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# AN INVESTIGATION OF THE MANAGEMENT OF WILDLIFE CROP-RAIDING IN THE LOCAL FARMING AREAS OF KUMBA MUNICIPALITY, SOUTHWEST REGION, CAMEROON

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## ABSTRACT

Crop-raiding is a serious problem for both agriculturalists and conservationists and has been occurring for decades, especially in the South of Sahara. Despite the fact that it has recently received considerable research attention from wildlife ecologists, in Cameroon very little survey has been carried out on this line of study. However, the objective of this study was to investigate how the local farmers in Kumba municipality are managing the crop-raiding behavior of wildlife on their farmland. The method used for this study was questionnaire. A total number of three hundred questionnaires were administered to a population of farmers selected randomly in different locations of the study area. The analysed data showed a significant relationship between the Age Category and Farm Size ($X^2$ = 84.900 df=6, P<0.05). Moreover, the study still revealed a significant relationship between Age Category and the Crops most often cultivated ($X^2$ = 36.297 df=8, P<0.05). Furthermore, the survey recorded a positive correlation between Profession and the Mitigation of Human-wildlife conflict in farms ($R^2$ = 0.319, P<0.05). In addition, there is a positive significant association between the wildlife impact in farms and their damage acknowledgement to the wildlife management authorities, ($X^2$ = 5.205 df=2, P<0.05). The Average Crop Loss has significantly shown an association with the impact of wildlife in the farms ($X^2$ = 24.410 df=6, P<0.05). The local farmers seem no longer to be very much troubled by the impact these animals are causing, rather, are more concerned with costless efforts that would avoid destroying the animal population totally, but give them an annual average substantial yield.

**Keywords:** Agriculturalists, Ecologists, Crop-raiding, Wildlife, Farms

  

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## INTRODUCTION

The expansion of agriculture in connection with human population growth is significantly related to deforestation (Scherr & McNeely 2002). As more farms encroach into wildlife habitat, which not only decreases available space for wildlife and destroys natural food sources, but also positions crops within close range of those food-depleted animal populations – wildlife consequently begins to feed on these crops, becoming problem animals (Kushwaha & Hazarika 2004; Wang *et al*. 2006; Riley 2007). Furthermore, as new agriculture expands, the use of lands already cultivated intensifies (Meyer & Turner II 1992) and habitats are destroyed at increasingly rapid rates as small scale subsistence agriculture shifts to vast commercial monocultures (Lee 2010). With habitats quickly becoming human-dominated, more species are compelled to exploit human resources in order to survive (Strum 2010).

Success of conservation efforts can also cause increasing conflicts. In response to the application of wildlife management and protection from overexploitation, many wildlife populations have recovered over the last century (Garrott *et al*. 1993; Messmer 2000), while some extirpated populations have also been successfully reintroduced (Smith et al. 1991). As recovering wildlife populations expand, they are forced to do so into areas now inhabited by people. For example, in the wake of habitat recovery and legal protection, wolves and other carnivores have recovered in many areas of North America and Europe, but this has happened alongside human populations and as a result conflicts over livestock depredation have increased (Treves *et al*.2002).

As with human population increase, an increase in wildlife populations leads to increased conflict over resources. Increased crop raiding by rhesus macaques (*Macaca mulatta*) was reported after the establishment of a National Park in Bhutan (Wang et al. 2006). An increase in chital (*Axis axis*) population numbers following protection resulted in an increase in the incidence of crop damage (Studsrød & Wegge 1995). Increased reports of crop raiding by elephants may reflect the recovery of population numbers following the CITES ban on ivory trade and subsequent decline in poaching (Sillero-Zubiri & Switzer 2001). Protection of wolves in Minnesota led to a threefold increase in their population numbers and consequently an increase in conflict with people (Mladenoff *et al.* 1997). Problems are exacerbated if these populations become overabundant, and the resulting negative experiences further heighten public concerns over these species (Messmer 2000).

A lack of conservation equally causes problems. Farmers in Bhutan attribute increases in their crop losses to the elimination of wild dogs (*Cuon alpinus*), as wild dogs previously limited numbers of wild pigs (*Sus scrofa*), the crop raiding culprits (Wang *et al*. 2006). In Japan, wolves are believed to modify the range use of deer and consequently relieve the

  

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intensity of deer feeding pressure on vegetation in particular locations; extinction of the wolves has led to vegetation destruction and crop raiding occurring unchecked (Agetsuma 2007). Destruction of predators has been attributed to the increase in raiding behaviour of hamadryas baboons (*Papio hamadryas*) in Saudi Arabia (Biquand *et al.* 1994). One of the most common conflicts between people and wildlife takes the form of crop foraging, hereafter referred to as crop raiding (Naughton-Treves *et al.*1998; Sillero-Zubiri & Switzer 2001). Crop raiding can be simply defined as wild animals moving from their natural habitat onto agricultural land to feed on the produce that humans grow for their own consumption (Sillero-Zubiri & Switzer 2001). This consumption of human foods regularly brings wildlife into conflict with people (McLennan & Hill 2010). Crop raiding is not a new phenomenon and is as old as agriculture itself (Hill 2005; Lamarque *et al* 2008; Riley & Priston 2010; Nyirenda et al. 2011). It is now widespread and an issue throughout the world (Box 1991; Sillero- Zubiri & Switzer 2001; Priston & Underdown 2009; Nijman & Nekaris 2010).

Crop raiding is essentially a foraging strategy that can be explained through optimal foraging theory – that animals strive to maximise their energy intake (Pyke 1984). Raiding can be understood as a cost-benefit scenario. It is a high-risk behaviour – raiders suffer greater mortality and injuries than non-raiders (Lee & Priston 2005; Obanda et al. 2008; Chiyo *et al.* 2012). However, it is also a high-gain foraging strategy – successful raiders derive substantial nutritional benefits from crops and as a result are able to reduce their overall investment in foraging time and have more time for resting and socialising (Hill 2000; Lee & Priston 2005; Obanda *et al*. 2008; Strum 2010; Chiyo *et al.* 2012). As agriculture and wildlife have existed side by side for millennia, crop raiding has naturally become an essential part of many species' subsistence strategies (Lee 2010; Wallace 2010), although both Strum (2010) and Riley (2007) have demonstrated that crop raiding is not inevitable when wildlife and humans live side by side.

The main aim of this study is to examine how the local farming population of Kumba municipality is responding to wildlife crop-raiding in their farmland. Crop raiding in Kumba and many parts of Cameroon is one of the main causes of agricultural poor harvest, posing a huge challenge to agricultural sustainability. Despite the deterrent measures engaged upon by these farmers the crop raiding refuses to abate. In order to handle this, many local farmers in this area have engaged into unconventional crude methods by using chemical aerosol pesticides that are very destructive to the aquatic ecosystems, especially within the farming areas.

  

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## MATERIALS AND METHOD

### Description of the study area

Kumba is one of the cities in the Southwest Region of Cameroon. It is found at latitude 4º,64' North and longitude 9º,45' East with an elevation of 258m above the sea level, with a population of about 144,413 (Melle, and Ewane 2015). Kumba has a coastal equatorial climate, with two distinct seasons, a long rainy season of 8 months and a short dry season of 4 months. The annual amount of rainfall ranges from 2000m to 4000mm.

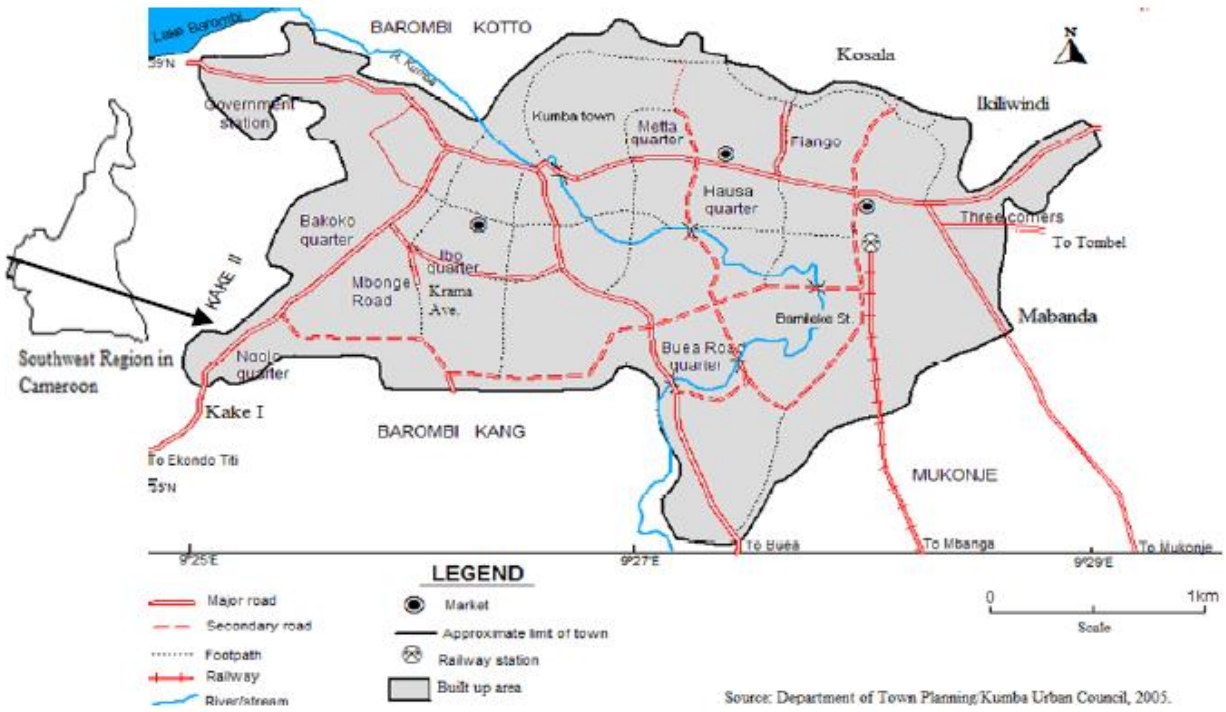


**Figure 1.** The map of Kumba (Department of Town Planning/KUC, 2005).

The rainfall pattern provides a suitable condition for both perennial and annual crops to grow, thus providing an ideal condition for two cropping seasons a year (Melle, and Ewane, 2015). The rainfall here is one of the most important climatic factors influencing agriculture. Daily temperatures are high throughout the year and ranged from 28°c to 33°c. The atmospheric humidity varies with the absolute value and the seasonal distribution of the rainfall being uniformly high throughout the wet season and falling to lower level during the dry season (Nkeng, 2009). Kumba municipality is mainly characterized by a coastal lowland possessing some wetland and flood zones. The lowland areas are the sites favorable for human settlement. The forest exploitation for farmland destroys the habitat of many wildlife species rendering them

  

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vulnerable to severe poaching. This is the main reason for the disappearance of many of the forest fauna species that existed in Kumba in the past. However, a few wildlife species still exist in the area (Ndam, *et al* 2002).

Food crop farming is the most important source of livelihood of the population around this area. The forest as direct source of income and subsistence through hunting and gathering is not very important for the overall population. Plantains, cocoyam and cassava are the most important agricultural products and contribute more than twice as much as cocoa and coffee to the daily livelihood. However, cocoa remains the main bulk income earner of the area (Ndam, 1998). On average the settlements are engaged in 3.7% alternative income-generating activities, but beside the various forms of livestock rearing, only beekeeping, cassava processing, fuel wood and timber harvesting have any relevance for the rural population. Agriculture is presently the most important economic activity carried out in the area, employing about 95% of the population, while timber exploitation, hunting and petty trading are also practiced by some inhabitants. Farm sizes range between 0.25 ha to more than 10 ha on average (Ndam, *et al* 2002). Non-indigenous farmers own the largest farms and account for most of the agricultural production of the area (Ndam, 1998). Livestock rearing is practiced for subsistence and for cultural sacrifices, which require the slaughtering of animals.

**Data collection**

The method used for data collection is an oral interview and questionnaire. In addition, the targeted population was largely literate and it was unlikely to have difficulties responding to questionnaire questions, though a few of the respondents could not read and write, but with the help interpreters success was met. The questionnaire administration and oral interview was done just after a pilot survey was executed. A period of one month was used for the data collection programme. Questionnaire administration was done by a random sampling method, restricted to farmers residing within this municipality. A total number of three hundred questionnaires dished out to the respondent population were all answered and handed back to the researcher.

**Data Analysis**

The research data was analysed by using SPSS version 20. Chi-square and correlation statistical tools were used for the analysis. The quantitative variables like gender, profession and age category were tested with the qualitative variables statistically. Exploratory analysis was also done, especially with some of the qualitative variables.

  

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## RESULTS

In fig.2, the result has revealed a very significant association between the Age Category and Fram Size ($X^2$ = 84.900 df=6, P<0.05). Farming in Kumba has no age category boundaries. The farming activity climaxes during week-ends and immediately after official working hours of the day, especially for the State and Private Service workers. The tradition of serious farming in Cameroon indiscriminate of age, gender and professional status is rooted into income generation to meet up with the increased cost of living that is affecting the living standards of Cameroonians negatively. Moreover, the study still revealed a significant relationship in fig.4 between Age Category and the Crops most often cultivated ($X^2$ = 36.297 df=8, P<0.05). However, crop cultivation is more of a tradition than for the purpose of revenue and feeding. An average Cameroonian enjoys physically exercising the body in farm-work, especially after some days of beer-drinking. The crop-farming is gradually replacing other sport exercises that would similarly sweat the body profusely in helping to reduce body weight.

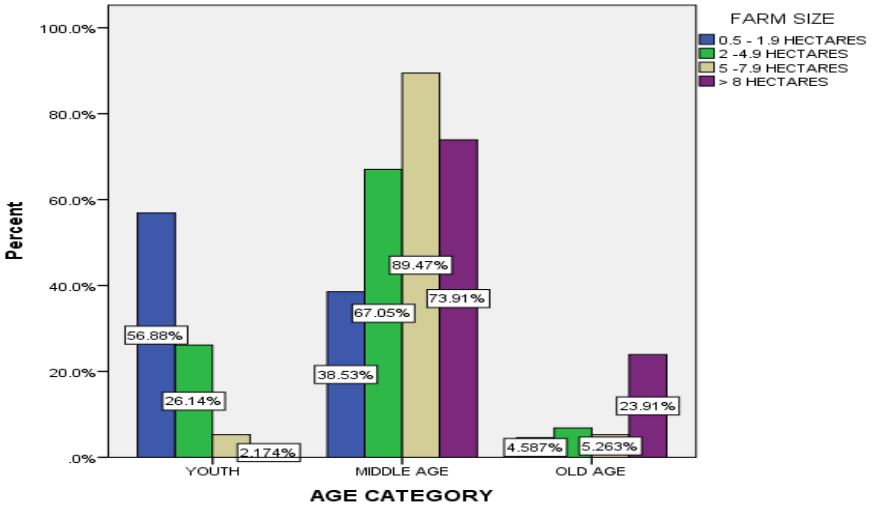


**Fig. 2: The Age Category and the Farm Size**

The survey has shown in fig.3 a positive correlation between Profession and the Mitigation of Human-wildlife conflict in farms ($R^2$ = 0.319, P<0.05). Through work-shops, Television and Radio programmes, News papers and the Social media most Cameroonians are very conscious of the conservation aspect and also the tourism values of the wildlife animals. Hence, any conflict is often handled with prudence, avoiding at all cost killing the animals. The State government has also enacted some wildlife protection laws which punish any person found with any wildlife species dead or alive that is earmarked for protection by the State. These deterrent laws have taken even the bushmeat consumers from dependently relying on bushmeat as a major source of protein, despite their craving consumption behaviour.

  

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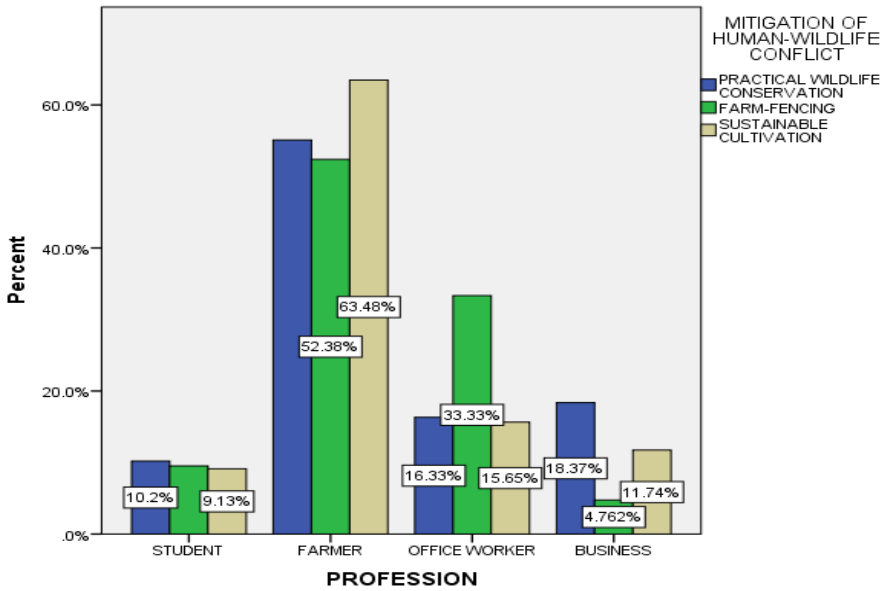


**Fig. 3: Profession and the Mitigation of Human-wildlife conflicts**

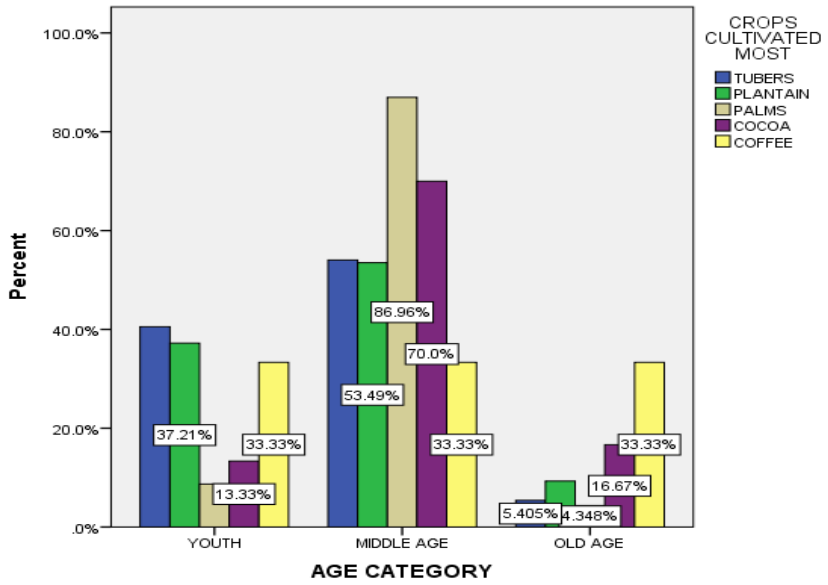


**Fig. 4: Age Category and the cultivation of crops**

In fig.5, there is a positive significant correlation between the seasonal destruction of wildlife and the most destroyed species ($R^2$ = 0.541, P<0.05). Crop-farming is seasonal in Cameroon; hence, seasonality plays a very prominent and crucial role in cultivation. However, seasonality in this study seems not to be the only determinant to crop cultivation but as well as wildlife species

  

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that have a crop-feeding-selection behaviour. These species of animals would only surface on the farmland whenever these species of crops are cultivated. Nevertheless, farmers have resorted to using all types of methods to prevent them from attacking these crops, but seems not to be working.

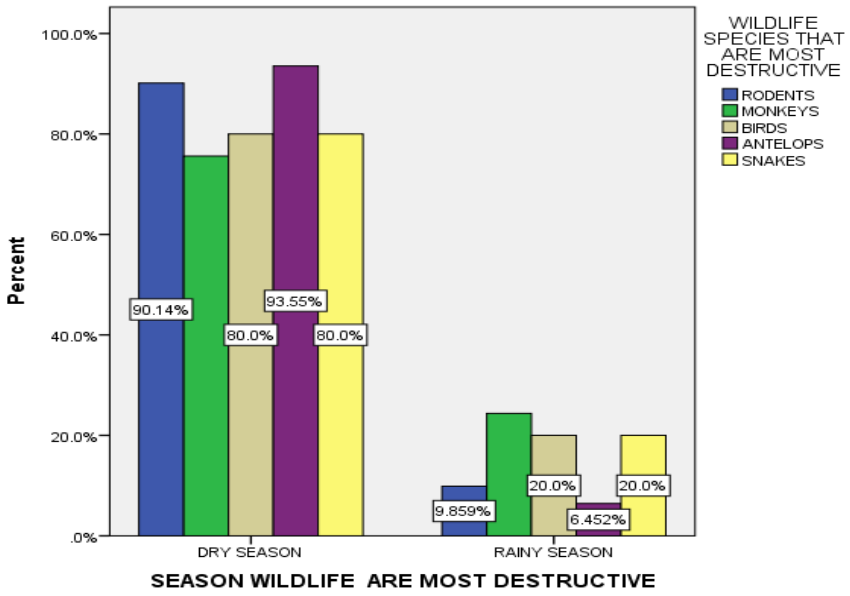


**Fig. 5: The species of wildlife most destructive and the most destructive Seasons**

The survey has shown in fig. 6 a positive significant association between the wildlife impact in farms and their damage acknowledgement to the wildlife management authorities, ( $X^2 = 5.205$ df=2, $P<0.05$). Cameroonians are very much uncomfortable with the way the Wildlife Authority service is relating with them, especially on such complaints. There is no allocation for any compensation programme to the victims and whenever an animal is killed in this conflict the authorities would often punish the local farmer. For this reason most victims hardly go reporting their problems to them, rather they would kill these animals silently and consumed as bushmeat or sell.

  

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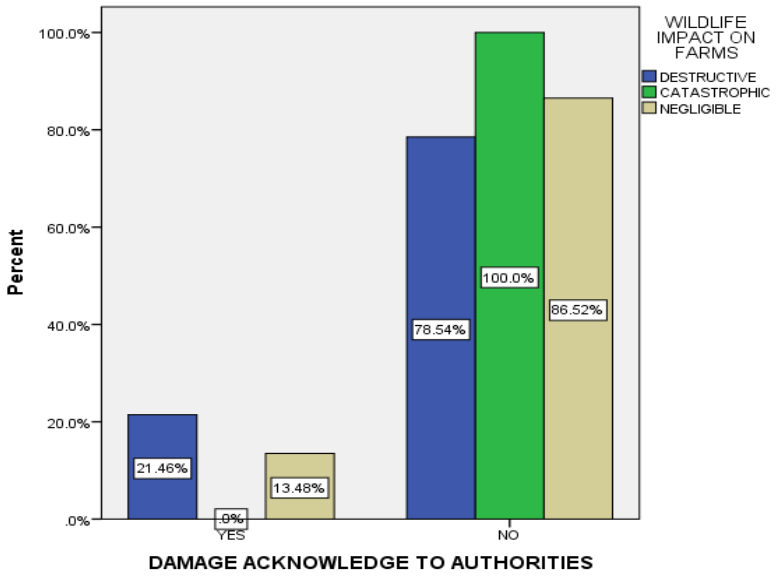


**Fig. 6: The wildlife destruction impact and acknowledgement to authorities**

The survey has shown in fig.7 a significant association between wildlife farm-destruction impact and the mitigation of this conflict ($X^2$ = 14.365 df=4, P<0.05). Farmers have embarked on many methods to handle the destructive aspect of wildlife to farm-crops. But, despite all these methods farmers are still not having satisfactory results, and their war with the wildlife raiding their crops seems to be far from ending. The silent behaviour and deliberate negligence of the State government in helping in the mitigation as in other countries in the south of sahara has aggravated the relationship.

  

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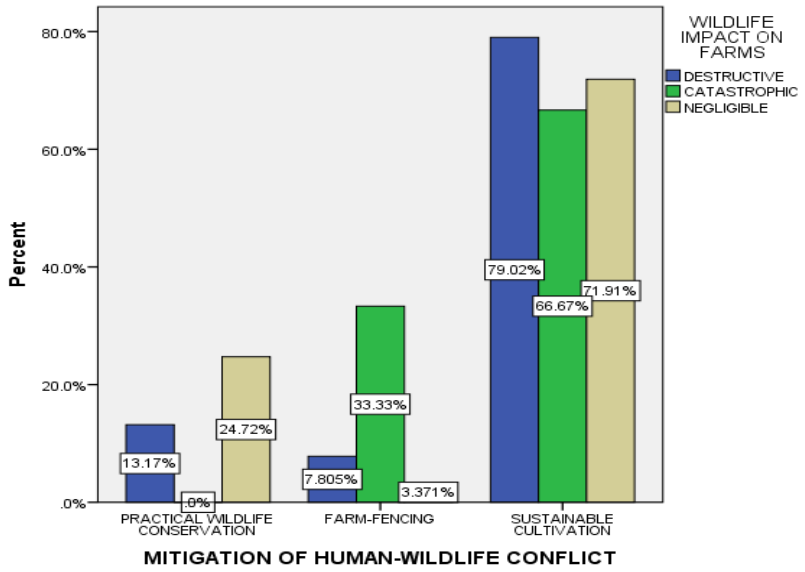


**Fig. 7: Mitigation of human-wildlife conflict and the wildlife impact on farms**

The average crop loss has significantly shown an association in fig.8 with the impact of wildlife in the farms ($X^2$ = 24.410 df=6, P<0.05). The local farmers seem no longer to be very much troubled by the impact these animals are causing, rather are more concerned with costless efforts that would avoid destroying the animal population totally but guarantee them an annual average substantial yield.

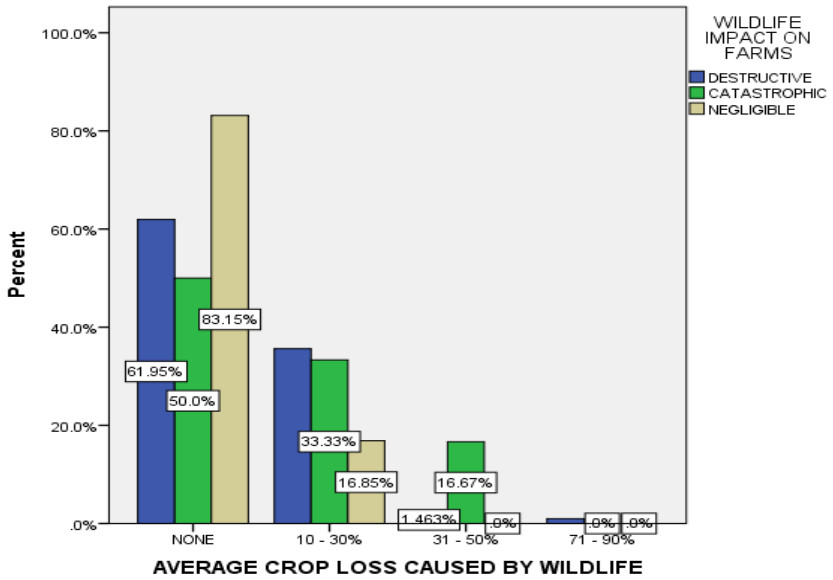


**Fig. 8: Average crop loss and the impact of wildlife on farms**

  

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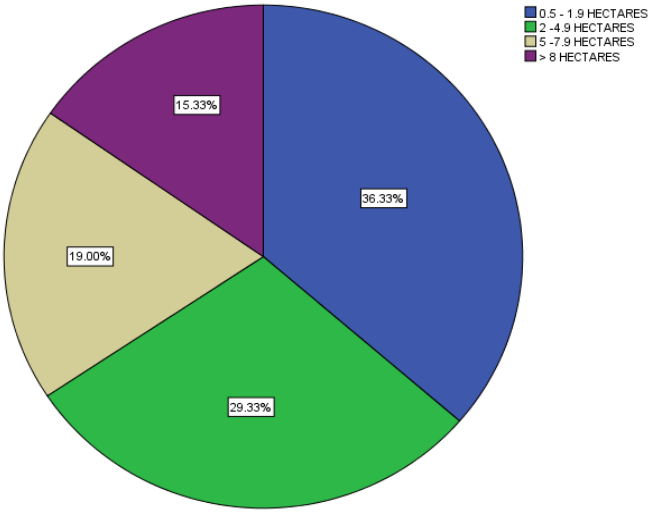


**Fig. 9: Farm size**

The industrial monocultural farming system of crops like red oil palms and banana seems not to be welcome by the climatic condition in the ecological zone of Kumba(fig.9). Secondly, the State government has not taken any interest in empowering the economy of Kumba through industrial crop-farming. This has made the people of the area to practice subsistence farming (36.33%) just to survive their family households with their small farm-sizes o.5 – 1.9 hectares. In the survey only 15.33% of the respondent score is recorded on farms with the size of 8hectares and above.

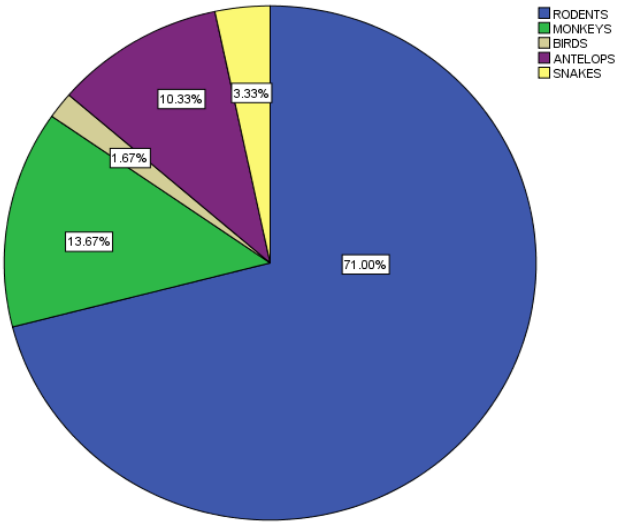


**Fig. 10: Wildlife species considered most destructive**

  

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Rodents are considered by the farmers as shown in fig.10 to be the most destructive to farm crops (71.00%). This area seems to be very rich in rodents' population and with the State government deterrent wildlife protection laws on even some of these rodents their increase in population is obvious and their destruction capacity to farm-crops is inevitable in Kumba and other parts of Cameroon. This problem is aggravated by the absence of research data on the various rodent species population found in this ecological zone. The control of rodent population in Kumba is very necessary for crop cultivation and production to maximize.

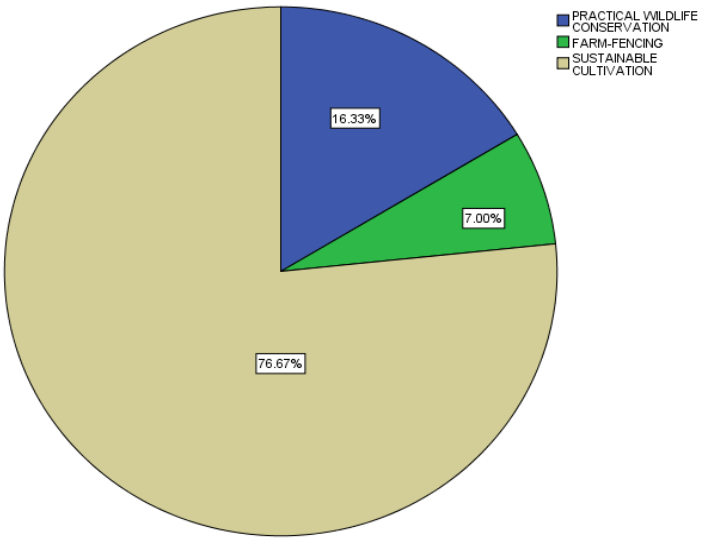


**Fig. 11: Mitigation of human-wildlife conflict**

The respondent score on sustainable crop cultivation of 76.67% as shown in fig. 11 is an interesting result. Through extensive agricultural education, sustainable agricultural through the use of artificial fertilizers seems very much to be replacing the long standing farming tradition of shifting cultivation, believed to be the major cause of rainforest destruction and degradation. However, the State government still needs to do more on this light in industrializing cultivation for the local farmers, this would help them grow both nationally and internationally in production exportation capacity.

## DISCUSSION

Among vertebrates, rodents are by far the greatest agricultural pest, causing significant amounts of damage (Makundi *et al.* 1999; Stenseth *et al.* 2003). It is larger mammals however, that are often selected for attention as pests by the people involved (Knight 2001) and primates dominate amongst the larger mammals that damage crops (Naughton-Treves 1998; Naughton-Treves *et al.* 1998; Hill 2000). Naughton-Treves *et al.* (1998) reported that primates

  

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were responsible for 71% of crop damage events and 48% of the total area of damaged crops in a survey. Similarly, Priston (2005) reported crop losses to primates to be as much as 70% on individual farms, while Warren *et al.* (2007) reported instances when over 60% of a season's crops were lost to primates. Hill (2000) found baboons to crop raid more often than any other species and were responsible for 70% of all crop damage events. Within the primate order, almost all families have been identified as crop raiders (Lee & Priston 2005), but Cercopithecidae (baboons, macaques and to a lesser extent colobines) top the list of the crop raiding culprits (Nijman & Nekaris 2010). Within this family, *Papio* (baboons) are among the most frequently cited primate crop raiding species (Naughton-Treves 1998; Hill 2000).

People and wildlife have lived in close association for thousands of years (Hill 2002), but because human and wildlife niches overlap extensively the possibility for competition between the two is much higher (Priston & Underdown 2009). Furthermore, despite the increasing threat to primates from human-primate conflict, some primates are able to cope with some degree of human encroachment (Hill 2002); some species are even able to thrive in human-modified habitats (Kaplan *et al.* 2011).

The adaptability, intelligence, opportunism and agility of primates allows many species to easily exploit human food sources (Nijman & Nekaris 2010). Traits held by some species within the primate order that further enable successful exploitation of agricultural resources include being primarily terrestrial with an ability to exploit arboreal habitats, opportunistic omnivores and possession of cheek pouches to store food and therefore maximise food acquisition while reducing processing time (Priston 2009). The fact that primates are able to cross fences with ease (Hill 2002) and often wait for farmers to leave before raiding (Maples et al. 1976) only lends to their success. As such primates are the most challenging of all the larger mammals to control (Conover 2002; Wang et al. 2006) and are frequently conceived of as 'pests' (Goedeke & Herda- Rapp 2005), posing major management and conservation challenges (Strum 2010).

If people and wildlife are to coexist outside of protected areas, then ways must be found to resolve conflict. Identifying successful methods will provide major enhancements to conflict resolution and wildlife conservation in general (Sillero-Zubiri & Switzer 2001); current threats to wildlife stemming from conflict require strategies to manage and contain conflict if populations are to persist (Lee & Priston 2005). Conflict resolution is also important in reducing the vulnerability of people that come into conflict with wildlife, by reducing the magnitude of wildlife damage sustained (Dickman 2010). If problems are allowed to persist losses will only get worse and difficulties in management magnified (Engeman et al. 2010).

  

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Furthermore, providing solutions helps encourage positive attitudes towards wildlife so that peaceful people-wildlife coexistence can be maintained (Strum 2010).

There are a number of deterrent methods that are currently implemented by agriculturalists that suffer from damage by wildlife. These include: guarding, chasing, beating drums, throwing stones, slingshots, spears, bear bangers, ultrasound, dogs, scarecrows, chilli bombs, translocation, culling, a range of fencing including electric, fladry, buffer crops, and many more (Arlet & Molleman 2010; Nyirenda *et al*. 2011; Kaplan 2013). However, most of these methods are employed with limited effectiveness and could be significantly improved.

Mitigative techniques will only be successful if the risk to animals of crop raiding is increased to outweigh its benefits; techniques need to be developed that artificially enhance the perceptions of risk by reducing the accessibility or palatability of crops (Lee & Priston 2005; Strum 2010). Furthermore, because crop raiders save foraging time they are able to 'sit and wait' for opportunities to raid. Control techniques therefore need to use up much of the raiders' time (Strum 2010). To be effective mitigation must also meet the following criteria. First and foremost, the value of the resource to be protected, in this case the crops, must exceed the cost of a deterrent (Kaplan 2013). Secondly, any strategy must be appropriate to the site concerned and acceptable to those living there (Hill 2000). Lastly, the technique must meet the needs of both the people and the wildlife involved.

The first step in developing a strategy for controlling the impact of crop raiding is a general understanding of the ecology and behaviour of the target species, site-specific spatial and temporal determinants of conflict and the human socio-political and economic environment (Woodroffe *et al*. 2005; Bal *et al*. 2011). Solutions must be driven by both biological and social scientific data, and not solely by fears and prejudices (Treves & Karanth 2003). It is unlikely that a single management strategy will prevent all crop damage by all problem animals (Wang *et al*. 2006), and therefore a combination of techniques should be used. Mitigation will work best when deployed simultaneously in a combination of methods and when used in random rotations (O'Connell-Rodwell *et al*. 2000; Sillero-Zubiri & Switzer 2001; Treves & Karanth 2003; Wang et al. 2006; Zimmermann et al. 2009). The mix of strategies used will often involve modification of raider behaviour, a change in human behaviour, spatial separation and increasing tolerance (Treves & Karanth 2003; Bal *et al.* 2011). In many cases, highly technical interventions are not practical and so are unlikely to solve the problem (Treves & Karanth 2003; Bal *et al.* 2011). Despite commercial farmers being in a better position to use technical interventions, the large size of the farms often precludes this from being an option. Furthermore, because many animals habituate to deterrents, the most effective strategies are likely to be adaptive and inexpensive rather than complex (Osborn & Hill 2005). It is more

  

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likely therefore that successful techniques will be developed from the improvements of traditional deterrent methods (Sillero-Zubiri & Switzer 2001).

Finally, developing and implementing effective mitigation strategies is challenging and can cause unexpected consequences. Effective mitigation may only displace the conflict (O'Connell-Rodwell *et al.* 2000; Wang et al. 2006; Dickman 2010). For example, chasing primates from one field may simply move them to the next field. Furthermore, the removal of one problem species may allow another to move in. When cardamom farmers removed problem squirrels (*Funambulus palmarum*) from their plantations in south India depredation by birds increased significantly (Chakravarthy *et al*. 2008). These consequences need to be considered and monitored for mitigation methods to be effective in the long-term.

## CONCLUSION

If people and wildlife are to coexist outside of protected areas, then ways must be found to resolve conflict. Identifying successful methods will provide major enhancements to conflict resolution and wildlife conservation in general. Current threats to wildlife stemming from farmland conflict require strategies to manage and contain them if wildlife populations are to persist. Conflict resolution is also important in reducing the vulnerability of people that come into conflict with wildlife, by reducing the magnitude of wildlife damage sustained. If problems are allowed to persist, losses will only get worse and difficulties in management magnified. Furthermore, providing solutions helps encourage positive attitudes towards wildlife so that peaceful people-wildlife coexistence can be maintained. Hence, the various stakeholders, wildlife conservationists and the State government wildlife management authorities have a crucial role to play in joining the local farmers in mitigating the unnecessary killing of wildlife in farmers. This strategy would as well ensure sustainable agricultural growth for the local farmers.

  

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