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Nature and management of human-elephant conflicts around the Dassioko classified forest on the Ivorian coastline

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1 ABSTRACT

In Côte d'Ivoire, conflicts between humans and elephants species (HEC) *Loxodonta Africana* classified as vulnerable in UICN red list occur around some protected area. This conflict occurs around the Dassioko Classified Forest (DCF) between human population and a small herd of elephants that have migrated into this forest. Agriculture and human settlements within or adjacent to DCF typically result in this conflict. This study aims to determine both the nature and management of HEC in order to implement a sustained conservation strategy for both the DCF and the elephants. The survey was done using a standardized questionnaire formulated by AFESG (African Elephant Specialist Group)with slight adaptations as well as on the damage that elephants have caused to villager's properties. Direct observations were then conducted in the fields around the DCF through plots measuring 2000 x 1000 m^2 to confirm and assess the extent of the damage. All damage reported was done by the small herd of elephants, which, are increasingly threatened. For mitigating this conflict, human population address some methods (beating drums, using firecrackers, or even burning the animals with lighted torches, or shooting in the air) unfortunately seem to be ineffective. For both sustainable conservation of this forest and the dwindle elephants, the government has to promote successful means to repel elephants into the farmlands.

2 INTRODUCTION

Forests worldwide are facing an unsustainable exploitation, resulting in massive destruction and fragmentation of forests **(**Oliveri and Vitalis, 2000). The deforestation rate in Côte d'Ivoire is one of the highest in the world (Koné *et al.,* 2012). Forests are exploited mainly for farming practices (Gonédélé bi and Bitty 2011; Bitty *et al.,* 2015). The primary consequence of this deforestation is the loss and fragmentation of natural wildlife habitats (Oliveri and Vitalis, 2000), which encourages other human activities such as poaching (Béné *et al.,* 2013 ; Béné *et al.,* 2015 ; Bamba *et al.,* 2017). As a result, national parks, nature reserves and other classified forests are the only remaining habitats for the country's wildlife species. Representatives of different zoological groups in these different habitats ranged from least concerned to conservation

concerned, according to (Béné *et al.,* 2015). It is the case of Elephant *Loxodonta Africana*, classified as vulnerable (VU) by Union for the Conservation of Nature UICN (2017) red list but classified as Endangered in Côte d'Ivoire. Based on the results of inventories carried out between 1987 and 2000, the elephants' population was estimated at around 1100 in Côte d'Ivoire. Currently, the country has less than 500 individuals (MINEF, 2018). The situation is even more deplorable because, outside the population of the two national parks Taï and Comoé, estimated at 180 and 120 individuals respectively, only small groups of 2 to 13 individuals or even solitary individuals are reported elsewhere in the country (MINEF, 2018). The Ivorian coastline is one of those areas that still containing small elephant populations. However, it is an extremely sensitive area characterized by a rapid increase in the human population causing the accelerated degradation of forests (MINEF, 2004). With the loss of their habitats, elephants in the region undertake repeated incursions into surrounding farmland. The damage caused in this context is enormous for the rural communities. Studies conducted around some protected forests in Côte d'Ivoire have shown that the methods of protection against such elephant damage practiced by the population are limited to traditional methods (e.g. screams, various noises, smoke and fires). These methods have proved ineffective and people no longer hesitate to shoot elephants (Soulemane O, 2002; Ouattara *et a*l., 2010; MINEF, 2004, 2018). This is contrary to the dynamism with which the country undertook its intentions by ratifying the international conventions on sustainable conservation of natural resources. Understanding the nature of HEC, the methods and means attempt to reduce HEC can provide useful information for developing methods to mitigate sustainably this conflict. This study was aimed to participate in the sustainable management of the suspicious elephant population in the Dassioko classified forest (DCF). The specific objectives were to characterize the nature of conflicts encountered around this forest, evaluate the extent of the damage caused by elephants and investigate existing crop protection methods used in the area and their effectiveness.

3 MATERIAL AND METHODS

3.1 Study environment: The DCF (Figure 1) belongs to the rain forest area of Guinean domain. It is an evergreen lowland forest (Guillaumet and Adjanohoun, 1971), characterized by several types of vegetation including land forest, swampy forest on hydromorphic soils and coastal thickets. This diversity of habitats inhabited by a wide range of wildlife, from entomo-fauna to mammalian and fish species. Recent studies conducted within the DCF have revealed the presence of 19 species of large mammals distributed within six families (Elephantidae, Hippopotamidae, Bovidae, Suidae, Cercopithecidae and Pongidae) (Yao, 2013). The communities around this forest are involved in several activities carried out near the DCF. However, agriculture is the dominating form of human activity and concerns coffee, cocoa, rubber, oil palm, coconut and citrus for commercial crops. Food crops are dominated by cassava and rice.

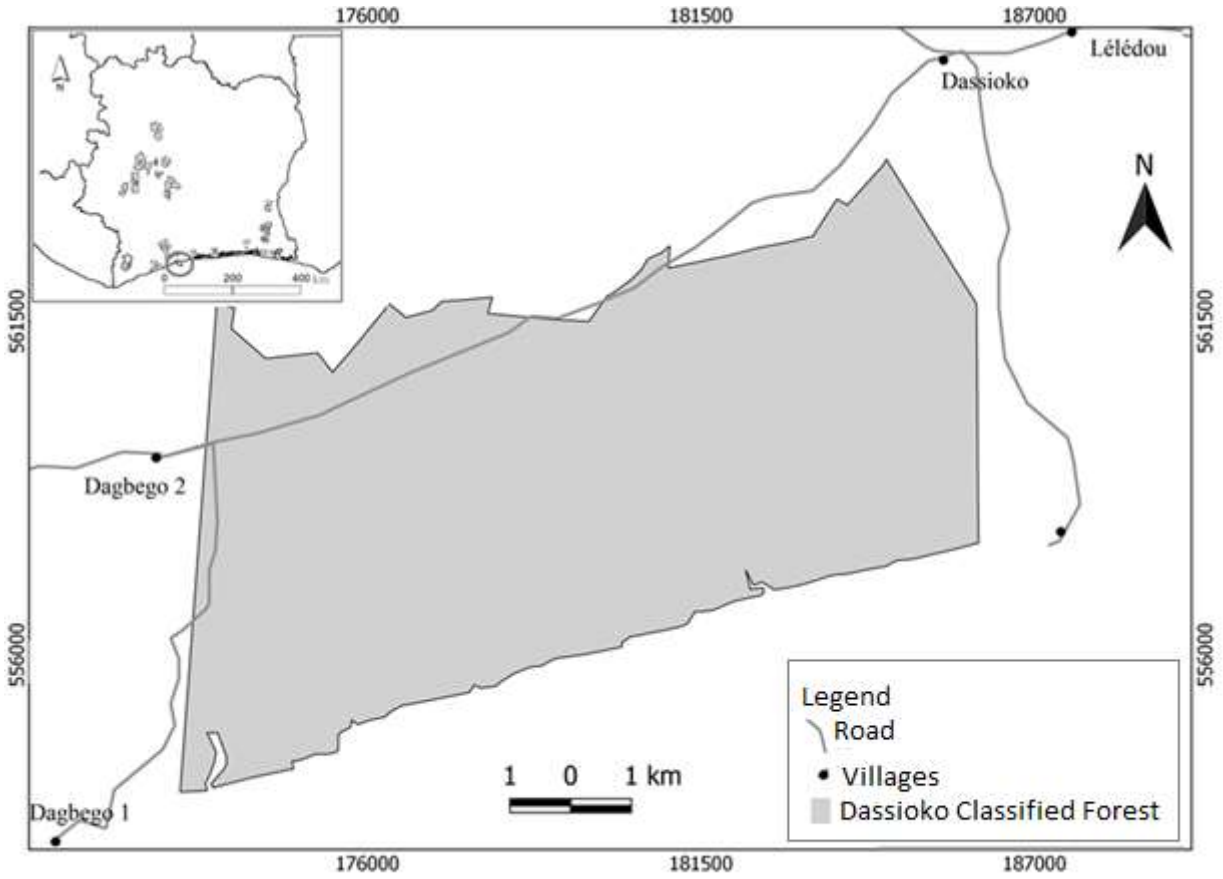

Fig. 1. Geographical situation of Dassioko Classified Forest

3.2 Data collection: The data was collected in two stages. At first, there was a survey of the population of the villages near the classified forest and then there were direct observations in the fields and other private properties having recorded damage caused by the elephants.

3.2.1 Interview structure: The villages where we conducted the surveys were selected based on their proximity to the DCF and are composed of Dassioko, Dagbego, Kpata Abidou and Leledou. The questions dealt mainly with the thematic of human-elephant conflicts (HEC). The sample size n = 160, obtained from the formula: $n = t^2. p. (1-P)/e^2$ (Pupion, 2008), was distributed proportionally according to the population size of each of these four villages. According to the formula, n = sample size; e = 5% margin of error; t = margin coefficient deduced from the confidence rate; and p = proportion of people affected by the damage. 39 respondents in Dagbego, 46 respondents in Kpata Abidou, 38 respondents in Dassioko and 37 respondents in Leledou were interviewed. This study questionnaire was designed on the model of the African Elephant Specialist Group (AFESG) on human-elephant conflict **(**Parker *et al.*, 2007). The main issues are concerning the types of damage related to the conflict, the location of the conflicts, the state of conservation of the forest and protection of the elephants, the actions undertaken by the population and the state for the protection of private property.

3.2.2 Direct observations: The delineated grids measured 2000 m x 1000 m and were placed Ouattara *et al.* (2010) for the collection of data on elephant marauds around the Taï National Park. The authors placed two grids on the immediate periphery of the Taï National Park according to the entry and exit points of

elephants into the park. In this study, two grids placed in the areas regularly visited by elephants reported by the community were also delineated a grid between Dassioko-Kpata and a second between Dassioko-Leledou was placed (Figure 2). The village of Dagbego was excluded from further work after conducting the surveys there. Most interviewers indicated that elephants did not visit the surroundings of this village. Within the squares, the surfaces of the identified crop plots represent meshes. The areas of the crop plots expressed in hectares (ha) were surveyed using GPS.

3.3 Estimated total number of plants per crop: Surveys started in April 2016 coincided with the maize planting period. To facilitate the estimation of the number of plants on each plot surveyed, different portions were taken account for by each crop. The total number of maize plants was estimated on one of the plots surveyed, an area of 25 m x 25 m and the excavated holes containing the seedlings were counted. The cassava were counted in a new cassava field over an area of 25 m x 25 m. Peanut and rice plants were counted in 5 m x 5 m squares.

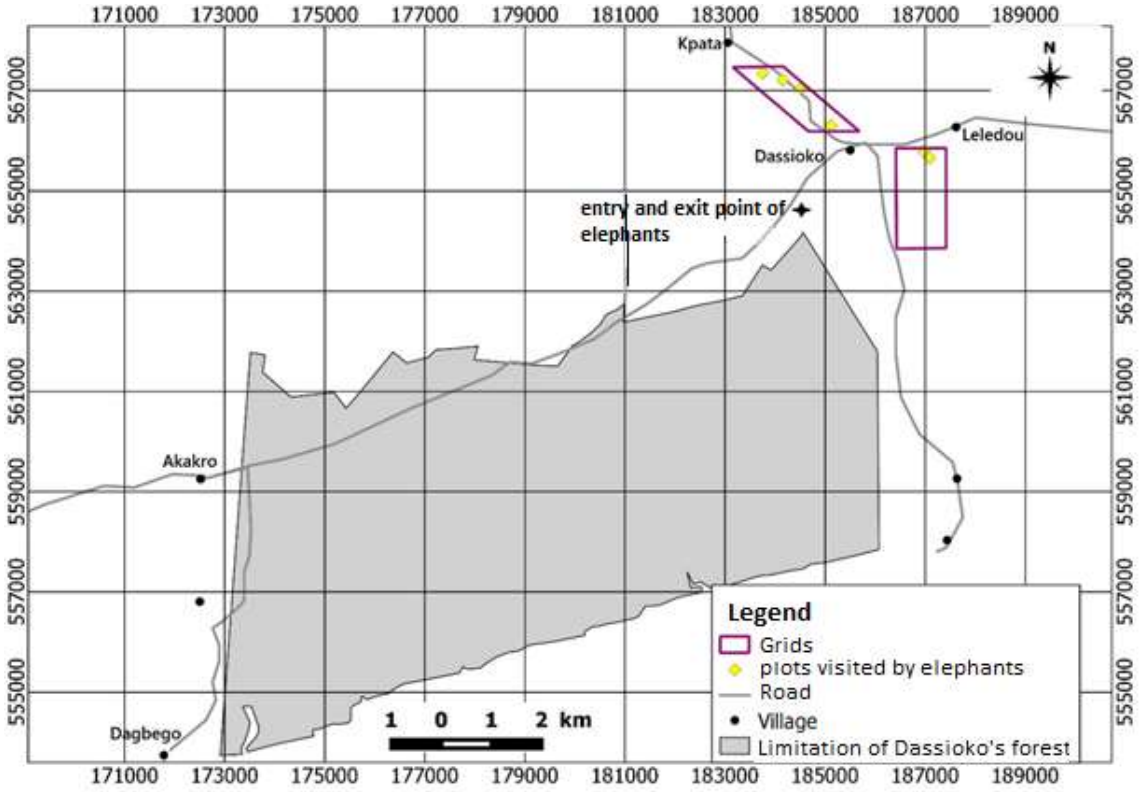

Fig. 2. Layout of plots

The yam and potato plots were GPS-circulated and the mounds they contain were counted. The few banana plants encountered were counted on the surface housing them. For cocoa orchards, the plants were counted on a plot of 50 m x 50 m. The plants of these crops were evenly distributed over the plots. The number of plants was obtained by estimating the total number of plants per crop and extrapolated proportionally to the areas occupied by the plots visited in each plantation.

Concerning the other industrial crops (rubber and oil palm), the requirements of state agencies in charge of these two crops were taken into account. By these requirements, an area of 1 ha contains 513 rubber trees and 140 oil palm trees.

3.4 Estimated total number of root or part of plant affected by Elephants: To

estimate the total number of plants and part of plant destroyed, a slow prospecting walk through the crop plots was carried out. During this survey, we scanned the plants from root to leaf to determine which plants were attacked by elephants and counted them by crop plot as done by Hill (2000) and Boukoulou *et al.* (2012). On each plot, the type of crops, the index left by elephants on the plants and the stage of development of the plant were then recorded. Finally, the condition of the entire plant after depredation and the means used by the farmer to protect his/her crops against elephant intrusions was recorded.

3.5 Data analysis

3.5.1 Estimated cost of losses: The cumulative number of Plants only partially damaged (in the case of cassava and coco-yams) and plant destroyed at each visit gave the total number of part of plant/ plants destroyed by elephants on each parcel of land concerned. The total number of non-directly visible of part of plant such as cassava was obtained by counting the number of tubers exposed by the animals under three randomly selected cassava plants. The average obtained was reduced to one cassava. Production and income per ha for each crop was estimated based on local production figures and average local market costs in Francs CFA (F CFA) converted in USD. The calculation of losses has been simplified by reducing the production of each crop per ha (Soulemane, 2002; Kagoro-Ragunda, 2004).

3.5.2 Statistical analyses: The data from the interviews was entered via the sphinx software and analysed under SPSS.20. Under SPSS.20, we carried out analyses of descriptive data that provided the proportions for each variable concerned. The data obtained after direct observations was entered in Excel and the analysis was carried out both directly under excel and via SPSS.20. In order to evaluate the effectiveness of the protection methods used by farmers, the Pearson's correlation test was carried out between the two variables: the percentage loss on the different plots surveyed around the DCF and the methods used on them.

4 RESULTS

4.1 Nature of human-elephant conflicts

4.1.1 Nature of conflicts according to respondents

Damage to private owners: To determine the nature of the damage caused by elephant-human conflict around the DCF, of the 160 people surveyed, 154 (96%) reported that they were victims of elephant damage. The majority of the damage caused by these animals were to crops (N=151; 98%), livestock (2; 1%) and food stocks stored in attics (N=1; 1%).

Human deaths and injuries around the DCF: Regarding this form of conflict, 71 people or 44% of the 160 respondents stated that these animals have already caused injuries and deaths. According to them, this herd of elephants is responsible for the deaths of two men, one in the remote vicinity of the DCF and another near the forest. Unlike these people, 81 (51%) argue that these elephants are not responsible for injuries or deaths among the populations. The final 8 people (5%) did not want to comment. Despite these mixed opinions, N=103, or 64% of all respondents, believe that elephants are still dangerous to people.

4.1.2 Nature of man-elephant conflict according to direct observations

Crops concerned: The two plots located on the periphery of the DCF have enabled us to identify different plant species of food crops attacked by elephants. These are corn (*Zea mays*), rice (*Oryza sativa*), yams (*Dioscorea* spp) and cassava (*Manihot esculenta*). In addition to the food crops that had been attacked, there were certain perennial crops such as the cocoa tree (*Theobroma cacao*), the rubber tree (*Hevea brasiliensis*) and the oil palm (*Elaeis guineensis*) that were also attacked.

Other private property attacked by elephants: Apart from crops, elephants caused damage to other private property. They destroyed an earthen house by leaning against it in the absence of the occupants. Twice, they broke the wall of a pigsty with the pigs therein. They broke graves in Dassioko, destroyed a

bicycle and trampled on water basins. Their predation actions also focused on food stocks in granaries. They also ransacked hundreds of cups used to collect latex in some rubber plantations.

4.2 Extent of damage caused by elephants: Surveying within the plots allowed us to determine the extent of crop losses caused by elephants. These losses vary according to the food preferences of these animals from one village to another (Table 1).

Extent of damage at Dassioko: The plots on the side of this village showed that elephants caused quite significant losses on different crops. Regarding damage to food crops, 0.048 ha of sweet potatoes were visited during our study. Of this area, 71%, or 0.034 ha, was destroyed by elephants. As this speculation is intended solely for self-consumption, we were unable to estimate this loss in financial terms. The same is true for yams. For this crop, 0.01 ha was visited with a loss of 0.007 ha or 70% caused by elephants. As for rice, 2 ha were visited with an estimated production of 1200 USD. Here, the damage caused by elephants covering an area of 1.15 ha or 57.5% of the total area is equivalent to a loss of income of 690 USD. The total area of cassava cultivation visited is 0.55 ha estimated at 475,475 USD; elephants damaged 0.14 ha of this area or 26% of cassava plants valued at 123, 62 USD.

In the case of cash crops in this village, 16.5 ha of rubber trees estimated at 4125 USD were visited. Elephants caused damage to 0.99 ha or 6% of the total area visited, which amounted to 247, 5 USD. In addition to rubber, 3 ha of cocoa trees, with an expected cocoa production estimated at 1500 USD were planted. The elephant herd caused the loss of 0.079 ha or 2.64% of the expected harvest equivalent to 158, 4 USD Surveys were also carried out on plots covered with 6 ha of palm trees. The feet lost by elephants cover an area of 0.071 ha (estimated at 16, 66 USD) or 1.19% of the total area.

Extent of damage at Kpata level: In this village, 0.22 ha of the total cassava area with an expected production of 190, 19 USD was visited. Elephants caused the loss of 0.014 ha, or 6.36% of the total area, estimated at 12,095 USD. The cash crops concerned rubber trees planted on a total area of 16.5 ha with a cost of the plots estimated at 4125 USD. On these plots, the elephant herd caused the loss of 1.23 ha corresponding to 7.45% of the total area, this loss is worth 306, 07 USD.

Extent of damage at Leledou: The crop losses noted in this village relate only to food crops. A total area of 1.51 ha of cassava with an expected harvest estimated at 1305, 47 USD was visited. From this area, elephants trampled on 0.012 ha or 1% of cassava feet. Those losses are estimated at 13,053 USD. For a total area of 1 ha of maize plants visited, these animals destroyed 0.030 ha representing 3% of plants at an estimated cost of 20, 2 USD.

Table 1: Extent of losses caused by elephants for each crop concerned in each village.

Village	Crops	Total area visited (ha)	Area destroyed (ha)	Proportion destroyed (%)	Cost of the total crops)		Loss	
					F CFA	USD	F CFA	USD (2016)
Dassioko	Rubber *(Hevea brasiliensis)*	16.5	0.992	6	2,475,000	4125	148,500	247,5
	Palm oil trees (*Elaeis guineensis*)	6	0.0714	1.19	840, 000	1400	9996	16,66
	Cocoa *(Theobroma cacao)*	3	0.0790	2.64	900, 000	1500	95,040	158,4
	Rice (*Oryza sativa*)	2	1.15	57.5	720, 000	1200	414,000	690
	Yam (*Dioscorea sp.)*	0.01	0.007	70	ND	ND	ND	ND
	Sweet potatoes (*Ipomea batatas)*	0.048	0.034	71	ND	ND	ND	ND
	Cassava* *(Manihot esculenta)*	0.55	0.1418	26	285,285	475,475	74, 174	123,62
Kpata	Rubber *(Hevea brasiliensis)*	16.5	1.23	7.45	2, 475,000	4125	183, 642	306,07
	Cassava* *(Manihot esculenta)*	0.22	0.014	6.36	114, 114	190,19	7, 257	12,095
Leledou	Maize (*Zea mays*)	1	0.0303	3	400, 000	666,66	12, 120	20,2
	Cassava* *(Manihot esculenta)*	1.51	0.012	1	783, 287	1305,47	7, 832	13,053

Legend: Manioc*= the cassava plants for the production of foutou and the cassava plants for the production of attiéké were found on the plots with a clear dominance of the foutou plant variety.
1 dollar USD (2016) = 600 F CFA

4.3 Protection of crops

4.3.1 Means of crops protection according to respondents:

In response to the damage caused by elephants, we noted different reactions. Of the 154 (96%) from a total of 160 respondents affected, 42 (27%) say they accept the losses caused by these animals on their crops or other property without planning to kill them. Further, 55 respondents, or 36%, said they only use methods to protect their crops that are safe for elephants. The remaining 24 respondents (16%) said they agreed that devices should be put in place to kill them. These respondents revealed that, shortly before the start of our data collection, professional poachers recruited by some farmers killed an elephant at the Kpata Abidou level. The last 33 people (21%) did not want to comment on the issue.

Compensation and other measures taken by the State to manage the human-elephant conflict: Among the 160 people interviewed around the DCF, 94% (N=150) say they are not aware of any compensation or other measures proposed to farmers by the state to mitigate existing HEC. The rest of the sample, i.e. 6% (N=10), remained without any opinions on possible compensation procedures or methods implemented by the state and popularised in their village.

4.3.2 Methods of crops protection identified during direct observations

Methods of control at Dassioko level: Three main methods have been identified in the different areas located in the village domain. The first is maintenance, which consists of regular weeding of crop plots, according to the populations surveyed; wild animals less visit a regularly weeded field. Thus, all the plots (100%; N=16) of this village were maintained. The second method of controlling elephant incursions is the use of scarecrows on 5 plots (31%). The third method can be summarized as physical presence for surveillance with shouting or the use of tools made of wood (25%; N=4) (Figure 3).

Methods of control at Leledou level: At this village, the only method of control identified is regular maintenance of the plots. Thus all the plots surveyed (N=4; 100%) are only maintained by their owners who hope that their crops will be spared by elephants (Figure 3).

Methods of control at Kpata level: Two crop protection methods have been identified in Kpata: maintenance and use of repellent. Maintenance is the main method used on the plots (N=9; 100%), on a single rubber plantation the base of the crops were coated with motor oil in order to deter the elephants (Figure 3).

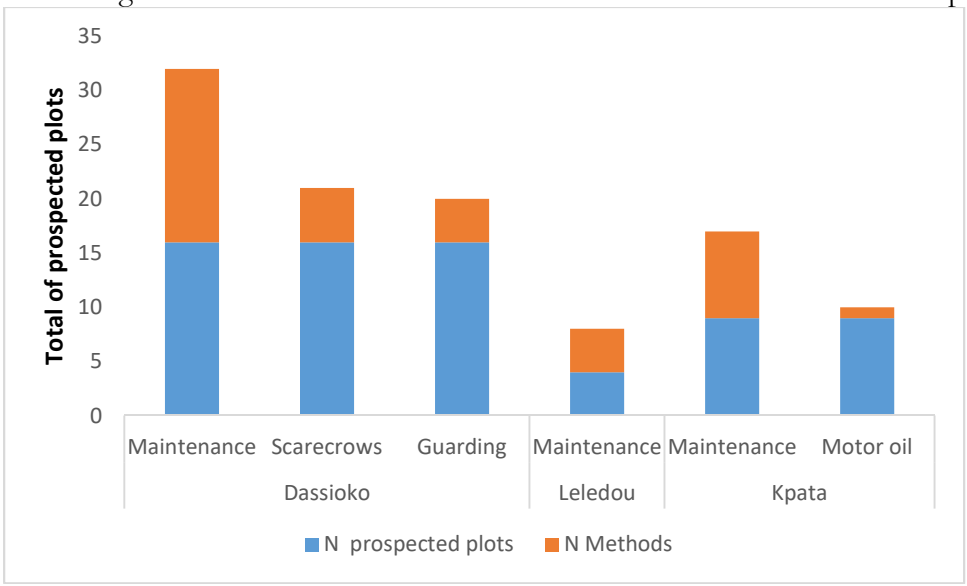

Fig. 3. Size of surveyed crop plots and methods of crop protection against elephants identified

4.4 Analysis of the effectiveness of methods of crops protection human-elephant conflicts using by peasants:

The Pearson correlation test done between the two

variables, the percentage loss on the different plots prospected around the DCF and the methods used on them, shows that the correlation between these two variables is not significant (r= -0.99; p=0.57). In other words, elephants despite the practice of these means of protection regularly visit the crop plots.

5 DISCUSSION

According to FAO, a set of global trends concerning both human demographics and changes in wildlife habitat contribute to increasing human conflicts with wildlife worldwide (FAO, 2010). These conflicts take various forms (FAO, 2010**)**. The survey conducted among the population living along the DCF revealed four different forms of conflict between humans and elephants. These are crop depredations, damage to private property such as livestock enclosures/housing huts, death/injuries to humans and finally, human reaction to elephants. Of these four forms, the most common in this study concerns crop depredation, as in the work of Warren (2003), Hill (2004) and Distefano (2010**)**. Studies have shown that elephants move to crops at certain times to obtain nutrients essential to their existence such as carbohydrates and protein (Kiringe *et al.,* 2007; Webber *et al.,* 2007). The crops most often attacked and cited are maize, cassava, sweet potato and rice (Hill, 2000). In addition to these commodities, commonly mentioned by the authors in their work, this study identifies that elephants are also fond of yams. In addition to food crops attacked by the elephant herd, perennial crops are also of interest to them. Thus, the cocoa and rubber plots are regularly visited by this herd to consume the beans and bark. The most serious form of human–elephant conflict identified in this study and reported by (Treves *et al.,* 2004; Madden, 2006; Muruthi, 2005; FAO, 2010) remains the death of humans caused by elephants. Crop losses caused by elephants are mostly relatively high, as indicated by previous studies Ngure, 1995 in Kenya; Okello, 2005 in Amboseli area in Kenya and Tchamba, 1995 in Northern Cameroun. This could be explained by the large amount of food eaten by an adult elephant (nearly 200 kg of plants per day). The elephant herd involved consumed up to 57.5% of the rice production grown by farmers on the plots surveyed around the DCF. These significant losses of rice, which have become recurrent in recent years, unfortunately force most farmers to abandon their plots in search of new ones, since rice is their staple food. These searches are usually unsuccessful due to the lack of land formally mentioned by FAO in its report FAO (2009). This could be a cause of food insecurity fought by the state in its policy of food self-sufficiency. This herd also caused significant losses on cassava crops, a total of 26% of the plants were uprooted, consumed 71% potatoes and 70%of the yams. Work conducted in Kibale in Ougadan, indicated food crop losses ranging from 19.6% for beans to 38.4% for maize caused by elephants (Ilukol, 2002). It was further reported, from work in southern Ghana that crop losses caused by elephants ranged from 43%, 68% and 76% respectively for bananas, maize and yams (Barnes, 1996). With regard to cash crops, rubber plots are the most frequented by elephants, causing nearly 8% of the total area of rubber plots to be lost. Indeed, in recent years, this crop has increasingly replaced the coffee-cocoa pair that had been encountered a few years earlier. Elephants, during their regular incursions into rubber fields, they have destroyed plant products or remove the bark they consume, as claimed by some owners interviewed. The bark surely contains nutrients that are essential for their development as already mentioned above. Unfortunately, however, they cause enormous damage in these rubber fields. Unlike rubber trees, the losses caused by elephants on the cocoa orchard surveyed in this study are low. Other work, undertaken around the Classified Forest of Haut-Sassandra in Côte d'Ivoire, showed a loss of 20% of the total cocoa production expected by farmers Soulemane (2002). In Ghana, there were estimated losses of 0.56% to 29.95% for perennial and food crops

combined around the Kakum protected area Dakwa *et al.* (2016).

Crop protection methods adopted by farmers are limited to field maintenance, plot monitoring, the provision of scarecrows in crop plots and occasionally the use of repellents such as motor oil. Of these identified methods, plot maintenance seems to be the method within reach of farmers on the periphery of the DCF to keep elephants away from their fields. Killing the elephants as the ultimate means of managing this type of conflict practiced until now by these populations was recently criticized by the manager of that forest. Indeed, the Ivorian State reacted vigorously, via this manager, by arresting the perpetrators of the slaughter of an elephant from this herd judged as "worst crop raider". This reaction by the State has calmed the willing of the farmers who planned for killing another elephant of this herd. In this way, the peasants since opted to maintain the plots, but which does not seem to produce as effective results. Soulemane (2002) work also showed that planters most often use elephant shooting to manage repeated elephant incursions on their crop plots on the periphery of the Upper Sassandra Classified Forest.

In contrast to Côte d'Ivoire, in other countries, various methods such as chilli grease, bricks coated with oxen or burnt chilli droppings around forests, beekeeping and construction of physical barriers, are successfully tested against HEC (Parker *et al.,* 2007; Boukoulou *et al.,* 2012). These methods have been put in place to mitigate the growing animosity towards elephants as noted in previous studies Infield (1988), Newmark *et al.* (1993), Hill (2000). The Ivorian state would benefit from working in collaboration with researchers to experiment with some of these methods to prevent all kinds of elephant animosities with most of the remaining small populations in some of the forests and savannahs.

6 CONCLUSION

HEC exists in four different forms around the DCF: crop damage, damage to other private property, death/injury to humans and human response to elephants. The conflict is majorly concerned with elephant-induced crop depredation; however, unfortunately it has also claimed human and animal lives. Losses caused by elephants are relatively high and force some of the farmers to abandon their crop plots. The fear of repression currently aroused by the state among the population regarding the killing of new elephants, must not obscure the fact that the state must establish and popularise effective methods for managing this type of conflict among the population. This will enable it to guarantee food security on the one hand and to increase the size of the small elephant populations that still exist in its forests on the other.

6 REFERENCES

Bamba K, Béné J-CK, Kouakou YC, N'guessan K A and Kouakou CV: 2017. Diversité, distribution et Statut de conservation des Primates dans les reliques de forêts dans la région du Tonkpi, à l'ouest de la Côte d'Ivoire. European Scientific Journal September 2017 edition Vol.13, No.26 ISSN: 1857 – 7881 (Print) e - ISSN 1857-7431

Béné J-CK, Koné I, Gonédélé Bi, Bitty EA, Ouattara K, Akpatou KB, N'guessan KA and Djaha A K: 2013. The diurnal primate community of the Tanoé Forest: species composition, relative abundance, distribution, polyspecific associations and conservation status. DOI: 10.4314/ijbcs.v6i1.5

Béné J-CK, Daouda. D and N'guessan. E: 2015. Gestion durable de la faune et des ressources cynégétiques en Côte d'Ivoire Rapport pour les Etats généraux de la forêt, de la faune et des ressources en eau, 101 p.

Bitty EA, Gonédélé Bi S, Béné J-CK, Kouassi PK and McGraw WS: 2015. Cocoa farming and primate extirpation inside Cote d'Ivoire's protected areas. Mongabay.com Open Access Journal - Tropical Conservation Science Vol.8 (1): 95-113

Boukoulou H, Mbete P, Mbete R, Ngokaka C, Akouango F, Rhaysaint E, BK and Vouidibio J. 2012. Conflit Homme/Elephant: étude de cas dans le village Miélékouka au nord du parc National d'Odzala Kokoua (Congo). Journal of Applied Biosciences, 50: 3478-3484.

Dakwa K B, Monney KA and Attuquayefio D: 2016. Raid range selection by elephants around Kakum Conservation Area: Implications for the identification of suitable mitigating measures. International Journal of Biodiversity and Conservation Vol. 8(2), pp. 21- 31, February 2016 DOI: 10.5897/IJBC2015.0825 Article Number: 50BF7BA57140 ISSN 2141-243XCopyright © 2016.

Distefano, E: 2010**.** Human Wildlife Conflict Worldwide: Collection of case studies, analysis of management strategies and good practices. South Africa, pp. 1-34.

FAO: 2009. –Human-wildlife conflict in Africa: Causes, consequences and management strategies. Food and Agriculture Organization of the United Nations, Forestry Paper no. 157 (Editors Lamarque et al., 112 p).

FAO : 2010. Les conflits humains-faune en Afrique Causes, conséquences et stratégies de gestion. P 110.

Gonédélé BS and Bitty AE: 2011. Statut de Conservation et Taxonomie de la forme de Colobe noir et blanc existant entre les fleuves Sassandra et Bandama en Côte d'Ivoire, rapport, 14 p.

Guillaumet JL, Adjonohoun e and perraud a : 1971. « La végétation de la Côte d'Ivoire », Le milieu naturel de la Côte d'Ivoire, ORSTOM, p. 161-262.

Hill CM: 2000. Conflict of interest between people and baboons: crop raiding in Uganda. International Journal of Primatology, 21(2), 299-315. International Journal of Primatology, Vol. 21,No2,2000http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.470.9835&rep=rep1&type=pdf.

Hill CM: 2004. -Human dimensions of wildlife farmers' perspectives of conflict at the wildlife agriculture boundary: some lessons learned from African subsistence farmers. Human Dimension of Wildlife, 9(1), 279-286.

Infield M: 1988. Attitudes of a rural community towards conservation and a local conservation area in Natal, South Africa. Biological Conservation, 45, 21–46.

Illukol P: 2002. Elephant Crop Raiding Patterns in Areas around Kibale 106 National Park (KNP), Uganda. In Hill CM, Osborne FV, and Plumptre AJ. Editors.

Human-Wildlife Conflict: Identifying the problem and possible solutions: Albertine Rift Technical Reports Series, Volume 1, Wildlife Conservation Society, pp. 107-115.

Kiringe JW, Okello MM and Ekajul SW: 2007. Managers' perceptions of threats to the protected areas of Kenya: prioritization for effective management; Oryx 41:3

Kone I, Kablan AY, Mouroufie KV, Gleanou KE, Zadou DA, N'guessan A, Ouattara K and Bene K.J-C: 2012. Communication pour la promotion de connaissances et comportements favorables à la conservation: cas du programme de conservation de la Forêt des Marais Tanoé-Ehy, dans le sud-est de la Côte d'Ivoire. Institut de l'énergie et de l'environnement de la francophonie (iepf) 56, rue saint-pierre, 3e étage, québec (québec) g1k 4a1 canada Gouvernance : l'arbre qui cache la forêt Chap 5 174-181.

Madden F: 2006. Gorillas in the garden-Human-wildlife conflict at Bwindi Impenetrable National Park. Policy Matters 14, 180-190.

Ministère de l'Environnement : 2004. Livre Blanc du Littoral Ivoirien.46p

MINEF (Ministère des Eaux et Forêts): 2018. Avant-projet de loi portant protection de l'éléphant en Côte d'Ivoire MINEF

Muruthi P: 2005. Human wildlife conflicts: lessons learned from AWD's African heartlands.AWF Working Papers. Nairobi, Kenya, African Wildlife Foundation.

Newmark WD, Leonard NL, Sariko HI and Gamassa DM: 1993. -Conservation attitudes of local people living adjacent to five protected areas in Tanzania. Biological Conservation, 63(2), 177–185.

Ngure N: 1995. People-elephant conflict management in Tsavo, Kenya. Pachyderm, 19: 20-25

Oliveri I and Vitalis R: 2000. La biologie des extinctions médecine/sciences. 17: 63-9 Mercredi 17 janvier 2000

Okello MM: 2005. Land use changes and human-wildlife conflicts in the Amboseli area, Kenya. Human Dimensions of Wildlife, 10, 19–28.

Ouattara FA, Soulemane O, Nandjui A and Tondoh EJ: 2010. Etat des maraudes et des dégâts de cultures lies aux elephants à l'ouest du secteur de Djouroutou dans le sud-ouest du Parc National de Taï (Côte d'Ivoire). Pachyderm; 47: 9p.

Parker GE, Osborn FV, Hoare RE and Niskanen LS: 2007. Human-elephant conflict mitigation a training course for community-based approaches in Africa. Participant's Manual. Elephant Pepper Development Trust, Livingstone, Zambia and African Elephant Specialist Group, IUCN, Nairobi, Kenya.

Pupion P-C : 2008. Statistiques pour la gestion, Applications Excel et SPSS, 2ème édition

Soulemane O : 2002. -Conflits homme-éléphant autour de la Forêt classée du Haut-Sassandra (Côte d'Ivoire). Pachyderm 32, 12-21.

Tchamba MN:1995. The problem elephants of Kaelé: a challenge for elephant conservation in Northern Cameroon, Pachyderm, 19: 26-32

Treves A, Naughton-Treves L, Harper E, Mladenoff D, Rose R, Sickley T and Wydeven A: 2004. -"Predicting human-carnivore conflict: A spatial model based on 25 years of wolf predation on livestock" Conservation Biology. 18:114-125.

IUCN: 2017. The IUCN Red List of Threatened Species. Version 2017-1. . Downloaded on 19 May 2017.

Warren Y: 2003. Olive Baboons (Papio anubis): Behaviour, Ecology and Human Conflict in Gashaka Gumti National Park, Nigeria. Ph.D. Thesis, University of Surrey.

Webber AD, Hill CM and Reynolds V: 2007. -Assessing the failure of a community-based human-wildlife conflict mitigation

project in Budongo Forest Reserve, Uganda, Oryx, 41(2): 177–184.

Yao A : 2013. Conservation des grands mammifères dans la forêt classée de Dasssioko Sud-Ouest. Mémoire de Master II de Biologie Animale. UFR, Biosciences, Université Felix Houphouët Boigny de Cocody 75p.