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Small-scale Farmer's Perception on the Impact of Grazing Livestock Animals on Crop Production in Abuja, Nigeria

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ABSTRACT

The production of crops and livestock animals in Nigeria is not mutually exclusive hence a study was conducted to determine small-scale crop farmers' perception of the impact of grazing livestock animals like cattle, goat, sheep and domestic fowls on crop production in Abuja, Nigeria. A multi-stage technique was adopted for sample selection while semi-structured questionnaires were used for data collection. A total of 384 small-scale crop farmers were randomly interviewed in four agricultural zones-central, eastern, northern and western. Data were analyzed using two-way factorial analysis of variance (ANOVA) and mean separation was done at 5% probability level. Results revealed that there was significant difference ($p < 0.01$) in the perceived impact of the grazing livestock animals on crop production. The mean responses indicated that the impact of cattle (2.67^a) on crop production was perceived to be serious and it was significantly higher than the impacts of goat (1.92^b), sheep (1.78^c) and domestic fowls (1.28^d). The implication of this is that cattle were the most destructive livestock animals while domestic fowls were the least. At the zonal level, result revealed that the crop farmers in the eastern and western agricultural zones of Abuja felt the impacts of the grazing animals more than crop farmers in the other two zones. Based on the results, the paper recommended that government should map out grazing routes and/or educate and encourage the livestock farmers to adopt intensive system of management to minimize clashes and the damages that occur.

Key words: Crop farmers, livestock animals, small-scale farmers, impact of grazing, pastoral-farmer conflict

INTRODUCTION

Agriculture plays significant roles in Nigeria's economy and some of these roles have been outlined by different authors (NBS, 2012; Okolo, 2004; Ugwu and Kanu, 2012; Dayo *et al.*, 2009). One of the challenges confronting the sector is the impact of grazing livestock animals on crop production, especially in the northern part of Nigeria. This is a serious problem because Nigeria has a high herd of cattle population, majority of which are in the hands of pastoralists (Obadiah and Shekaro, 2012). By 2001, Nigerian livestock farmers were rearing about 15.6 million cattle, 45.2 million goat, 26.7 million sheep and 118.6 million poultry birds. Other animals also reared include 1 million horses, camels and donkeys (PCOL, 2003). In 2009, Agricultural Production Survey (APS) conducted by the Federal Ministry of Agriculture and Rural Development indicated that the stock of cattle, goat, sheep and domestic fowls in Abuja were 263,360; 3,009, 889; 958, 443 and 7,406,408, respectively (NPAFS, 2010). The above stock figures provide an estimate of the livestock animals that are reared under intensive, semi-intensive and extensive systems in Nigeria and Abuja in particular. Extensive system refers to the system where the animals are allowed to

roam and look for food (Ezeibe, 2010). The semi-intensive system allows for good control of feeding and management and the animals are more protected under this system. Intensive system is a total confinement of the livestock animals (Ezeibe, 2010; Devandra and Fuller, 1989). Although, information on the number of livestock animals that are reared in each of the three systems could not be accessed, documented report indicated that the most predominant system among the small-scale farmers in Nigeria and other African countries is the extensive system and it is also called the free range system (Ezeibe, 2010; Wilson, 1995; Nweze *et al.*, 2003; Ovwigho *et al.*, 2009).

In view of the fact that the struggle for available land resources according to Blench (2010) brings conflict between the crop farmers and pastoralists, there is every need to verify how the crop farmers perceive the impact of the grazing livestock animals on crop production. This is very critical because the productions of crops and livestock animals under extensive and semi-intensive systems in Nigeria are not mutually exclusive. They are not mutually exclusive because, first, both crops and livestock animals compete for the available land resources for survival. Second, the production of crops and livestock animals are both carried out by small-scale farmers that are scattered all over the country with no demarcation between grazing routes and cropping zones. Third, majority of the livestock farmers practice extensive system of livestock husbandry which demands that the animals must graze on the open grassland without being confined to any farm house or grazing routes/areas while crop farmers plant without fencing. Fourth, the production of livestock animals is not seasonal meaning that the animals must be fed throughout the year. During dry seasons, some of the crop and livestock farmers move close to streams, rivers and lakes to have access to water. This also brings the livestock and the crop farmers in close contact with consequent increase in conflicts. Pasquale *et al.* (2007) classified the conflicts into pastoralists-farmers, conservationists-farmers, pastoralists-fishermen and farmer-farmer conflicts. But of all the conflicts, the authors emphasized that the most predominant is the pastoralists-crop farmers' conflicts and this has been attested to by several authors (Fasona and Omojola, 2005; Nyong and Fiki, 2005; Fiki and Lee, 2004). Other studies by Adisa and Adekunle (2010) also indicated that stores, bans, residence and households' items were destroyed in many of the violent crashes. Adisa and Adekunle (2010) also added that serious health hazards are also introduced when cattle are reared to water bodies that serve rural communities.

Conflicts usually lead to disunity, violence, disagreements and blood shed because parties involved try to reach their objectives (Adebayo and Olaniyi, 2008). Presently in Nigeria, this conflict has now been subsumed into a broader dichotomy of religion (Blench, 2010). Disputes over access to resources between nomads and crop farmers are framed in religious terms thereby polarizing the country into two. Several other studies have reported increasing conflicts-induced frustrations experienced by pastoralists and crop farmers within and outside Nigeria (Watts, 1983; Philips and Titilola, 1995; Lee, 1993; Raynaut, 2001; Adger and Brooks, 2003). It is not only in Nigeria because conflicts between farmers and herdsmen cut across traditional nomadic societies like North Africa (Johnson, 1974), Ferlo Region of Senegal (Juul, 1993), Eastern Sudan (Blaikie, 1993) and Niger republic (Rasmussen, 2002). Unfortunately, the increasing availability of modern weapons according to Blench (2010) has increased the intensity and violence of these conflicts.

Since the most frequent causes of conflicts between the crop farmers and pastoralists are crop damages caused by animals belonging to herdsmen, farm encroachments on cattle routes and sometimes water points, grazing on harvested crops (Adebayo and Olaniyi, 2008; Gefu and Gills, 1990), there is every need to verify how the crop farmers perceive the impact of grazing livestock animals on crop production. The study is vital because it has led to serious manifestations of

hostilities and social friction among pastoralists and crop farmers who are the major user-groups in many parts of Nigeria (Adebayo and Olaniyi, 2008; Buhari, 1998). The conflicts/clashes according to Adisa and Adekunle (2010), are becoming fiercer and increasingly widespread in Nigeria. The conflicts have not only heightened the level of insecurity, but have also demonstrated high potential to exacerbate the food crises in Nigeria and other affected countries due to loss of farmers' lives, animals, crops and valuable properties (Adisa and Adekunle, 2010).

The main objective of the study is to determine small-scale crop farmers' perception of the impact of grazing livestock animals on crop production. Specific objectives are to: (1) determine small-scale crop farmers' perception of the impact of grazing cattle, goat, sheep and domestic fowls on crop production, (2) determine the livestock animal that poses the most serious problem to crop production, (3) determine the livestock animal that poses the least serious problem to crop production and (4) determine if there are locational (agricultural zones) differences in the impact of the livestock animals on crop production.

METHODOLOGY

This study was conducted in Abuja, Nigeria which is located in the north central between latitudes 8°25' and 9°25'N and longitudes 6°45' and 7°45'E. It was conducted in 2012 and the population comprised all small-scale crop farmers in Abuja. Multi-stage technique was adopted for sample selection while semi-structured questionnaires were used for data collection. Presently, the Abuja Agricultural Development Programme (AADP) has 4 agricultural zones-namely, central, eastern, northern and western with 12 agricultural blocks and 93 cells. In the first stage, all the 4 agricultural zones were selected while in the second stage, 2 agricultural extension blocks from each of the 4 agricultural zones were randomly selected giving a total 8 blocks. In the third stage, 8 cells were randomly selected from each of the 8 agricultural extension blocks resulting in a total of 64 cells. Finally, in each of the 8 cells (fourth stage), 8 small-scale crop farmers were randomly selected and interviewed giving a total of 384 respondents. The animals considered include cattle, goat, sheep and domestic fowl. Analysis of variance (ANOVA) was adopted for data analysis. The two independent factors in the ANOVA were the livestock animals with four levels (cattle, goat, sheep and domestic fowls) and locations with four levels (central, eastern, northern and western zones) and these gave 4×4 mixed factorial design with 16 treatment levels. This is a repeated measures ANOVA (Andy, 2005) and it is mathematically expressed as:

$$Y_{ij} = \mu + L_i + A_j + LA_{ij} + e_{ij}$$

Where:

Y_{ij} = The individual crop farmer's response regarding the seriousness of the impact of grazing livestock animals on crop production

μ = General mean

L_i = Impacts due to the differences in location (central, eastern, northern and western agricultural zones)

A_j = Impacts due to the different livestock animals (cattle, goat sheep, and domestic fowls) on crop production

LA_{ij} = Interaction effect of location and the type of livestock animal

e_{ij} = Error term

By interpretation, the model states that the perceived impact of grazing livestock animals on crop production (Y_{ij}) depends on the location (L_i) of the crop farmer in Abuja, the type of animal (cattle, goat, sheep and domestic fowls) being reared (A_j) and the joint effects of both location and the type of animal being reared (LA_{ij}). The μ (constant) is unaffected by the two factors while the e_{ij} represents the error term. Based on the model, the following hypotheses were tested: (1) H_0 : There is no significant difference in the mean perception of the impact of grazing cattle, goat, sheep and domestic fowl on crop production ($u_{cattle} = u_{goat} = u_{sheep} = u_{domestic\ fowl}$), (2) H_0 : There is no locational (agricultural zones) difference in the impact of all the animals on crop production ($u_{central\ zone} = u_{eastern\ zone} = u_{northern\ zone} = u_{western\ zone}$). In the questionnaires, the crop farmers were asked to pick from the options provided the impact of grazing cattle, goat, sheep and domestic fowls on crop production. The seriousness of the impact of each of the animals was verified using: very serious problem = 4; serious problem= 3; fairly serious problem = 2; very little effect =1 and not serious at all = 0. The above scores were used for data analysis in line with the method adopted by David (2004), Fredrick and Wallnau (2004), Shah and Madden (2004); Andy (2005) and Gray and Kinnear (2012). SPSS 15.0 was used to run the analysis and mean separation was done using Bonferroni model (Andy, 2005). It was tested at 5% probability level. The socioeconomic characteristics of the crop farmers (respondents) analyzed include: marital status, age (years), gender (male or female), household size defined by NPC (2006) as a person or group of persons living together usually under the same roof or in the same building/compound, who share the same source of food and recognize themselves as a social unit with a head of household and literacy level which also include: No formal school education, primary school education, Secondary school education, Ordinary National Diploma (OND)/Higher School Certificate (HSC), Nigerian Certificate of Education (NCE), Higher National Diploma (HND) or B.Sc and above.

Table 1 shows the analysis of variance (ANOVA) results of the impact of grazing livestock animals on crop production. The values in the “Animal impact” row of the ANOVA table measured of how the crop farmers perceived the impact of each of the animals on crop production, that is, the main effect of the livestock animals on crop production. The results indicated that there was a significant difference in the impact of the different animals on crop production, $F(3, 1140) = 142.03, p = 0.00$. In other words, the impacts of grazing cattle, goat, sheep and domestic fowls on crop production were not perceived the same by the crop farmers. Again, the values in the “location*animal impact” row in the ANOVA table measured the impact of the interaction effect of location and the livestock animals on crop production. The mean values reflect the seriousness of the impacts of each of the livestock animals on crop production in each of the locations (agricultural zones). The interaction effect is significant, $F(9, 1140) = 2.11, p = 0.03$, implying that the seriousness of the impacts of some of the animals on crop production was perceived differently in some of the locations (agricultural zones). Furthermore, the values in the “location” row of the ANOVA table give the main effect of location. The values show that the main effect of location (agricultural zones) was significant, $F(3, 380) = 10.45, p = 0.00$, implying that the

Table 1: Analysis of variance results of the impact of livestock animals on crop production

| SOV | df | SS | MS | F-cal | p-value | Sig. |
|-------------------------|-----|---------|---------|--------|---------|------|
| Animal impact | 3 | 355.76 | 118.59 | 142.03 | 0.00 | S |
| Location animal impact | 9 | 15.86 | 1.76 | 2.11 | 0.03 | S |
| Error (within factor) | | 1140.00 | 951.80 | 0.84 | | |
| Location | 3 | 29.10 | 9.70 | 10.45 | 0.00 | S |
| Error (between factors) | 380 | 352.76 | 0.93 | | | |
| Total | | 1535.00 | 1705.28 | | | |

Table 2: Mean separation of the impact of grazing livestock animals on crop production

| Agricultural zones | Mean impacts of livestock animals | | | | Zonal mean total |
|--------------------|-----------------------------------|-------------------|-------------------|-------------------|-------------------|
| | Cattle | Goat | Sheep | Domestic fowl | |
| Central | 2.36 | 1.47 | 1.54 | 0.96 | 1.58 ^b |
| East | 3.10 | 2.15 | 2.02 | 1.46 | 2.18 ^a |
| North | 2.49 | 1.68 | 1.51 | 1.14 | 1.71 ^b |
| West | 2.73 | 2.40 | 2.05 | 1.55 | 2.13 ^a |
| Mean total | 2.67 ^a | 1.92 ^b | 1.78 ^c | 1.28 ^d | 1.91 |

Means with same alphabet did not significantly differ at $p < 0.05$ from each other

crop farmers in the four locations (agricultural zones) perceived the seriousness of the impact of the animals on crop production differently. These results differed from that of Adebayo and Olaniyi (2008), Tenuche and Ifatimehin (2009), Blench (2010), Gefu and Gills (1990) and Adisa and Adekunle (2010) because their findings did not indicate if there are significant differences in the impact of the livestock animals on crop production or not. The authors generalized the impact of the livestock animals but this study has shown that their impacts are not perceived the same by the crop farmers.

Based on the analysis of variance results, mean separation was done to determine the mean responses that were significantly higher than the other (see Table 2). The mean responses indicated that the seriousness of the impact of grazing cattle (2.67) on crop production was significantly higher than the impact of the grazing goat (1.92), sheep (1.78) and domestic fowl (1.28). Similarly, the seriousness of the impact of grazing goat (1.92) was significantly higher than that of sheep (1.78) and also, that of sheep was significantly higher than that of domestic fowls (1.28). The implication of this is that the crop farmers perceived the seriousness of the impact of grazing cattle as the highest while domestic fowl had the least impact. At the zonal level, the mean separation revealed that farmers in the eastern and western agricultural zones felt the seriousness of the impact of grazing animals more than crop farmers in the central and northern zones. The mean response for the crop farmers in the eastern agricultural zone (2.18) was not significantly different ($p < 0.05$) from that of the crop farmers in the western agricultural zone (2.13) but they are significantly higher than the mean responses from the crop farmers in the northern (1.71) and central (1.58) agricultural zones. This implies that the crop farmers in these two zones felt the impact of the grazing animals the same. Furthermore, the mean response for the crop farmers in the central agricultural zone (1.58) was not significantly different ($p < 0.05$) from that of the crop farmers in the northern agricultural zone (1.71).

Looking at the mean values, it is clear that the crop farmers did not perceive the impact of grazing cattle on crop production as “very serious (4)” but rather it was perceived as “serious (3)” because the mean value (2.67) tended towards “serious (3)” as coded in the questionnaires. The fact that the impact of cattle on crop production is serious goes to confirm the findings of Sulaiman and Ja’afar-Furo (2010) and Williams (1998) which indicated that crop farmers incurred higher loses from conflicts that results from livestock grazing on crops. The mean values for the impact of goat and sheep were perceived as “fairly serious (2)” while the impact of domestic fowls (1.28) was perceived as being “very little (1)”. Based on the mean values, it is clear that the impact of grazing domestic fowls did not pose much problem to the crop farmers in the study area. In general, the grand mean value (1.91) shows that the farmers perceived the impact of the grazing animals as “fairly serious (2)”.

Table 3 shows the socioeconomic characteristics of the crop farmers interviewed. The gender distribution of the farmers indicated that majority (84.11%) of them were males while only 15.89%

Table 3: The socio-economic characteristics of the small-scale crop farmers

| Socio-economic characteristics | Frequency | Percentage |
|--------------------------------|-----------|------------|
| Gender | | |
| Male | 323 | 84.11 |
| Female | 61 | 15.89 |
| Total | 384 | 100.00 |
| Marital status | | |
| Married | 348 | 90.63 |
| Single | 18 | 4.68 |
| Widow | 12 | 3.13 |
| Divorced | 3 | 0.78 |
| separated | 3 | 0.78 |
| Total | 384 | 100.00 |
| Literacy status | | |
| No school | 122 | 31.77 |
| Primary | 113 | 29.43 |
| Secondary | 84 | 21.88 |
| NCE/OND/HSC | 39 | 10.16 |
| B.Sc/HND and above | 26 | 6.76 |
| Total | 384 | 100.00 |
| Household size | | |
| 1-2 | 21 | 5.47 |
| 3-4 | 22 | 5.73 |
| 5-6 | 85 | 22.14 |
| 7-8 | 109 | 28.38 |
| >8 | 147 | 38.28 |
| Total | 384 | 100.00 |
| Age (year) | | |
| ≤20 | 3 | 0.78 |
| 21-30 | 54 | 14.06 |
| 31-40 | 138 | 35.94 |
| 41-50 | 113 | 29.43 |
| >50 | 76 | 19.79 |
| Total | 384 | 100.00 |

were females. This does not mean that men were more in agricultural production in the study area but rather it reflects the difficulty of accessing women farmers for data collection. One of the reasons for this is the practice of purdah, a religious belief that restricts, especially, muslim women, from interacting with others except their husbands and close relatives. The exceptions are the cattle-owning Fulani households, where married women work outside the home primarily to milk the cows and sell the milk, butter and cheese (Dayo *et al.*, 2009, NARP, 1994). Based on this religious belief, the enumerators had more interaction with the male crop farmers than with the female farmers hence the skewness of the data in favour of the men-folk. The distributions of farmers based on marital status showed that majority (90.63%) of the farmers were married. Unmarried ones (single farmers) were only 4.68% while only 3.13% were widows. Divorced and separated farmers were 0.78% each. The implication of the distribution is that it is difficult to see rural farmers who are not married because many of them marry more than one wife (polygamous family) and also the chances of remarriage is very high among the rural dwellers in the study area. The literacy status of the farmers showed that greater percentage (31.77%) of the farmers had no formal school education. In fact, 66.20% of the farmers attended at most primary school while only 38.80% had at least secondary school education. The knowledge of farmer's literacy status is good

because Nwaru (2005) stated that an educated farmer, other things being equal, allocates farm resources more efficiently. Household distribution revealed that majority (38.28%) of the farmers had over eight persons per household while 66.60% of them, had over six persons per household implying that majority of the farmers had large households. Okoye *et al.* (2009) stated that large household size might create a positive effect on output per hectare if household labour is devoted mostly to agricultural production. On age distribution, the modal class is 31-40 years but it is also clear that majority (65.37%) of the farmers were between 31-50 years. This shows that the farmers were still in their active and productive age and can perform farming activities.

CONCLUSION

The production of crops and livestock animals reared under extensive and semi-intensive systems in Nigeria is not mutually exclusive because both compete for the available land resources. There was no area of land exclusively reserved for livestock rearing or crop production. The resultant effect of the struggle for survival between crop and livestock farmers are frequent clashes which has claimed many lives and properties worth millions of naira. Since it is very difficult to stop the rearing of livestock animals or the production of crops in the northern part of Nigeria including Abuja, there was the need to verify how the crop farmers perceived the seriousness of the impact of grazing livestock animals on crop production. The livestock animals considered for the research include cattle, goat, sheep and domestic fowls. The results of the study revealed that there was significant difference in the mean perception of the impact of cattle, goat, sheep and domestic fowls on crop production. Cattle were perceived to be most destructive animal followed by goat and sheep while domestic fowls were the least. The study also revealed that farmers in the Abuja eastern and western agricultural zones felt the impact of livestock animals on crop production more than crop farmers in the northern and central agricultural zones. Based on the findings, the study concluded that grazing livestock animals affected crop production in the study area but the seriousness of the impact depended on the type of livestock animal reared. It was recommended that grazing routes should be mapped out for the livestock farmers to reduce the clashes. In addition, the livestock farmers should be educated and encouraged to adopt intensive system of animal production.

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