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ELEPHANT INVASION AND ESCALATED DEPLETION OF ENVIRONMENTAL RESOURCES IN A SEMI ARID TROPICAL ECOSYSTEM

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ABSTRACT

For decades, elephants' invasion is known to be associated with severe environmental consequences leading to escalated depletion of environmental resources (plants, water, wildlife and soil). This paper examined the effects of elephants' activity on the environmental resources in Hong and Gombi Local Government areas of Adamawa State, considering the damage they usually cause. Data collection was by personal observation, oral interview and semi-structural questionnaires using 400 respondents. The data collected was analysed using chi-square (x^2) and descriptive statistics. Results showed that the extent of damage was highly significant (P<0.01) for all the crops namely; mango, guava and orange while the types of damage done to plants, water, wildlife and soil as identified in perceived order of importance show that reduce productivity of horticultural crops (96.5%), deforestation (82.3%), water pollution (64.0%), soil erosion (60.0%), scaring of smaller wild animals (58.5%), enhance desertification (55.3%), emigration of wild animals (41.8%), blockage of water ways (35.8%) and extinction of some less resistant plant species (17.8%). Further investigation revealed that large sum of money was lost due to elephants' activity on the horticultural crops as mango (N1,547,946.67), orange (N648,120.00) and guava (N634,600.00). This paper is of the view that management techniques such as careful culling and cropping of the elephants (97.8%), use of buffer zones (95.5%), upgrading of available forest/game reserves in the study area to National park (73.8%), demarcation of forest areas from farming activity sites using walls or ditches (64%) and mounting of resettlement programmes (46.0%) can go a long way in controlling elephant menace

Keywords: Escalated, Ecosystem, Horticultural crops, Depletion, Extinction, Management

INTRODUCTION

Hong and Gombi local government areas of Adamawa State lie within the yearly circular route of elephants' (Wammanda, 1995), of which their movement is highly associated with environmental resources depletion (Estes, 1992). Dirkwi (1996) reported that elephants in the study area destroy the forest through their various browsing behaviour on tress and shrubs accompanied by trampling on the herbaceous layers (herbs and grasses). Dirkwi (1996) stressed that the effects of elephants' movement cannot be over-emphasized, because they destroy locally constructed wells and water shed sites by bathing in them, scare comparatively smaller animals, destroy horticultural crops (mango, guava, orange etc) and also the forestry crops by pulling down trees, breaking up bushes and up rooting of smaller trees and shrubs that constitute the forest (Malgwi, 2002). The destruction of trees according to Estes (1992) most at times lead to extinction of several less resistant species of plants (especially the shed loving species). Dirkwi (1996) reported that the consequence of the above effects on the environmental resources in the study area led to the escalated depletion of its natural resources. These effects resulting from elephants' activity have reduced this once forested area to a mere grass land, and the productivity performance of the forestry sector drastically reduced (Kinging, 1996). The question now is what must be done to over come this situation? Considering the global call by the conservationists and Ecologists on the need to conserve these animals.

The answer to this question may be in line with Shashi (1996), who observed that for any conservation programme to succeed, it should be able to address the economic, social and cultural needs of the local people living closer to the conservation sites.

Report of the sampled respondents showed that the members of those communities living within the elephants' invasion areas are in serious problem and there is need to address it urgently, if not the situation may run out of hand. According to the respondents, a substantial number of people within the communities depend on the environmental resources for their livelihood. Respondents' observation is in line with Langet (1999) report, that environmental resources such as plants, water, wildlife and soil have been indispensable components of man's life. Men directly depend on forest resources such as fruits, seeds, wood, leaves etc. for the sustenance of his livelihood. These resources are either taken directly as food (fruits, seeds and leaves) or locally processed before usage while the wood are used as fire wood or processed into timber. The water is taken by man, animal and plants for various uses, which include digestion, body metabolism, medium of transportation within or outside the body while the wildlife provide animal protein for men and other carnivores, in addition some of their extracts e.g. python and fish oils are use as medicine for

curing fractures and rheumatism respectively (Awi, 2006).

The soil provides stable ground for the growth and development of varieties of plant species and also holds water for the need of plants and animals. Furthermore, soil determines the status of vegetation of an area of which the vegetation in turn determines the types and availability of wild animals usually found (Asibey and Child, 1990).

In addition, the respondents reported that nearly all the inhabitants of the study area depend on the available tall grasses as a roofing material for thatched houses. The consequence of the elephants' invasion, is that the tall grasses are now scarce because of the trampling of elephants over them which rendered the grass useless. Correspondingly, the comparatively smaller wild animals in the area according to Dirkwi (1996), were forced to migrate as their hide out and food resources have been destroyed. Kinging (1996), reported that because of continuous activities of elephants in the study area, Kinging forest reserve have been converted to a mere grazing land where the herbaceous layer is constituted by mainly assorted grasses. The observation made by Kinging (1996), confirms the report made by Estes (1992), that the woodland of Murchison and Tsavo was transformed into grassland due to elephants' activity in the area.

The escalated depletion of the environmental resources therefore as reported by the respondents, have direct economic consequences on the inhabitants, because their horticultural crops are destroyed, available water bodies (streams, small lakes etc) are put out of use from the months of January to June each year. The crop losses as investigated amounted to millions of naira because the damage caused was highly significant. Considering the economic state of the inhabitants who are mainly peasant farmers, there is need to address this problem with immediate effect because the seasonal presence of elephants and their activities in the study area, promotes natural resources depletion, and environmental degradation and causes poverty on the inhabitants. This research therefore focuses on the following objectives.

1. To examine the types of damage caused to environmental resources by elephants
2. To quantify the damage done to some selected horticultural crops (mango, orange and guava) from 1996 to 2005.
3. To suggest management techniques that could be adopted in the control of Elephants' menace in the study area.

MATERIALS AND METHODS

Study Area: The research was conducted in Hong and Gombi Local Government Areas of Adamawa State. The study area was stratified into two major administration units (Hong and Gombi units) for easy sampling of respondents and area coverage.

A total of 400 respondents consisted of mainly farmers of forty (40) years and above were sampled randomly, from 16 villages using simple random sampling technique (Jen, 2002). The sampled villages are known elephants' invading sites. The age preference was to ensure that such person or persons have witnessed the changes that affected the environmental resources (water, plants, wild animals and soil) over the years.

Semi-structured and close-ended questionnaires were administered to them ensuring equal number of respondents drawn from the two units, thus reducing bias. For easy administration of the questionnaire, participatory rural appraisal method was employed because it allows free interaction and understanding between the researcher and respondent (Dunn, 1994). Information through personal observation and literature search were equally utilized.

The contents of the questionnaire include; name of local government area, resources usually affected by the elephants, types of damages done to environmental resources, the extent of damage done to horticultural crops, estimated monetary loss caused to horticultural crops and the management techniques that could be adopted in the management of environmental resources. The data collected was analyzed using descriptive statistics and chi-square (x^2).

RESULTS AND DISCUSSION

Environmental Resources Usually Affected by the Elephants: The resources usually affected by the elephants include, soil, water, wildlife and plants (Table 1). These resources according to the respondents, suffer heavy losses due to various feeding behaviour and trampling of the elephants. Plants were highly affected by the elephants (98%), followed by water (80%) while wildlife (63.5%) and soil (40.8%) suffer less damage.

Table 1: Environmental resources affected by elephant inversion

S/No	Resources Affected	Percentage of Respondents (%)
1	Water	80.0
2.	Plants	98.0
3.	Wildlife	63.5
4.	Soil	40.8

Damage to Environmental Resources: The types of damage done to plant, water, soil and wildlife components of the environment as reported by the respondents sampled (Table 2), revealed that the productivity of horticultural crops (mango, guava and orange) were seriously affected (96.5%), this was followed by deforestation (82.3%), pollution of water (64.0%) while plant species diversity or abundance suffer less threat from the elephants (17.8%).

The Extent of Damage done to Horticultural Crops (Mango, Guava and Orange): The damage done to mango, guava and orange were highly significant (P < 0.01) (Table 3).

Table 2: Percentage damage done to water, plants, wildlife and soil as a result of elephant inversion

S/No	Environmental Resources	Types of Damage	Percentage of Respondents (%)
1	Water	(i) Blockage of water ways	33.8
		(ii) Pollution	64.0
		(iii) Extinction of local wells	31.0
2.	Plants	(i) Deforestation	82.3
		(ii) Extinction of some plants species	17.8
		(iii)Causes reduce productivity of horticultural crops due to physical damage	96.5
3.	Wildlife	(i) Scaring of smaller wild animals	58.5
		(ii) Encourages emigration of wild animals	41.8
4.	Soil	(i) Causes erosion	61.0
		(ii) Enhances desertification	55.3

Table 3: Damage of crops by elephant in Hong and Gombi Local Government Areas   of Adamawa State

Crops	Observed Yield(kg)	Expected Yield(kg)	Yield Difference (kg)	Chi-Square (x^2)	df	P-value
Mango	30,833	88,942	58,048	1047.2288	15	0.01*
Guava	20,190	51,920	31,730	974.8254	15	0.01*
Orange	15,630	48,096	32,466	49026.5634	15	0.01*

Extent of damage: Highly significant. *Significant at 1%. **Source**:   Analysed field data, 2006.

Table 4:   Monetary loss to horticultural crops as a result of invading elephants

S/NO	Name of Crops	Damage in kg	Quantity per Carton (kg) (Akbar 25 Tea carton)	Unit price in Naira (₦) per carton as of July 2006	Amount of loss in Naira (₦)
1	Mango	58,048	30	800.00	1,547,946.67
2	Guava	31,730	30	600.00	634,600.00
3	Orange	32,406	30	600.00	648,120.00

Heavy losses were recorded in all the crop types. Mango was the most affected (58,048 kg), followed by orange (32,466 kg) and lastly guava (31,730 kg).

According to the respondents, the similar destruction results from the fact that the crops were cultivated usually in the same place and they constitute the riparian forest where the elephants usually rest after drinking water or during hot days. Kinging (1996) opined that since vegetated sites provides resting place for the elephants, this gave them easy access to feed on the crops.

Monetary Loss: The result of analysis shows that large sum of money amounting to ₦ 2, 870,666.67 was lost due to elephants' damage in respect of mango, guava and orange. The breakdown showed that ₦1,547,946.67 was lost due to damage caused to mango, ₦ 634,600.00 for guava while ₦ 648,120.00 went to orange (Table 4).

Adoptable Management Techniques: Management techniques such as demarcation of forest areas from farming activity sites using walls or ditches dug to a reasonable depth and width (6 by 6 feet), mounting of resettlement programmes, use of buffer zones, upgrading of available forest/game reserves in the study area to National parks for increase security and careful culling and cropping of the elephants can be effective measures against crop damage (Table 5). These management techniques when properly implemented can go a long way in reducing elephants' menace (Asibey and Child, 1990).

Table 5: Management techniques to control elephants' menace

S/No	Management Techniques	Percentage of Respondents (%)
1	Demarcation of forest areas from farming activity sites using walls or ditches	64.0
2	Mounting of resettlement programmes	46.0
3	Use pf Buffer zones	95.5
4	Upgrading of available forest/game reserves to National park	73.8
5	Careful culling and cropping of the elephants	97.8

Conclusion: This study examined the problems surrounding elephants' invasion in Hong and Gombi local government areas of Adamawa state, with the view of suggesting management strategies that can be adopted to control elephants' menace.

The results showed that there is escalated depletion of plants, water, wildlife and soil components of the environmental resources. The plants component suffers the most severe damage, followed by water and less affected is soil as reported by the respondents. This study was designed to evaluate the problems faced by the inhabitants of the study area due to elephants' invasion, using a total of 400 respondents sampled randomly.

This paper is of the view that the adoption and proper implementation of the above management techniques will reduce if not totally control the menace cause by elephants to horticultural crops and other resources of the environment.

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