an assessment of the floristic and faunal diversity of the Guesselbodi forest and the means of adaptation of the local populations in the face of the changes observed in recent years. The analysis of the floristic statements carried out on this site made it possible to identify 30 plant species including 9 herbaceous and 21

ligneous at the end of the study against 61 plant species including 18 herbaceous and 43 ligneous which existed before 1980. The floristic diversity is therefore relatively low compared to other protected areas. Regarding the fauna, there are only 20 species left today which are divided into 17 genera and 16 families while there were 40 species distributed in 38 genera and 31 families. This decrease would be due not only to the destruction of the habitat but also to anthropogenic pressure. Unfortunately, adaptation and survival measures contribute intensely to the degradation of the forest such as gravel quarrying within the classified forest, and the manufacture of artisanal materials using wet wood.

Acknowledgments:-

The authors warmly thank Mr. Abdoul Razak KORONEY for checking the translation of the manuscript.

Bibliography:-

1. CNDD, 2014 : Cinquième rapport sur la diversité biologique. 19 pages
2. CNEDD, 2000 : Programme d'action national de lutte contre la désertification et la gestion des ressources naturelles (PAN-LCD/GRN), 15 pages
3. Dan Mario A.M. (2010) : Influence des actions anthropiques sur la diversité végétale des parcours du centre caprin de Maradi au Niger. Mémoire de Master en agronomie phytotechnie. Université Abdou Moumouni de Niamey, 36 pages
4. Maman, M. I., Abdoulaye, D., Yacoubou, B., Boubé, M., Maïnassara, Z., Ali, M., et Mahamane, S. (2014). Situation de référence de la phytodiversité et la productivité herbacée d'un dispositif de suivi du feu de brousse au Niger. *Int. J. Biol. Chem. Sci.* 8(3): 1165-1178
5. Mahamane, A., Mahamane, S., Mohamed, B.D., Karim, S., Bakasso, Y., Abdoulaye, D., Boubé, M., Inoussa, M.M., Idrissa, S., Arzika, T. (2009) : Biodiversité Végétale Au Niger : Etat Des Connaissances Actuelles. Série Sciences, Tome XVIII : 81-93
6. Karidio, O., Adamou, H., Hamidou, I., Abdoulaye, I.M., Mahamadou, A. (2011) : Etude socio-économique de la zone de la forêt classée de Guesselbodi. 39 pages
7. Karim, S., Mahamane, A., Morou, B., Saadou, M., (2010) : Dynamique de l'occupation des terres et caractéristiques de la régénération de la végétation dans la commune rurale de Simiri (Région de Tillabery, Niger). *Annales de l'Université Abdou Moumouni de Niamey*, tome xi-A pp-166-177
8. Plan de développement communal de la commune de N' Dounga (2015).
9. Saidou, O., Douma, S., Djibo, A.Z., Fortina, R., (2010) : Analyse du peuplement herbacé de la station sahélienne expérimentale de Toukounous (Niger) : composition floristique et valeur pastorale. *Secheresse*, 21(é) : 154-160
10. Zakaria, O. (2003) : Au secours à la forêt classée de Guesselbodi, Article du DDE de Kollo.