Quest Journals
Journal of Research in Humanities and Social Science
Volume 4 ~ Issue 12 (2016) pp: 22-31
ISSN(Online) : 2321-9467
www.questjournals.org

Research Paper

Impact ofpastoralism on the Afzelia Africana Natural regeneration in the Protected Forest of Kouandé.

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Received; 07 November 2016 Accepted; 10 December 2016; © The author(s) 2016. Published with open access at **www.questjournals.org**

ABSTRACT: *Anthropic activities have a share in both the environment degradation and disappearance of some tree species. The here research work on the protected forest of Kouandé which is a transit and a welcoming area for transhumant people, aims at apprehending the impact of pastoral exploitation on the Afzelia africana regeneration, and proposing measures for its conservation. Dendrometrical data have been collected from 62 circular 17.84m-ray plates. The obtained results have shown three types of habitats sheltering the species: farms, fallows and savannahs. Comparison of the density has indicated that no significant difference at a 5% sill. The maximal value of the of the density is found in the savannahs, and represents 20.60 trees per hectare land while the minimal value of the density is 10.38 trees per hectare land and is found in the fallows. Also, there is no significant difference between the pruning rates. This is30.20 stems densityfor 50% rate, and 20.05 stems for the exploitation rate superior tp 50%. Structure of the Afzelia Africana populationsin the Kouandé protected forest shows a distribution in diameter scales in the form of bell with dominance of class 35 and 45cm individuals. The risk of its disappearance is foreseeable, which urges an integral protection and conservation.*

Keywords*: Kouandé, impacts, pastoral exploitation, regeneration, Afzelia africana.*

I. INTRODUCTION

Biologic diversity in the township of Kouandé has yearly faced deep modifications due to anthropic actions. In 2012, the farmed lands were about 2367.25 ha, and the livestock were about 7539 animals, which is exclusive of the many domestic and trans-boarding transhumant cattle (ACDD, 2012).The bouvreuil breeding system specifically based on transhumance has caused overgrazing and anarchic shrubs pruning. The current state of the development and the pastoral use of Afzelia africana in the North of Cameroon show that this tree is one of the most used shrubs in the region, which accounts for the high interest set on it (Onana and Devineau, 2002). Over-exploiting that tree, together with the climate harshness and the bush fire, has affected the species regeneration possibilities.

Inventory of the vegetation, associated with a pastoral enquiry with the breeders in the Toui-Kilibo protected forest, has permitted to display the grazing situation in that forest. The total land concerned with cattle grazing has covers about 21,380 ha land, which represents 43 % of the whole forest (PGRN, 1996). As indicated by GTZ quoted by Roufaï (1996), the nearby land of the Okpara River are characterized by "very good quality pasturage with high breeding development possibilities, which marks a transit and welcoming land for transhumant". Over-pasturage effects are clearly noticeable in the dry season. Ligneous forage trees like Afzelia africana have frequently been pruned by those breeders during that period. Using ligneous forage, at the end of the dry season, can represent up to 75% of the whole time devoted to pasturage Tézenas ofMontcel (1994) said that the average contribution of the ligneous is 40% during the drought in the North of Burkina Faso. According to the findings byMeurerand al. (1991), Schleichet andSidi (1994), there is an over-exploitation of the ligneous forages up to 193% during the dry season. This means that forage trees are pruned at least once during this period, and 93% of them are pruned twice. Such results had already been announced by Sinsin and al. (2001) who have observed destruction of 100% for the africana in the regions of the Monts-Kouffé.To lessen the overuse of protected forest by nearby populations, the Benin government in 2008 through noticen°13/PR/SG/REL on April 9th, 2008, has recommended the then Minister in charge of the Environment

and the Protection of the Nature to organize frequent patrols inside the protected forests in order to reinforce their protection, and to arrest, reprimand and send out every individuals that illegally take hold of the land there. Let's remind that in Benin, 280 tree species are under threat of disappearance, 90% of which representing a high extension probability according to UICN(2011) and 10% being on UICN's red list, namelyAfzelia Africana. In the Kouandé protected forest, like in all forests in Benin, this species is highly under threat due to the pressure done on it. Facing these various facts, two fundamental questions come out:

- ✓ What is scale of Afzelia africanaexploitation by people in the protected forest ofKouandé?
- ✓ What is the impact of Afzelia africanaexploitation by the populations on the species' natural regeneration density in the protected forest of Kouandé?

Answers to these questions accounts for the choice of the present research topic: "The impact of pastoral exploitation of Afzelia Africana in the protected forest ofKouandé".The global object of this study is to analyze the impact of the exploitation of Afzelia Africana tree parts for pastoral needs, on the natural regeneration of that species in the natural ecosystems of the protected forest of Kouandé. Specifically, this study aims at: (i) comparing the density of the natural regeneration ofAfzelia africanain the different habitats of the species in the protected forest of Kouandé; (ii) testing the exploitation impacts of the Afzelia Africana tree parts on the natural regeneration density in the protected forest of Kouandé; (iii) analyzing the dynamic of the Afzelia Africana population in the protected forest of Kouandé.Intermsof hypothesis, we have the following:

the natural regeneration density of the Afzelia Africana species varies from one habitat to the other in the protected forest of Kouandé ;

the exploitation rate of theAfzelia africanatree parts has a negative influence over the natural regeneration of the species in the protected forest of Kouandé;

the Afzelia africana population dynamic is regressive in the protected forest of Kouandé.

II.STUDY AREA

Spread over a land area of about 4,560 ha, the protected forest of Kouandé is situated in the North of the township of Kouandé (in the Atacora department), between 10°17' and 10°25' North latitude, and 1°41' and 1°39' East longitude. It is limited to the North by the Fô-Tancéand Danri villages, to the South bythe Kpéssourou village, to the South-West by the villages OroukayoandGanikpérou villages, to the West by the Niarisseravillage and to the East by the Kouandé city (figure 1).

The climate in the region is of a continental Sudanese type, characterized a uni-modal hydric regime. The period of time going from October to March corresponds to the dry season (P < ETP/2) when vegetal species are submitted to a hydric stress. This dry period ends by mi-May with a monthly waterfall superior to l'ETP/2: it is the period for active vegetation. From May to September when P > ETP, vegetal species benefit from hydric resources again. Annual average rainfall are set between 900 and 1100 mm (ASECNA, 2010) ;the rain maximal height is observed in the months of July, August and September. This is a period for planting trees andfor restoring the ecosystem. The average temperature is around 27°C. The highest temperatures are obtained in the months of March and April, with a maximum 37°C, while the minimal is 15°C, and is observed between from December to January. Temperature can reach 10°C in the region, mainly during the harmattan.

The relative humidity of the air in the area is high enough, mainly in the period going from May to September. This varies from 26.2 to 82.3%. Insolation varies from 125 to 275 hours. The dominant winds generally go from South-West to North-East, while the harmattan blows from December to January and at time to February to the North-East. The potential evapotranspiration is close to 1850 mm and the hydric deficit is striking during the dry season..

The protected forest of Kouandé is set in a Sudanese zone where vegetation grow under the influence of anthropic actions, often characterized by non-adapted practices (clearing the land for farm, overexploitation of ligneous natural resources, over grazing, late bush fire, etc….).).

The following species can be found in that forest:

- forest gallery dominated by Afzelia africana,andTerminalia spp ;
- clear forest and wooded savannah, dominated byPterocarpus erinaceus, Vitellaria paradoxaandBurkeaafricana ;
- wooded and shrub savannah dominated by Vitellaria paradoxa, Parkia biglobosa andTerminalia macropteraandglaucescens ;
- cashew and teck trees and;
- mosaic cultures and fallows.

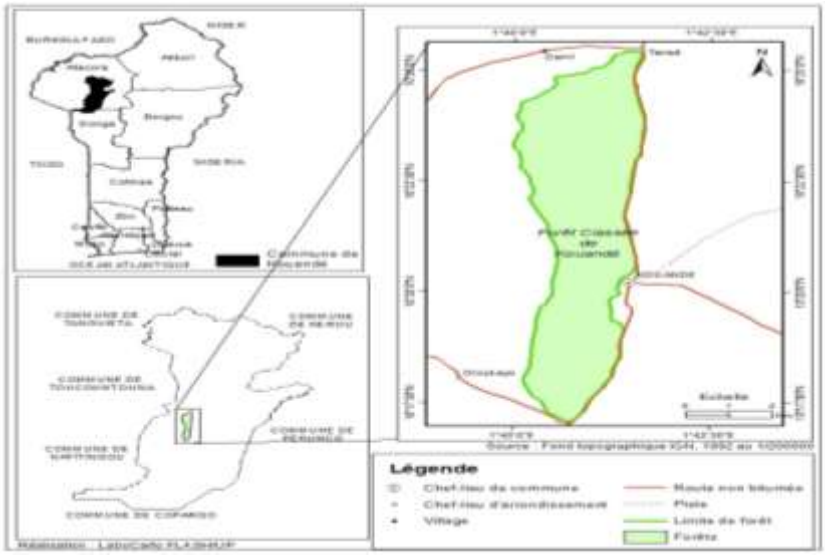

Figure 1 :Geographic location of the protected forest of Kouandé (Location of study site)

The township of Kouandé is situated in the Atacora channel, the most important mountain block of Benin. This channel stretches from East to West over 40 to 46 km wide reaching 658 m height in Alédjo. The peak in the township of Kouandé is at Kampuya (641m) in the North-West of the protected forest, in the district of Fô-Tancé. The lowest point (320 m) is in the North-East, in theMékrou valley. Land is made of quartzite and granites, geisha, migmatitsand micaschists.

According to classification by Dubroeucq (1977), the main sol types in the Kouande channel block are essentially tropical ferruginous soils such as:

- less progressed soils, almost ferruginous, laid over atacorianquartzitsand micaschistshighly dominant;
- tropicalferruginous soils, slightly clay washed and sesquioxyde washed, hardly fertile;
- tropicalGeomorphology and hydrography have ferruginous soils hardened washed, set over kaolinical land.

made of Kouandé, an ecologically fragile township through its position over an uneven slopebasin.

The hydrographic regime is less dense, with a permanent flowing river (Tikoundarou), but this is submitted to non-adapted cultures, which provokes a continuous sanding. This is a saxicolous forest, with trees hardly reaching 7m high. The protected forest of Kouandé is situated over a very uneven relief with a peak at a mountain zone belonging to the Atacora channel (641 m altitude). The country's land surface is 50 % made of hills while flat lands and valleys hold respectively34.1 and 15.91% of the land.

Auto-evaluation of the fauna during the past twenty years with the actors and the results from the PGFTR numbering (2010),have revealed a high regression of the wild fauna, and a loss of the fauna diversity due poaching, bush fire, agriculture based on burning lands, illegal forest exploitation and transhumance. The higher the demand is, the more striking the destruction rythm is.The whole forest is referred to for grazing. Ligneous forages like Afzelia africana, Pterocarpus erinaceus, Khaya senegalensisandVernoniacolorataare systematically destroyed by breeders on their way. Herbaceous stratus is covered by species of good forage value such as: Andropogon gayanus, Brachiariafalcifera, Andropogonchinensis, Hyparrheniasubpluimosa, Hyparrheniainvolucrata, Andropogonschirensis, Pennisetumpolystachion, Loudetia simplex, Tephrosiapedicellata, Stylosanteserecta.All these pastoral resources have favored transhumant breeders' rushing into the protected forest of Kouandé.

The TikoudarouRiverconstitutesthe only permanent river crossing the forest block. Also, there are water points for pastoral use in the surrounding area. These are strongly referred to by breeders; these include the Péssourouand Sowa (Sékogourou) water points.

Research methodology

The collection of data has been done through documentary research and observation.

Documentary research

This is concerned with an approach consisting in the synthesis of knowledge based on the topic, nationwide as well as on the international scale through existing documents. In this context, documentation centers, libraries, appropriate institutions, internet sites have been covered. The kind of data collected concern specific methodological information about the Afzelia Africana species.

Data collection materials and tools

The materials used on the field for data collection include:

- somevegetation maps about the Kouandé protected forest, compasses and aGPS,for locating survey points;
- adendrometer and a clinometer, two ribands of 1.5m and 3m, and forestery compasses for the dendrométric measures ;
- a claw and some pieces of chalk, some bomb paint and cords for identifying the placets;
- some data collection forms, and a pen for taking notes;
- gamblits, machetes and sickles for opening layons;
- a numerical photographic device for taking pictures;
-a good functioning state motorbike for transportation.

Sampling

The data collection system has been set up following a random sampling. The sampling corresponds to a fraction population of all trees concerned. The most often sampling units or of defined surface placets are: the square, the rectangle, the ribbon and the circle. The most favorableform of a placet is the one which, with an equal area, represents the smaller perimeter scale so that the number of trees on the limit of the placet is the most reduced possible. This condition is fully met by the circular form, which in addition allows a rapid delimitation. The placeaux have a 17.84m ray dimension.

In all, sixty-two 1000 m² circular placeaux have been installed and recorded using a GPS. All the Afzelia africana trees found on each placeau have been counted and measured.

Methods of data collection

The collection of data has followed the specific objective method.This has consisted in:

- compaining the Afzelia africana populations' natural regeneration density in the different habitats of the species in the protected forest of de Kouandé. Some 17.84m ray (1000 m²) placeaux have been placed around each stem tree inside the placeaux in the farms, the fallows and the savannahs. The stem tree is considered as the placeau center. Inside each placeau, all Afzelia africana wood fragments have been counted.
- Testing the organ exploitation impacts over the natural regeneration density of theAfzeliapopulations in the protected forest of Kouandé; each Afzelia Africana treebranches cutting rate, its back removing rate and its natural wounding rate have been evaluated. As for branches cutting, all main branches have been considered. Then, all those branches have been counted as well as the relation between cut and non-cut branches.This has allowed determining the branches cutting rate. As for the tree back removing and the trunks natural wounds, the truck's perimeter has been calculated. Then, the wounded area has been measured before a ratio is done to find out the natural tree back wound's rate..

- Analyzing the Afzelia africana population dynamic in the protected forest of Kouandé, the number of Afzelia africana trees inside each placeau has been evaluated. The diameter of the trees has been measured 1.30m from the soil using forestry compassesinside the different placeaux for the characterization of the demographic structure of Afzelia Africana spread through the different habitats. The diametrical structure and the individuals' density calculation (adults and regeneration) have allowed analyzing the Afzelia africana populations' dynamic. Figure 2 shows the setting of the two different study placeaux in the protected forest of Kouandé.

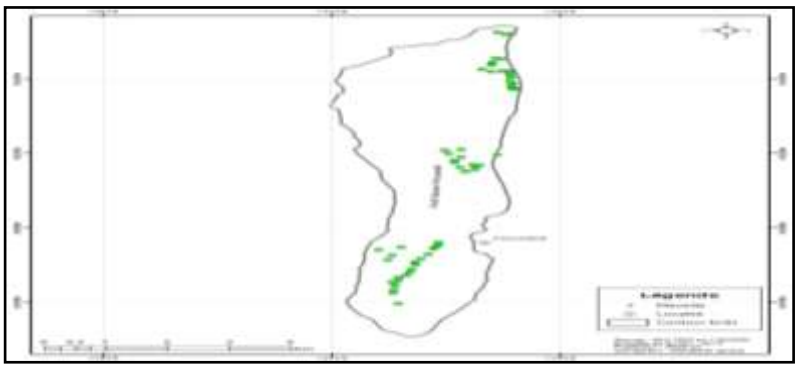

Figure 2: Location of the Afzelia Africana species

Data analysis methods

Data analysis has also been done following the specific objective method. This has allowed verifying the corresponding hypothesis.

- To test that Afzelia africana populations' natural regeneration density varies from one habitat to the other in the protected forest of Kouandé,the «t» test of Student has been used up to 5% and this has helped compare the averages of the natural density per habitat. If the obtained probability is inferior to 5%, the difference is said to be significant; when the probability value isinferior to 1% it is said to be highly significant. When this is superior to 5%, it is concluded that there is no difference between the observed averages.

- To justify that the Afzelia africana organ exploitation rate has a negative influence its natural regeneration in the protected forest of Kouandé, two modalities have been defined for the exploitation factors' rate (branches cutting, tree back removing and natural wounds): modality1- "exploitation rate inferior to 50 % and modality 2- exploitation rate superior or equal to 50 %. The normality, homogeneity test, and the « t » test of Student have been used up to 5%, which has allowed comparing the natural regeneration density averages per type and per exploitation rate. If the obtained probability is inferior to 5%, the difference is said to be significant; when this is inferior to 1% it is said to be highly significant. When the probability value is superior to 5%, it is concluded that there is no difference between the observed averages.

Dynamic of theAfzelia africanapopulation is regressive in the protected forest of Kouandé. The study of that dynamic is done from trees diameter class distribution. The Weibull three parameters distribution (GlèlèKaka and al, 2006) has been used. This Weibull adjustment has permitted to define dynamic evolution of the vegetal populations through the form of the curves. The 'inverted J' form showsanprogressive dynamic where individuals of the 15cm class are predominant. Here, there is disturbance and the population has to be reconstituted, and the dynamic is progressive when there is no disturbance.The 'bell' form indicates an aging population with predominance of higher diameter class trees. This population is meant de disappear. The natural regeneration density has to be calculated in these kinds of populations, and determinants factors have to be identified in order to find appropriate solutions.

Findings and discussion

At the end of the field inquiry on the impact of the pastoral exploitation over Afzelia africana natural regeneration, many parameters have been measured. They include i)the Afzelia africana populations' natural regeneration density which varies from one habitat to the other in the protected forest of Kouandé and ii) the Afzelia africana organs'exploitation rate which influences negatively the natural regeneration of the species in the protected forest of Kouandé. iii) The Afzelia africana populations' dynamic which is regressive in the protected forest of Kouandé.Study of the Afzelia africana population dynamic in the protected forest of Kouandé has been carried out through three distributions per tree diameter class.The Weibull three parameter distributions (Glèlè-Kakaïand al, 2006) has been used.

Population and economic activities

The surrounding population of the protected forest is evaluated to about à 57,832 inhabitants with 50.24% women and 49.76% men, according to the last census in 2013 (INSAE, RGPH4).
Figure 3 illustratesthe protected forest's surrounding populations' distribution per gender.

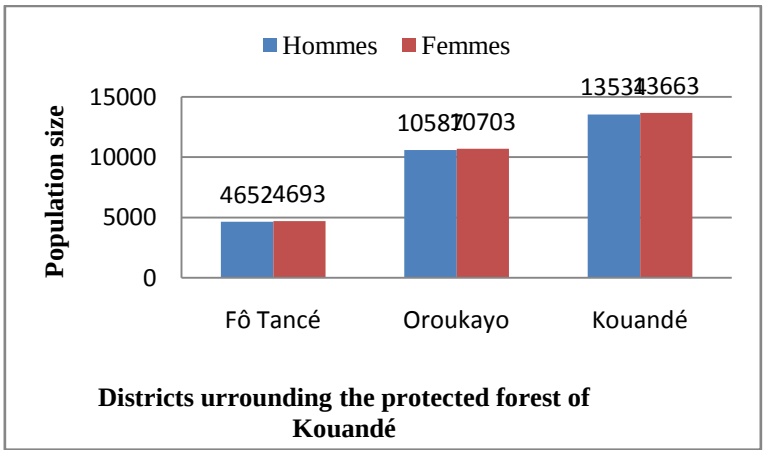

Figure 3 : Populations distribution based on gender, around the Kouandé protected forest
Source : INSAE, $RGPH_4$

The number of people living around the protected forest was evaluated to20,796, which represented 49.78% of women and 50.22% of men according to the 2002 census (INSAE, $RGPH_3$).Comparatively to the 2013 census indicated above, the population there has grown up to 139.04%.

Inter-ethnic and religious relations

Three large sociocultural groups are dominant in the social setting of the Kouandé protected forest villages. They include theBaatombu (46.3%), theNatimba(24%)and the FulaniorFulfulde(17.9%). The rest of people aretheYom,the Lokpa, the Dendi, the Bétamaribè, the Yorouba, the Adja, the Fon and others. These ethnic groups are related the ones to the others by history and by the solidarity spirit which they have been developing through the economic activities(PAPFK, 2013).

Those different people practice many religions of which we have Islam (38.5%) and traditional religions (30.2 %). Then come Catholicism (14.8 %), and Protestantism (1 %) and others (15.6 %), (PAPFK, 2013).

Economic Activities

Three main economic activities are practiced in the study area. They include agriculture, breeding and fishing..

Agriculture constitutes theprincipal activity of the Kouandé protected forest surrounding populations. This is practices in majority by the Baatombu, the Natimba but also by the sedentary Fulani communities.It is a pluvial and annual agriculture, characterized by low yields due to shortage of farming lands,lowering of soil fertility, lack of integrated agriculture, the short length of fallows and soil compactness due to bouvreuil' actions. The main cultures are maize, yams and sorghum. The other cultures include mil, soy, cashewnuts and cassava. The cultural techniques are based on maize-mil, yams-mil and cassava niebeassociations.Cotton is not grown inside the protected forest. Cashenut plantations are taking extensive proportions; they often set up in combination with annual cultures for the two or three first years. According farming statistics, farm lands cover about 291,539 ha, which represents 64.8% farm lands (PAPFK, 2013).

Breeding in that zone is essentially based on traditional systems.. Most households dispose of small breeding made of ovine, caprine, pocks and poultry. Bovine breeding is essentially practiced by the sedentary Fulani. The sedentary cattle is mainly concentrated in the Danri, PessourouandBoréareas.Table I presents the number of cows in the cattle each of the forest surrounding villages.

Tableau I: Bovine cattle population around the protected forest of Kouandé

Surrounding villages	Bovine number	Ovine number	Caprine number
Péssourou	803	440	182
Boré	605	550	726
Tikou	394	495	847
Fô-Tancé &Danri	1055	2695	1053
Niarisséra	86	81	48
Ganikpérou	101	-	-
Orou-Kayo	502	-	-
Kouandé	253	3300	7744
Sékogourou	1870	825	726
Doh et Sayakrou	1870	4400	3025
Total	**7539**	**12786**	**14351**

Sources: APIC-PGFTR 2011and Breeding Services, 2014.

According to table 1, the total number of bovines is 7,539, the number of ovine is 12,786and the number ofcaprine is 14,351. These data reveal that the caprine are more important in number, followed by ovine and then the bovines.These observations show that the caprine are concentrated in DohandSayakouwhile the bovines are concentrated inSékogourou.

Influence of the habitat type on the Afzelia Africana natural regeneration

The natural regeneration of the Afzelia Africana populationshas been taken into account in the different types of habitats in the protected forest of Kouandé. These habitats include the forest natural ecosystems (savannah and saxicolous savannah) and the agro-ecosystems (farms and fallows).Table II shows the average error types of the Afzelia africana natural regeneration density in the different habitats of Kouandé protected forest.

Table II : Average and error types ofAfzelia africana annual regeneration density in the different habitats of the protected forest of Kouandé.

Parameters	Averages	Error type	Probability
Champs	20,33	1,05	0,53
Jachères	10	0,62	
Savanes	20,60	0,44	
Savanes saxicoles	10,38	1,15	

Source : field inquiry dada AGUESSI, 2015

Comparing the Afzelia Africana natural regeneration density in the different existing habitat types using Student's statistic test has shown that there is no significant difference up to 5% for the natural regeneration density. The results are presented in table 3. Indeed, the resulting probability is equal to 0.53 % (then superior to 5 %). Nonetheless, the highest density is recorded in the savannah (20.60 stems/ha) followed by the one obtained from farms (20.33 stemss/ha). The lowest regeneration density values are obtained in the fallows and the saxicolous savannah (respectively 10 stems/ha and 10.38 stems/ha).

Impacts of the Afzelia Africana exploitationon the species natural regeneration

In order to apprehend the effects of the Afzelia africana exploitation on the species natural regeneration, the exploitation rate has been evaluated for each tree stem. This has permitted to analyze the impact of that practice on the species natural regeneration which is already set in a naturally non-favorable area. Exploitations that have been taken into account include branches cutting, the tree back removing and the trunk's natural wounds. Picture 1 shows a Fulani found in a flagrant misdemeanor of cutting branches from a Afzelia Africana tree to feed his cows.

Photo 1: Pruning of an Afzelia africana tree by a Fulani
Picture by: AGUESSI, May, 2015.

The average density of the natural regeneration is 20.34 ± 0.38 stems/tree/ha.For isolated Afzelia africana trees, the branches cutting, tree back removing and the natural wound rate has been evaluated following two modes: inferior to 50 % and superior to 50 %. There is no significant difference up to 5 % for the regeneration density of these two modes concerning the branches cutting and the tree back removing (p respectively equal to 0.11 % and 0.74 %). Nevertheless, as for the branches cutting, when the exploitation rate is inferior to 50%, the natural regeneration density is 30.20 ± 0.96 stems/tree/ha.
Table IIIpresents the averages and errors types of the Afzelia africana natural regeneration density following exploitation parameters together with their rates.

Table III: Averages and error type of the Afzelia africana natural regeneration density according to the exploitation parameters and their rate

Dependentvariables	Independent variables	Averages	Error type	Probabilité
Regeneration density (Nbr stems/tree/ha)	respective pruning rates (> 50% et ≤ 50%)	30,20	0,96	0,11
		20,05	0,39	
	respective tree back removing rate (> 50% et ≤ 50%)	20,61	0,5	0,74
		10,92	0,57	
	Respective natural wounds rate (> 50% et ≤ 50%)	20,90	0,49	0,001
		10,65	0,58	

Source: Field inquiry data, Aguessi 2015

When these rates exceed 50%, this density falls and has the following value: 20.05 ± 0.39 stems/tree/ha. As for the tree back removing, the regeneration density falls when the exploitation rate grows. Then, below 50 % of tree back removing regeneration density is 20.61 ± 0.5 stems/tree/ha and this reaches 10.92 ± 0.57 stems/tree/ha for more than 50 % of exploitation.

As for the Afzelia africana natural wound, the difference is significant up to 5 % and the obtained p probability is equal to 0.001 %. When the Afzelia africana natural wound has rate inferior to 50 %, the natural regeneration density has the value 20.90 ± 0.49 stems/tree/ha. When its rate is superior to 50 % this becomes weak and its value is 10.65 ± 0.58 stems/tree/ha.

TableIV presentsthe Afzelia africana natural regeneration density average error types following evolution of diameter class center of the trees studied inside the protected forest of Kouandé.

Table IV: Averages and error type of the Afzelia africana natural regeneration density based on evolution of the diameters class center of the trees studied stool in the Kouande protected forest

Dependent variables	independentvariables	Average	Error type	Probability
Regeneration density (Nbr of stem /tree)	25 cm	10,10	0,76	0,006
	35 cm	10,94	0,62	
	45 cm	20,40	0,84	
	55 cm et plus	30,93	0,79	

Source: Field inquiry data, Aguessi 2015

Other factors typical to the Afzelia africana trees can also act on the regeneration dynamic. This is concerned with the structural parameters such as the tree diameter, the trunk diameter. Here the ddh diameter of the trees are considered, and there is a highly significant difference up to 5 % (p=0.006) for the Afzelia Africana natural regeneration density per tree per hectare. Then, the average density of the natural regeneration decreases with the tree ddh.At the level of the diameter class center 25 cm and 35 cm, this density is respectively equal to10.10 ± 0.76 stem/tree/ha and 10.94 ± 0.62 stems/tree/ha. This value of the obtained density at level of the 25 cm and diameter 35 cm class center sis doubled when it is concerned with the 45 cm diameter class center, and tripled from the 55 cm diameter class center and more (respectively 20.40 ± 0.84 stem/tree/ha and 30.93 ± 0.79 stem/tree/ha).

Afzelia africana populations dynamic in the protected forest of Kouandé

Afzelia africana populations' individuals density in the protected forest of Kouandé with a diameter ≥ 10 cm is 6 trees/ha. The best adjustment of this Weibull distribution of individuals per diameter class has threeparameters. Figure 4 presents the Afzelia africana individuals' distribution per diameter class in the protected forest of Kouandé.

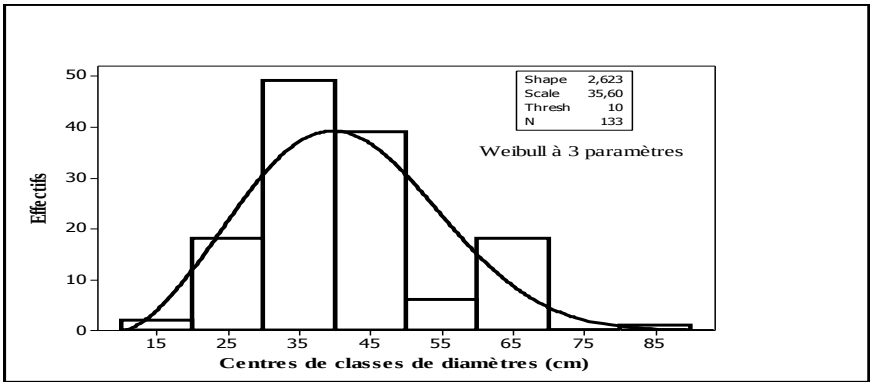

Figure 4: Distribution of Afzelia africana individuals based on diameters class

Source: Field inquiry data, AGUESSI 2015.

The individuals' diameter class distribution of those populations presents a curve in the form of a "bell". The form parameter is set between 1 and 3.6, precisely 2.62. It is an asymmetrical positive distribution positive centered on individuals belonging to diameter class centers 35 and 45 cm.

III. DISCUSSION

The obtained results through Student's comparison « t » test show that the habitats type has an influence on the Afzelia africana natural regeneration density. These differences can be due to the habitat type from a pedological view point (nature of the soil) or to humans' access to ligneous resources. According to pedology, the soil at the level of the farms, the fallows and the savannahs is favorable to germination and to the survival of fragments from the vegetal species' natural regeneration, contrarily to the soil of those saxicolous savannahs where there is much gravel that could halt germination. On the soil of those saxicolous savannahs, Afzelia Africana grains can fall over the gravels where they will stay longer and then lose their germination power. Other grains can germinate but will not survive. As for humans' access, fallows and savannahs are easily accessible for pasturage, contrarily to farms where there remain cultures that bovines must not destroy, and the saxicolous savannahs that are hardly accessible. In the areas accessible to the bovines, there are natural regeneration plants that will be grazed or stepped over; and although these habitats favor germination the natural regeneration density will always be weak. Houéhanou, (2014) made the same remarks about the

Bombaxcostatum natural regeneration in the Borgou, Alibori and Atacora departments, in a Sudanese zone where regeneration of the B. costatumis under the double effect of grazing and fragments and gaulis' stepping over by the bovines. Also, the obtained results about the Afzelia africana natural regeneration are probably due to the fact that all the air part of the species is all the time fully exploited as forage ligneous. This does not permit flourishing anymore, and as a consequence fruit and grain germination are not possible..

The different obtained results as for the Afzelia africana exploitation have indicated a negative impact on the species natural regeneration.This impact becomes striking when the exploitation rate increases and goes beyond 50 %. The same observations are made on isolated Pentadesmabutyracea trees in Sudanese and Sudano-guinean zones in Benin(Zinsou, 2014). According to that author, the exploitation level is one of the factors that weaken the Pentadesmabutyraceafruit production. And if fruit production is affected, it is clear that natural regeneration will be very weak, since without grains, no new vegetation will grow, and this is natural.The cutting of tree branches no more allow the Afzelia Africana trees to have fruits, and then, the natural regeneration is handicapped. In the study area, it is hard that trees produce fruits. It is those branches that are let which produce fruits. You have to reach the peak of the mountain where the cattle do not go before you can have fruits on some trees. When those fruits are mature, some grains fall up to the mountain side. These grains will germinate later during the rainy season. But here again, those young plants may not have opportunity to grow because of weeding, and foot stepping, and or grazing by the bovines.

If individually, these different types of exploitation have a negative impact on the natural regeneration dynamic, the effects of the latter would be more striking if they were combined, while the area is already naturally non favorable to the dynamic of the vegetal.

Afzelia africana individuals' diameter also has an impact on the regeneration density. Indeed, the natural regeneration varies according to the diameter class center. These observations could be due to the fact that the 25cm and 35 cm diameter class centers represent the "adults 1" classes which have started fruits production, and as such the annual regeneration in their area goes along with their average productivity. When these trees reach "adult 2" stage, their fruit productivity will increase, and consequently the natural regeneration density in their area will also be important.

The population dynamic of a vegetal species goes through the annual regeneration density, survival of this natural regeneration and the proportion of individuals of small diameter classes (Ouédraogo, 2008). According to this author, the paces in"J"and "bell"of the diameter class distribution histograms mean young, aging, and/or disturbed populations. The aging state of the trees is shown by weak proportion of small class diameter individuals. (Ouédraogo, 2008). This is the case with the Afzelia africana populations in the protected forest of Kouandé that have a pace in the form of a ''bell''. These populations are very aging because they are dominated by very aged trees. Younger trees of 15 cm and 25 cm diameter class centers which are meant to replace the aging class are in weak proportion. Also, the regeneration density is weak in these populations(20.34 ± 0.38 stems/trees/ha).

The results are due to the fact that the anthropic pressure on this species is strong (forage ligneousvery important for bovine breeders). These breeders take care of existing trees and they no more think of helping renew these tree populations. They would cut branches from trees that are starting flourishing towards the end of the dry season. These trees will then be incapable of flourishing let alone producing fruits.When new leaves come, those breeders will come again to take them for the bovine. Such trees henceforth belong to whole category of ligneous forage, and will never produce fruits again the rest of their life, until woodworkers come to cut them and remove the timber. These Afzelia africana population from the protected forest of Kouandéare meant to be extinguished if no solution is found soon.

IV. CONCLUSION

This research work highlights the influence of Afzelia africana exploitation, which affects the species' natural regeneration. Anthropic pressures (cutting branches, removing the tree back) have negative impacts on the species, which does not guarantee its progression dynamic.Indeed, the protected forest of Kouandé is situated in the Sudanese zone where climate does not allow a good vegetation development. At the same time, the breeding of bovine is highly developed, which increases the needs in ligneous forage resources. Likewise, the management modes of natural vegetal species in the protected forest of Kouandé are based on no resource conservation norms.As such ecosystems' degradation in that forest is daily worsened under the influence of anthropic activities.People there are mostly peasants and the existing exploitation systems in the study area do not favor regeneration of the natural resources.The progressive extension of anthropic occupation units explains the on-going deforestation prejudicial to the environment. This causes a regressive evolution of the vegetal surface with as consequence, the reduction of the vegetal biodiversity.

In the present research work, the adult and Afzelia africana natural regeneration density is weak. Also, existing populations are aging and the anthropic pressure still goes on. If this continues, and if the species' exploitation rhythm remains constant, form now to five or ten year time, the species will disappear from the

area. It is then urgent that strong measures be taken for a sustainable conservation of the natural resources in general, and the ligneous forage in particular, since conservation and sustainable management of natural resources have become important components in the process of community development.

ACKNOWLEDGEMENTS

At the end this research work, we would like to thank officials of the Northern Forestry Office and the Regional Office of Water and Forests, the Local Committee for Natural Resources Management, as well as Local traditional Official and the various Kouandé. Lastly, we would like to tell our gratefulness to the authorities of the University of Parakou for their technical assistance,

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