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# THE ASSESSMENT OF WEAVER-BIRDS' CROP-RAIDING ACTIVITY IN BUEA MUNICIPALITY, SOUTHWEST REGION, CAMEROON

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**ABSTRACT:** *The entire surface of the earth is visited by the birds in view of their aerial flights and variable habitats in search of suitable breeding and feeding grounds. Flight, intelligence, adaptability and sight are some of the attributes that add to the diversity in the life of birds, consequently there is complexity in their overall behavioral pattern. The key objective of this study was to assess the weaver-bird crop-raiding activity in Buea municipality on different environmental parameters. The study was undertaken for three months, six days in a week, from 7:00am to 6:00pm. Scan observations were made on birds' activity on a five-minute interval period across the entire study area. Simultaneously, data was collected on the environmental conditions. The study recorded a significant association between weaver-bird activity on crop-land, $X^2$ = 11.653 df=14, P < 0.005 and $X^2$ = 3.441 df=4, P<0.05 respectively. There was weaver-bird activity frequency of 51.63%, 45.35%, and 3.02% for Ploceus luteolus, Ploceus cuculatus, and Ploceus melanocephalus respectively. Moreover, a week association between bird activity and weather, $X^2$ = 3.125 df=3, P<0.05 was recorded. The sunny and cloudy weather conditions recorded 53.26%, and 42.09% respectively, while the windy and rainy weather conditions were significantly low (3.26%). An association was recored between atmospheric conditions and weaver-birds' activity on crops, $X^2$ = 23.249 df=21, P<0.05. In addition, the most destroyed farms were Elaeis guineensis (32.33%), Saccharum officinarum (19.77%), Zea mays (17.44%), and Mangifera indica (15.58%) respectively, and the scale of destruction was very prominent on the foliage used by the birds for nest-building. Maize crops and oil-palms were among the crop species most subjected to destruction by birds. These crops were observed with poor foliage formation and fruits, consequently they withered, and since the local farming population in this municipality predominantly cultivate these crops most, a heavy toll is often taken on the annual farmers' income.*

**KEYWORDS:** feeding, nesting, weaver-bird, environmental conditions, crops

## INTRODUCTION

The world population continues to grow, accompanied by rapid urbanization and industrialization. In 2009, more than 50% of the world's population was living in cities (UN, 2011), with the most rapid urban growth in low income regions. In Africa the urban population is likely to triple, and in Asia it will be more than double in a few decades (UN, 2011). Loss of biodiversity is a worldwide phenomenon (Butchart et al., 2010). Even though cities only occupy 2.7% of the world's dry-lands, urbanization leads to several environmental problems including damage to biodiversity (Kareiva et al. 2007, Grimm et al. 2008). Birds are globally seen as a flagship group for conservation, ecological and evolutionary reasons, and they occupy a significant place in people's perception of nature. Birds are highly sensitive as well as mobile, and thus eminently suitable to study the impact of anthropogenic disturbance on biodiversity (Chazdon et al., 2009; Gibson et al., 2011).

Birds use a wide variety of plant, animal and artifcial materials to construct their nests (Hansell 2000). Whilst the nest itself is primarily where eggs are incubated (Deeming 2016), it is suggested that they have a range of other roles associated with reproduction, and perhaps even lifetime fitness (Moreno 2012; Mainwaring et al. 2014a). Birds select materials during nest construction for a variety of reasons (Deeming and Mainwaring 2015), including sexual signaling (Dubiec et al. 2013; Tomás et al. 2013), defense from parasites or pathogens (Dubiec et al. 2013), camouflage (Kull 1977; Bailey et al. 2015), insulation (Hilton et al. 2004; Dhandhukia and Patel 2012; Mainwaring et al. 2014b) or for their structural role (Bailey et al. 2014; Biddle et al. 2015, 2017). Whether these materials are deliberately selected for specific roles has yet to be fully investigated, but it is known that variation in a particular type of material reflects its availability within the local environment (Álvarez et al. 2013; Cantarero et al. 2015; Briggs and Deeming 2016).

Recent studies have tried to determine the factors that affect nest construction both using captive species and by examining nests from the field, particularly in light of the structural properties of the materials. Captive Zebra Finches (*Taeniopygia guttata)* have been used to demonstrate that the structural properties of artificial materials (string) as well as the experience of the bird influence the materials chosen, with stiffer string appearing to be the more effective building material (Bailey et al. 2014). Additionally, captive birds also show an apparent sensitivity to the length of the string (Muth and Healy 2014).

Wild birds also appear to select materials which play an important mechanical role in construction. Common House Martins (*Delichon urbicum*) have been shown to enhance the mechanical behavior of mud-based nesting materials, particularly in compression, with the addition of polysaccharide/sugars obtained from abundant plant fruits (Silva et al. 2010). In the nests of Common Blackbirds (*Turdus merula*) plant-derived materials in the outer nest were found to be

thicker, stronger and more rigid compared to the materials present within the structural wall and the cup lining (Biddle et al. 2015). A similar pattern was observed in the mechanical properties of materials used in the various parts of the nests of Eurasian Bullfnch (*Pyrrhula pyrrhula*) (Biddle et al. 2017). The materials used by Bullfinches in the outer nest were thicker and stronger than those used by the much heavier Common Blackbird, which may reflect the absence of an internal mud cup in the Bullfinch nests (Biddle et al. 2017). These reports suggest that these birds may have some level of awareness of where and when to place certain materials in order to create a nest structure, although this has yet to be tested experimentally (Biddle et al. 2017).

Other animals have also been shown to use materials in a non-random manner during the construction of nests and other structures. Orang-utans (*Pongo spp*) build nests in trees that act as sleeping beds. They select stronger, more rigid materials for the outer 'structural' part of the nest compared to the weaker and more flexible materials used to construct the cup lining (Van Casteren et al. 2012). Irrespective of the availability of tree species in one study, Eurasian Beavers (*Castor fiber*) largely used poplars Populus and willow Salix branches in building their lodges (Fustec and Cormier 2007). Studies of the structural properties of nest materials are rare (Silva et al. 2010; Biddle et al. 2015, 2017; Bailey et al. 2016), so little is known about whether birds are generally selective of nest materials based on their biomechanical properties.

Weaver-birds are crop-raiders in Cameroon and other countries in sub Saharan Africa. Their prolific reproductive behavior has given them the ability to invade crop-farmland in hug numbers, the reason crop farmers in most areas in Cameroon suffer annual crop-yield shortages. The crop-raiding behavior of weaver-birds also involves nest-building in the farming areas for breeding. This characteristic is the main reason their destruction on crop-farms is heavy and takes an annual income toll on its victims. Hence, this study was focused on the birds' destructive feeding and nesting activities on farm crops in Buea municipality.

## MATERIALS AND METHODS

### The description of study area

Buea municipality is found in the Southwest Region of Cameroon, located between longitude $9^0$ 16' E and latitude $4^0$ 9' N (fig.1) (Tanjong 2014; Fitton *et al* 1983). The municipality is bounded to the north by tropical forest on the slope of mount Cameroon (4100m above sea level). The population is estimated at about 300,000 people, of whom two-third live in the city of Buea, while the rest in villages. The settlement pattern forms a closed ring around the foot of the mountain with no permanent settlements on altitudes above 1500m. The indigenous people in the area are Bakweri, Bomboko, Balondo and Bakolle (Ekane, 2000). With an equatorial climate, temperature is moderate with a slight seasonal variation (rainy and dry season) (Tanjong 2014). The region is also very diverse in fauna with over 370 species of wildlife recorded. The sub-montane and montane habitats are part of Cameroon mountain endemic bird area. So far,

210 species of birds have been recorded, out of which 8 are threatened and 2 strictly endemic mount cameroon francolin (*Francolinus camerunensis*) and mount cameroon speirops (*Speirops melanocephalus*) Ekane (2000). Agriculture is the most important source of livelihood in the area accounting for about 80% of household income in most villages. Other sources of income include hunting, timber and non-timber forest products (NTFP) exploitation, petty trading, and cattle rearing (Tanjong 2014).

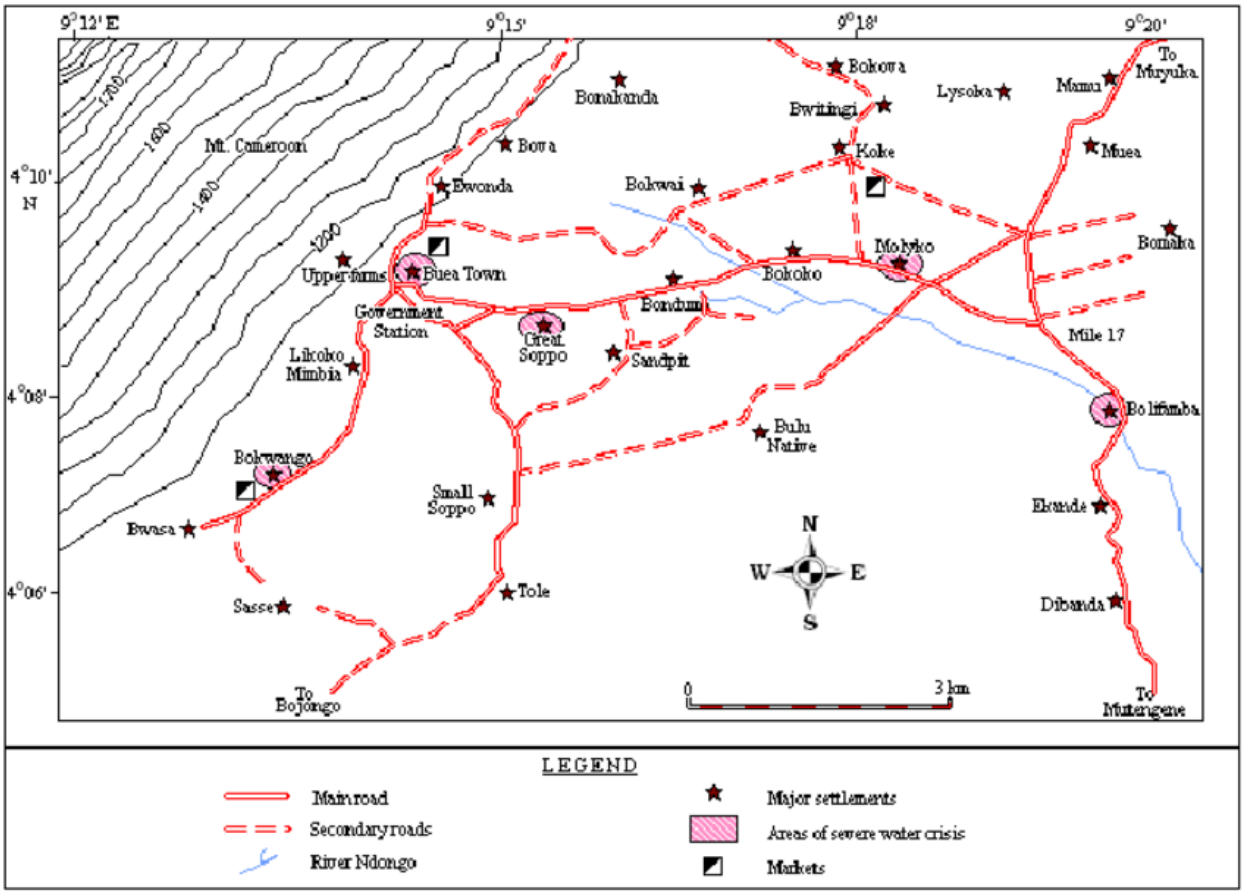


***Figure 1: Map of Buea Municipality***

**Data collection method**

The research data collection program was done by a research team made up of four persons, the principal investigator and three other student colleagues. The three-month study was carried out in Buea municipality, and the research data was collected between 7:00am – 6:00pm each day of the study, and was done 6 days each week, Monday – Saturday. The team visited all the neighborhoods of the city on a daily bases to record observations on bird species, feeding activity, locations, and day-period. A five-minute-spot-count method was used throughout the data collection period. Point counts (where the observer is sedentary at one place), is among the most frequently used techniques for monitoring terrestrial birds (Rosenstock et al. 2002). Bird population monitoring programs vary in how they are conducted. The Breeding Bird Survey

(BBS), for example, is run in Britain and variants of it are used by 18 other European countries (Spurr 2005). Five-minute point-based distance counts are used in France that specify the area of the sampling site and the distance bands used around each point, (<25m, 25-100-m, and >100-m) (Spurr 2005).

**Data analysis**

The research data collected on check-sheets was analyzed by the use of SPSS version 20. And the main statistical model used was chi-square to test the relationships existing between the variables such as bird species, bird feeding and nesting activities, and the neighborhood location. Exploratory analysis was used to further examine the frequency of variables like bird activity, environmental condition, and bird species

## RESULTS

The study recorded a significant association between weaver-birds activity on crop-land, $X^2$ = 11.653 df=14, P < 0.005 (fig.1) and $X^2$ = 3.441 df=4, P<0.05(fig.2) respectively. Birds are very important to the natural ecological sustainability, especially in the tropics where the rainforest is undergoing intensive depletion due to corruption and mismanagement of public funds. However, the touristic love for bird-watch on some species like weaver-birds has been controversial in wildlife conservation, due to the destructive role played some species of birds in croplands. The weaver-bird feeding activity on maize (*Zea mays*), avocado (*Persea americana*), and oil palms (*Elaeis guineensis*) was significantly recorded in this study. Crop-farming in Buea municipality and other parts of Cameroon has been rendered difficult by the weaver-bird feeding activity, one of the main reasons for the low crop-yield in most cultivation seasons.

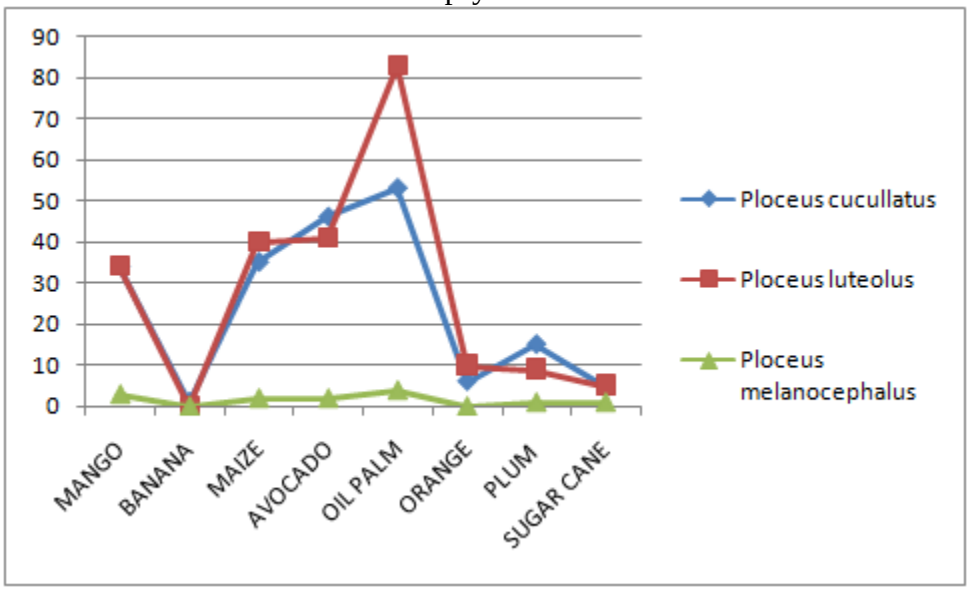


***Fig 1: weaver birds and agriculture***

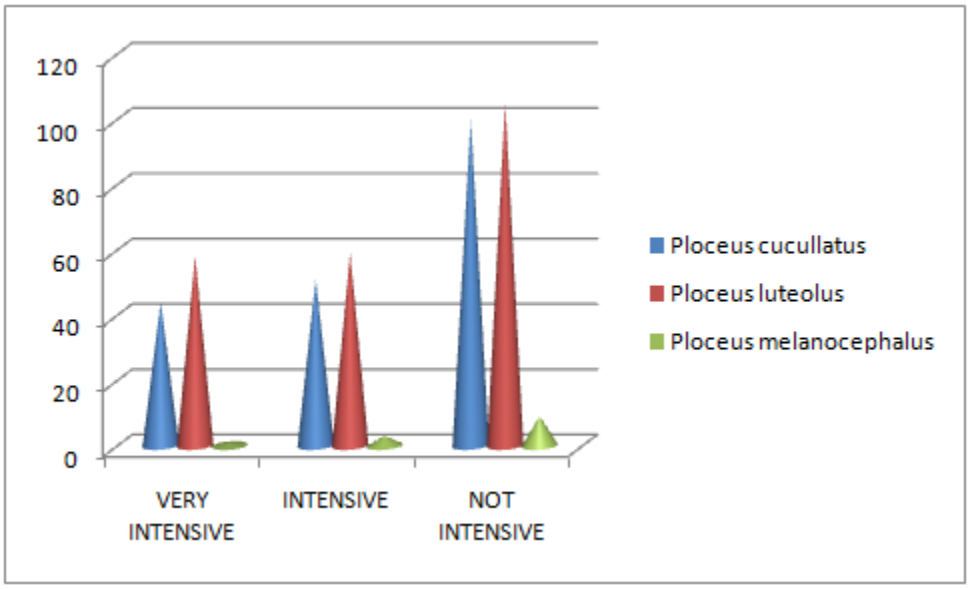


***Fig.2: Weaver bird activity on cropland***

There was weaver-bird activity frequency of 51.63%, 45.35%, and 3.02% for *Ploceus luteolus*, *Ploceus cuculatus*, and *Ploceus melanocephalus* respectively (fig. 3). These bird pests were not only frequent in the study area but are among the dominant bird pest in Cameroon and other countries in sub Saharan African region. The bird population is high and a nuisance to the local farming population, affecting their crop-farm yield on both seasonal and annual bases. The major problem farmers in the local and remote communities are facing is fighting the weaver-bird population. Unfortunately, the primitive approach involving the use of stone-throw, drumming, shouting, and hand-clap chasing rather seems to escalate their problems since weaver-birds would fly off to neighboring farmlands during the application of such methods.

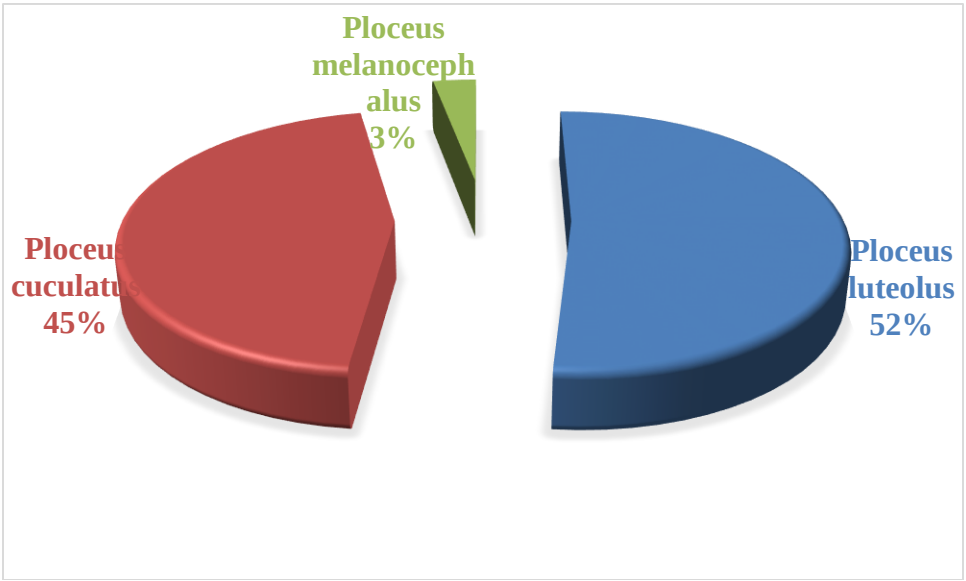

***Fig.3: Frequency of weaver bird species***

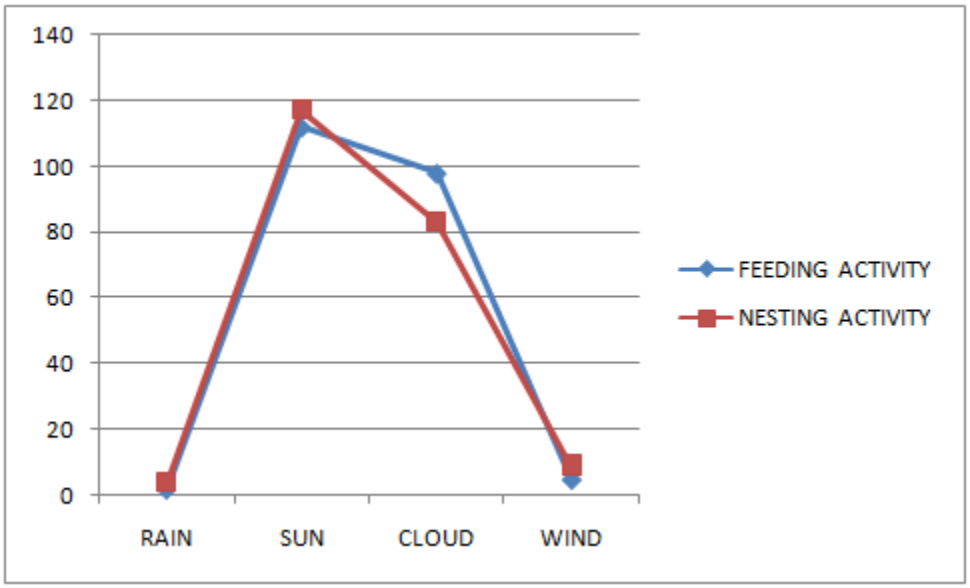


***Fig. 4: Bird activity and weather***

Additionally, a week association was recorded between birds' activity and weather, $X^2 = 3.125$ df=3, $P<0.05$ (fig.4). The effect of atmospheric conditions has been well known on wildlife behavioral activity changes, influencing both the social and individual activities. The sunny and cloudy weather conditions recorded 53.26%, and 42.09% respectively, while the windy and rainy weather conditions were significantly low (3.26) (fig.5). It must also be noted that the turbulent atmospheric condition in mount Fako is characterized with heavy rainfall, wind, and cloud in most parts of the year. Hence, any sunny weather condition, especially in the rainy season is considered as an advantage to wildlife feeding activity. During heavy rains the birds were observed flying into their nests to shelter, waiting for a convenient atmosphere to intensify feeding and their nest-building.

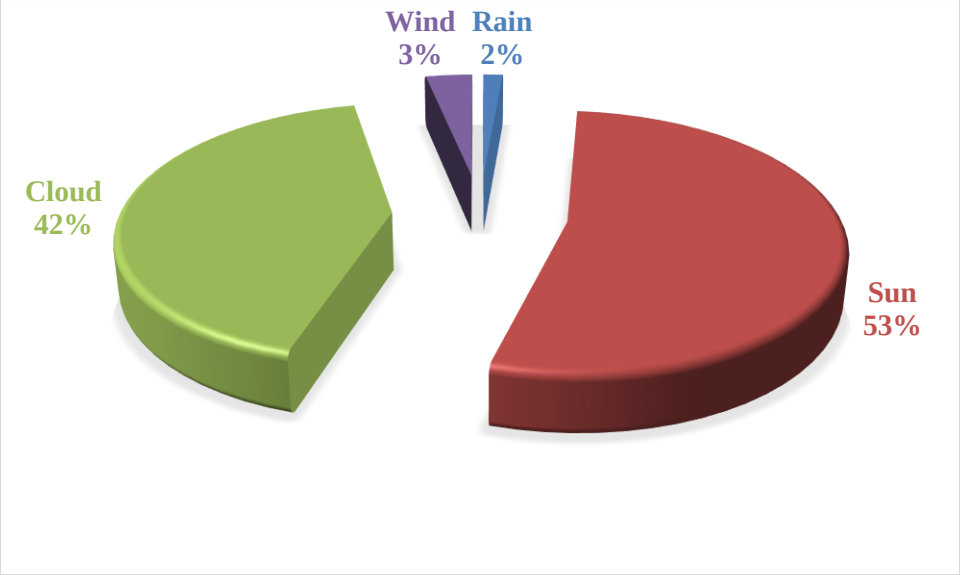


***Fig.5: Frequency of activity and weather***

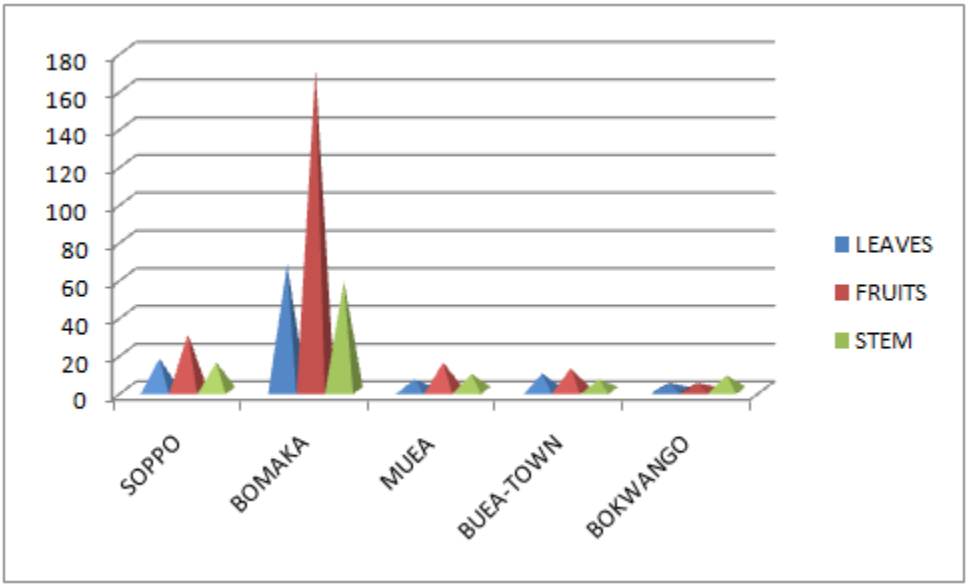


***Fig. 6: Human neighborhood and crop-portion destruction***

Furthermore, human neighborhood showed a significant association on crop species, $X^2 = 42.253$ df=28, $P<0.05$ (fig.7). Crop species such as maize, avocado, and oil palms were the most affected in Bokwango, Buea-town, Muea, and Bomaka neighborhoods, while Soppo neighborhood was the least affected. Human neighborhood and foliage destruction revealed a significance, $X^2 = 13.144$ df=8, $P<0.05$ (fig. 6). Bomaka neighborhood still recorded the highest foliage destruction comparatively.

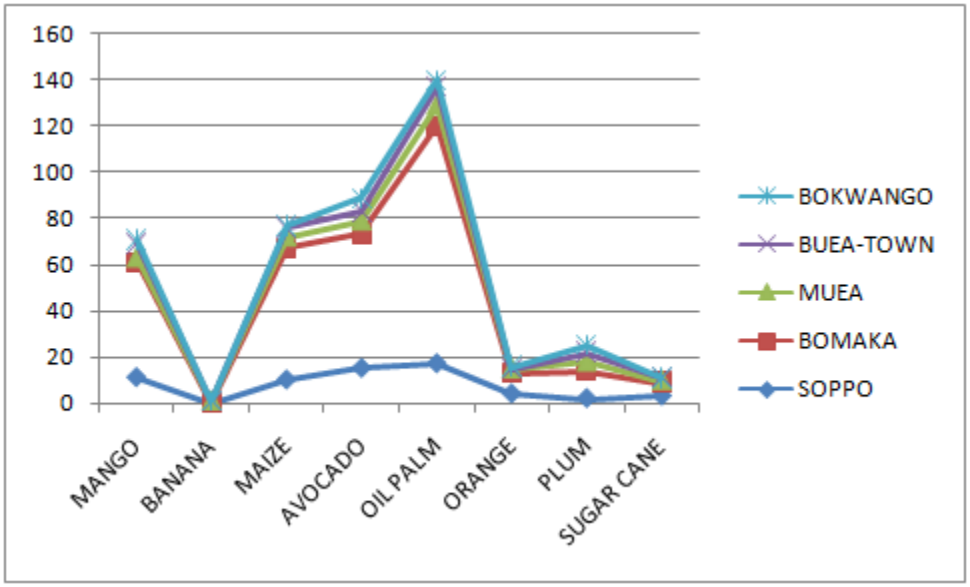


***Fig.7: Human neighborhood and crop species***

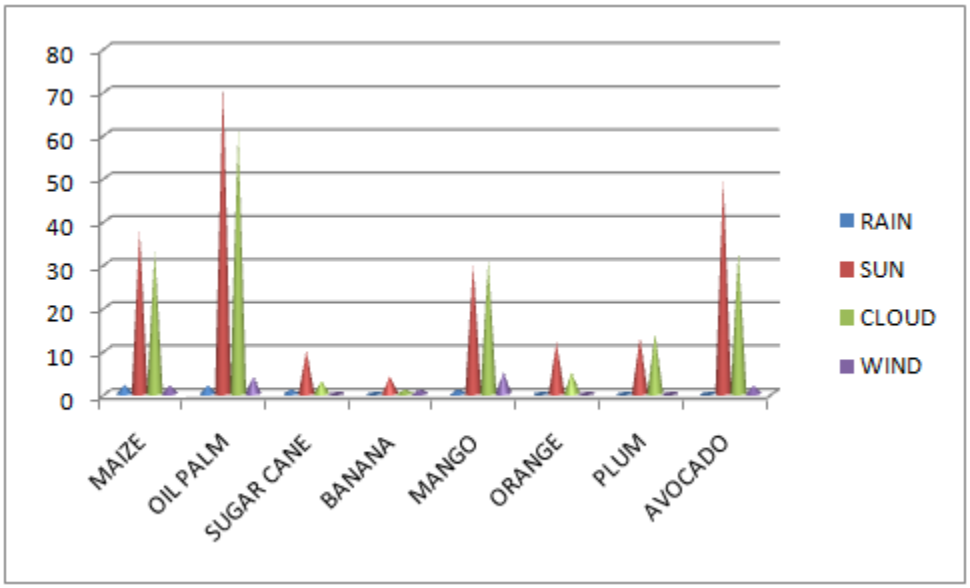


***Fig. 8: Atmospheric conditions and weaver-birds' activity on crops***

An association was observed between atmospheric conditions and weaver-birds' activity on crops, $X^2 = 23.249$ df=21, $P<0.05$ (fig.8). Three weather types, wind, cloud, and sun remarkably favored the activity of birds on maize, avocado, and oil-palm while their activities were low during rainy weather condition. Maize and oil-palms were among the crop species most subjected to destruction by birds. These crops were observed with poor foliage formation and fruits, consequently they

withered. Since the local farming population in this municipality is predominantly cultivating these crops most, a heavy toll is often taken on the farmers' annual farm-income. In addition, the most destroyed farms were *Elaeis guineensis* (32.33%), *Saccharum officinarum* (19.77%), *Zea mays* (17.44%), and *Mangifera indica* (15.58%) (fig.9), and the scale of destruction was very prominent on the foliage used by these birds to build their nests.

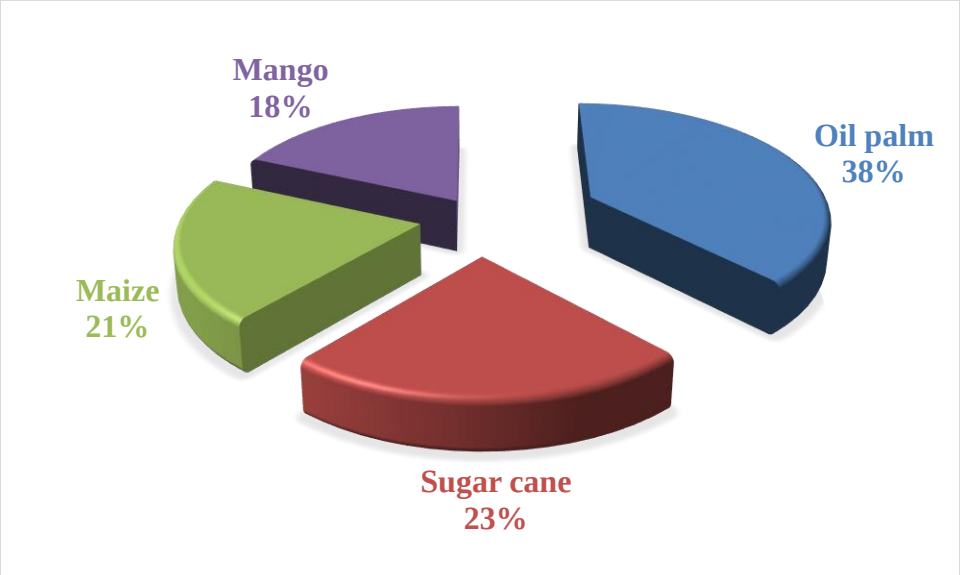


***Fig. 9: Frequency of farm destruction***

**DISCUSSION**

Human wildlife conflict is one of the major threats to conservation, house-hold food security and rural incomes. In Africa, the great dependence of a large proportion of human population for their survival on land, coupled with the presence of many species of large mammals leads to many sources of conflict between people and wildlife. This in turn creates friction between protected area managers and local communities living in the regions that border these protected areas. (Hill, 1999). People have coexisted with wildlife since the early age when they lived a simple hunter-gatherers lifestyle supplementing their diet with fruits and leaves. Man has been and is still a threat to wild plants and animals.

There are about 40 species of birds in North, East and Central Africa, which are considered as agricultural pests (Schmutterer, 1969). Relatively a few number of all these species do appreciable damage to cultivated crops. Some bird species are extremely destructive, particularly to small grains as in the case of quelea and Bishops. The activity pattern of birds in croplands is influenced by a number of factors such as crop type, non-crop physical structural arrangement and the

agricultural practices (Rodenhouse et al., 1995). Shift in cultivation timing also significantly affects the activity pattern of cropland birds, which causes further reduction of the population of farmland birds (Best, 1986; Jobin et al., 1996).

Home-garden agroforestry systems (HAS) are complex combinations of multilayered and multispecies vegetation patterns (Kehlenbeck & Maass 2004) thereby, providing an ideal forest-like habitat to conserve wildlife species by providing sufficient nesting, breeding, food and temporary refuge opportunities all year round (Griffith 2000). These habitats are suitable for bird species, such as Common Pigeon (*Columba livia*), Spotted Dove (*Spilopelia chinensis*), House Sparrow (*Passer domesticus*), Scaly-breasted Munia (*Lonchura punctulata*), Common Myna (*Acridotheres tristis*), Baya Weaver (*Ploceus philippinus*), among others, which are human-tolerant and adjusted to human habitats. These birds have been usually found to build nests and forage for food in and around human settlements (Soni et al. 2004). their breeding season lasts from May to October (Ali & Ripley 1987). During breeding season, the males moult into a yellow and brown nuptial plumage, while females remain pale brown (Ali & Ripley 1987). They are granivorous (Avery 1979) birds forming enormous communal roosts (Gadgil & Ali 1974).

Birds select habitats that fit their requirements for successful reproduction and survival though some generalist species may utilize several habitats (Rodríguez-Estrella, 2007). Differences in requirement among bird species have caused specificity on habitat requirement (Buckley and Freckleton, 2010). For example Mountain plover (*Charadrius mountainus)* feeds primarily on insects (grasshoppers, crickets, beetles, flies, ants); uses ground for nesting and prefer short grass while Mongolian sand plover (*Charadrius atrifrons*) feeds on invertebrates (molluscs, worms, crustaceans especially crabs and insects), uses tree for nesting and prefer shore of the lakes. Therefore, habitats either terrestrial or aquatic restrict bird species distribution and diversity (MacLean, 1970). In most habitats, plant communities determine the physical structure of the environment, and therefore, have a considerable influence on the distributions, abundance and diversity of birds and interactions of other animal species. For example, for bird species diversity in forests, Tewes et al. (2004) evidenced that the physical structure of a plant community, i.e. how the foliage is distributed vertically, may be more important than the actual composition of plant species. Ranganathan et al. (2007) found that farmland also has been an important habitat for farmland bird showing that some bird species are habitat specific though some are generalist.

## CONCLUSION

Green revolution has contributed in enhancing human population growth and distribution around the world. Unfortunately, it's done at the cost of the wild and our surrounding environment that we all depend. The consequence of fighting land space with wildlife is inevitable and it's the main

reason wildlife population has suffered a severe decline over many decades. On the other hand local crop-farming areas have been molested by wildlife, especially weaver-birds known to be specialized on cereals, grains, fruits and foliage. Their nest-building activity and feeding on crop-farms have been a major problem faced by local crop-farmers in Cameroon and most parts of Africa. Reduction of the bird population on crop-land has given sleepless nights to both wildlife and agronomic researchers over years due to its prolific reproduction nature and its ability to cover long flight distances for crop-raiding. Though the bird population is not very high in southern Cameroon as compared to north, the damage on crop-farms is significantly embarrassing to the annual farm income of most farmers in places like Buea.