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Knowledge of hazards associated with urban livestock farming in Southeast Nigeria

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Abstract

In Nigeria, the rate of population growth in urban area is increasing. To ward off hunger and poverty urban dwellers engaged in livestock farming (ULF). Urban livestock farming is associated with health and environmental hazards. The study assessed urban farmers' knowledge of health hazards associated with ULF. Multistage and random sampling technique was used to select 210 respondents. Structured interview schedule was used to collect data. Data was analysed using descriptive and inferential statistics. A good proportion of the respondents had a high knowledge of hazards associated with livestock keeping. However, a high proportion of the respondents did not know that animal products from intensive system can be contaminated with heavy metals and that livestock can cause climate change. There was a significant ($F = 6.366$; $P < 0.05$) influence of socio-economic characteristics of farmers on the knowledge of hazards posed by livestock keeping. A significant ($F = 4.317$; $P = 0.015$) variation was observed in the knowledge of hazards associated with urban livestock keeping, among urban farmers in three states of southeast Nigeria. It is necessary to create awareness, so that farmers know, the contributions of livestock to climate change and also that heavy metals can contaminate animal products.

Introduction

Globally, the growth of cities and urbanized areas continues at an exponential rate. The urban population of the world is estimated to increase from 2.86 billion in 2000 to 4.98 billion by 2030, the highest urban growth rates being in developing countries (Ambrose-Oji, 2009). Projections show that between 2020 and 2030, 50 to 60 percent of Africa's population will be living in urban areas, compared to just 15% in 1980 and 34% in 1994 (UN, 2006). With an urbanization rate of about 20% and an annual growth rate of 5 – 7% of the urban population, an important proportion of the total population of sub-Saharan West Africa will live in cities by the year 2020 (FAO, 2004). As a result, the growth in urban poverty is rapidly outstripping that of rural poverty (Spore, 2012). Consequently, there is increasing concern about feeding the growing number of urban poor, many of whom have no permanent employment and limited access to resources.

Statistics show that by 2040, Nigeria's population growth would have quadruple without commensurate amenities and employment and between 2018 and 2050 projections indicate that urban expansion will rise by 35% (Vangard News Paper, 2018). As a result, the urban population of Southeast Zone of Nigeria is tremendously increasing alongside other urban centres in the country. The rate of rural-urban drift is greatly accelerated leading to urban expansion in southeast Nigeria. In 2006, Nigerian Population Commission (NPC) reveals that about 2 million out of the 4, 177,8 people in Anambra State lived in urban areas (NPC, 2006). The urban population of Enugu State in 2006 Census was 3,267,835 and out of this about one million people lived in urban areas. (NPC, 2006). The above condition poses great sustainable food security challenges for Nigerian urban centres.

About 40 million people in Nigeria are believed to be hungry and a large percentage of the population lacks access to adequate food (Kumolu, 2010). High inflation rate, food price instability and relatively low wages have made the average Nigerian liable to food insecurity (Trading Economics, 2019). To survive, urban dwellers engage in urban farming (UF). Urban Farming can be considered as an integrated part of viable strategies for sustainable urban development. Urban farming can be widely defined as any farming activity within the administrative boundary of an urban centre (Brock and Foeken, 2006). It involves both growing of crops and animal husbandry within the city areas. Urban livestock farming (ULF) can provide important contributions to answering a number of key challenges encountered by cities. This has led many governments to the conclusion that the development of ULF needs to be facilitated and controlled, in order to maximize its benefits while reducing the associated risks **(**De Haan, 2013**).**

The health hazards of ULF are probably the most significant fears that occupy the minds of development and urban planning professionals (Ambrose-Oji, 2009). Urban planners tend to believe that urban production presents a health risk because of specific use of wastewater in

production systems. Standing water in irrigation channels is perceived as providing breeding grounds for mosquito which is an important vector in the transmission of malaria (Afrane et al., 2004; Klinkenberg et al., 2008). The perception and beliefs around the use of wastewater from urban ditches and streams represents a significant health issue. Livestock keeping can be harmful to urban environment. Free wandering animals can injure people, cause traffic accidents and destroy gardens (FAO, 2001). Animals kept in intensive system may be contaminated with pesticides. Animal dung left to decompose in the compounds or along roads is a breeding ground for harmful bacteria.

International Labout Organization (ILO) (2004) found that agriculture is one of the most hazardous sectors in the world. Agricultural workers ULF suffer injuries and diseases from agricultural operations caused by machines, animals and chemicals. Thus despite the role of ULF in warding off hunger and poverty in urban areas, it has hazards associated with it. It is therefore necessary to assess urban farmers' knowledge of hazards associated with urban livestock farming. The specific objectives were to: describe socioeconomic characteristics of respondents; assess farmer's knowledge of hazards associated with urban livestock farming and identify strategies to minimize hazards associated with urban farming.

Hypotheses:

1 Socio-economic characteristics of respondents have no significant influence on urban farmers' knowledge of hazards associated with urban livestock farming.

2 There is no significant variation in the knowledge of hazards associated with urban livestock farming among urban farmers in the three states in southeast Nigeria.

Methodology

Nigeria is divided into six geopolitical zones namely, Northeast, Northwest, Northcentral, Southeast, Southwest and Southsouth zones. The study was carried out in the

southeast geopolitical zone of Nigeria. The southeast is made up of five states viz: Enugu, Anambra, Imo, Abia and Ebonyi States. The area stretches from latitude 04º15'N to latitude 07º00'N and longitude 05º34'E to longitude 09º24'E (Unamma et al., 1985).

The zone has so many urban towns with growing population. Such urban towns within the zone include: Enugu, Aba, Umuahia, Owerri, Awka, Orlu, Abakaliki, Okigwe, Onitsha, Nsukka and Afikpo. Observations show that a lot of urban agricultural activities take place in these towns. Many crops are grown along roadsides, near refuse dumpsites and open spaces within the towns. Many of the urban households also keep livestock like poultry, goats, pig etc.

The population for the study comprised all urban livestock farmers in the southeast zone of Nigeria. Out of the five states that make up the zone, three states were selected using simple random sampling technique. These states are Ebonyi, Enugu and Imo States. Each state has three senatorial zones. In each state, two out of the three zones were selected through simple random technique. In Ebonyi State: Ebonyi South and Ebonyi Central were selected while in Enugu, Enugu North and Enugu Central were selected. In Imo State, Owerri and Orlu zones were selected, thus making a total of six zones.

In each zone, a major urban centre was purposively selected making a total of six urban centres. Five urban (political) wards were purposively selected from each urban centre based on their involvement in urban livestock farming (ULF), making a total of 30 urban wards. From each sampled ward, a list of urban farmers was drawn. Seven urban farming households were purposively selected based on their involvement in ULF; giving a sample size of 210 respondents. Heads of households were interviewed.

Data were collected through interview schedule, focus group discussion (FGD) and observation. The instrument was validated by academic staff from Department of Agricultural

Extension, University of Nigeria Nsukka to give their opinions on the relevance and adequacy of the instrument in accordance with the objectives of the study.

To assess farmers' knowledge of hazards associated with ULF, the respondents were required to provide answers to specific statements about hazards from livestock keeping. Against each specific statement, respondents were requested to tick "True" for a correct statement and "False" for an incorrect one. A correct response was scored one (1) while an incorrect one was scored zero (0). Each respondent was given a knowledge index by summing the correct statements of each respondent on the total number of knowledge statements. The knowledge index of the respondents where used to run regression analysis. Furthermore, the total score for each statement was converted to percentage and a score of ≥ 80% was regarded as very high knowledge, 60 – 79% as high knowledge, 40 – 59% as moderate knowledge, 20 – 39% as low knowledge while ≤ 19% was regarded as very low knowledge (a modification of the classification of Iliyasa et al., 2005).

To ascertain strategies to minimize the hazards associated with ULF, a list of possible strategies was presented to the farmers. They were requested to specify any strategy not listed. They were expected to rate them on a 3 – point Likert-type scale with regard to how effective the strategies are in minimizing hazards associated with ULF. The scales were assigned values as follows: very effective = 2, effective = 1 and not effective = 0. A mean score of 1.0 was obtained. Any item with a mean of 1.0 and above was regarded as effective strategy to minimize hazards from urban farming while mean less than 1.0 was not regarded as effective. Data were presented using percentage and mean score. Hypothesis 1 was tested using a multiple regression analysis. This is represented by the equation.

$$Y = b_o + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + b_{11}X_{11} + e$$

Where

Y = Knowledge score

B_o = Coefficient of the model

b_i –b_{11} = Coefficient of the various socio-economic characteristics

X_1 = Age (in years)

X_2 = Marital status (single-1, married 0)

X_3 = Educational level (number of years spent in school).

X_4 = Membership of social organizations (1 if a member, 0 otherwise)

X_5 = Sex (Male = 1, female = 0)

X_6 = Extension contact (contact = 1, no contact = 0)

X_7 = Urban livestock farming experience (years)

X_8 = Household size (number of people eating in one pot)

X_9 = Major occupation (civil service = 1 others = 0)

X_{10} = Stock size (total number of animals reared)

X_{11} = Years spent in the city

X_{12} = Income from sale (annually)

e = error term

Hypothesis 2 was analysed using analysis of variance (ANOVA) to compare farmers knowledge of hazards associated with ULF in the 3 states (Ebonyi, Imo and Enugu). Post-hoc test was carried out using Duncan's Test. All analysis were done at 5% level of probability. The Statistical Product for Service and Solutions (SPSS) was used for the analysis.

Results and discussion

Socioeconomic characteristics of respondents

Age

The mean age of the respondents was 49.1 years (Table 1). The majority (61.4%) of the respondents was male and 88.2% were married. The mean years spent in school was 12.2 years while the average household size was 6 persons. About 47% of the respondents were migrants. The mean years spent in city was 21.65 years. The mean years of farming experience was 12.7. The majority (78.6%) of the respondents belonged to at least one social organization while 47.7% had access to credit and only 7.1% indicated farming as their main occupation.

Table 1: socioeconomic characteristics of respondents

Socio-economic characteristics	%	M
Age		

20 – 29	1.9	
30 – 39	10.9	
40 – 49	40.0	49.1
50 – 59	31.0	
60 – 69	12.4	
70 – 79	2.4	
80 and above	1.4	
Sex		
Male	61.4	
Female	38.6	
Marital status		
Married	88.2	
Single	3.8	
Widowed	5.2	
Divorced	2.8	
Educational level		
No formal education	13.3	
Primary education	20.5	
Secondary education	38.5	
Tertiary education	19.1	
Above tertiary education	8.6	
Mean years spent in school		12.2
Household size		
1 – 5	36.2	
6 – 10	53.8	
11 – 15	3.3	6. 0
> 15	6.7	
Migration status		
Migrants	46.7	
Indigenes	53.3	
Years spent in the city		
1-10	23.3	
11-20	32.4	
21-30	18.6	21.65
31-40	10.5	
41-50	5.7	
>50	9.5	
Urban livestock farming experience		
1-10	56.2	
11-20	29.0	
21-30	9.0	12.7
31-40	2.9	
>40	2.9	
Extension contact		
Yes	70	
Membership of social organization		
Yes	78.6	
Access to credit		
Yes	47.7	
Major occupation		
Civil service	45. 7	
Trading	16.2	
Politics	0.5	
Retiree/Pensioner	25.8	
Artisan	4.7	

Knowledge of hazards associated with urban livestock keeping

The percentage distribution of respondents according to knowledge of hazards posed by urban livestock keeping is presented in Table 2. The results indicate that for the 11 questions presented, about 37% - 92% of the respondents had high knowledge of the hazards associated with urban livestock keeping with percentage mean scores of 71.2%, 68.0% and 65.3% for respondents in Enugu, Imo and Ebonyi States, respectively. For the three states combined, a mean percentage of 68.3% was recorded. The mean percentage scores for each state, as well as, the three states combined were considered high.

Specifically, making environment dirty (87.2%), causing accidents in urban areas (83.8%), animal dungs in compound breeding disease (91.6%), bad odour (83.2%) were identified to be associated with urban livestock keeping by a high proportion of respondents in the study area. In-depth discussion with the farmers revealed that diseases like tuberculosis, worms and tetanus can be contacted through livestock keeping. Foeken *et. al.,* (2004) indicate that animal dung is a source of tetanus. Slurry containing dung, urine and water as seen in compounds with cattle, chicken and pigs attract disease causing vectors (Foeken *et al.* 2004). Also, Mougeot (2006) asserts that livestock rearing in urban areas can predispose humans to such diseases as avian flu. In developed countries, 20% of human illness are as a result of zoonotic diseases and the situation is undoubtedly worse in developing countries (Yongabi and Pertiwiningrum, 2014). Zoonotic diseases are of concern in developing countries and show a correlation with poverty, hunger, and livestock rearing (Yongabi and Pertiwiningrum, 2014). Interestingly, some farmers mentioned diseases that cannot be transmitted by livestock such as pneumonia and sleeping sickness. This implies that respondents lack full knowledge of animal diseases. Urban farmers need to be educated on these health issues. Farmers have to be urged to engage in healthy livestock production practices in the study area. The government has to exercise some control of ULF by putting some measures in place (insist on intensive system of production) or use statutes already in place. The finding that livestock destroy crops

and cause accidents may be associated with free roaming animals like local chicken, sheep and goat in the streets of towns. Livestock reared at the backyard could roam and cause traffic accidents, destroy crops, ornamental plants, lawn, water pipes and fences **(**Ishagi et al, 2002). This may cause conflict with neighbours who do not rear animals. On the other hand, these animals may be stolen or even knocked down by vehicles. Factors, such as weather and drought, and uncertainty to make profit from livestock yields, makes farmers to be anxious. This could make farmers more prone to injuries and even mental strain **(**Kuye et al., 2006) and may cause emotional distress to and discouragement. A study in Nigeria found that ULFs suffer high losses from stealing and are more likely to report emotional stress and discouragement (Anonkogu et al., 2008). This confirms that regulations of ULF and especially livestock rearing are weak and common risk management is not effective. These should be strengthened so that the benefits of ULF can be maximized. However, commands and regulations not properly handled can make things worse. A study in Kampala shows that dairy farmers who are more harassed by public authorities had fewer good practices (Grace et al., 2012). It is necessary to work with the farmers to put these regulations in place.

A high proportion of the respondents, however, did not know that animal products from intensive system can be contaminated with heavy metals and that livestock can cause climate change. Animal products (red meat, poultry meat and eggs) may be contaminated with pesticides if kept in an intensive system (FAO, 2001). Animal products may also become contaminated by heavy metals if animals feed or drink water polluted by exhaust fumes from automobiles in cities (FAO, 2001). Without appropriate handling and control of heavy metals, they may not only be a threat to animal health and a risk of heavy losses of livestock but also a threat to human health **(**Groot and van't Hooft, 2016**).**This may invariably cause health implications to humans who consume them. Since most of the respondents engage in intensive poultry production, it is necessary that they know these facts and take precautions.

Table 2: Correct knowledge of hazard from urban livestock keeping

Knowledge item	Enugu n = 65	Imo n = 58	Ebonyi n = 56	All n = 179
Livestock in urban area can destroy crops	58.5	62.1	57.1	59.2
Keeping livestock in urban areas makes the environment dirty	93.8	81.0	85.7	87.2
Livestock can cause accidents in urban areas	84.6	89.7	76.8	83.8
Livestock can destroy fences and pipelines	63.1	69.0	50.0	60.9
Livestock in urban areas can deplete water sources	70. 8	48.3	55.4	58.7
Animal product from intensive system can be contaminated with heavy metals	40.0	36.2	41.1	39.1
Diseases from livestock can affect human beings	60.0	55.2	66.1	60.3
Livestock can cause climate change	40.0	31.0	39.3	36.9
Animal dung in the compound is a breeding ground for disease causing vector	92.3	94.8	87.5	91.6
Waste from livestock has bad odour/smell	86.2	86.2	79.8	83.2
Animals in urban area can make a lot of noise	93.8	94.8	82.1	90.5
Mean percentage scores	71.2	68.0	65.3	68.3

It is surprising that respondents did not know that livestock farming can cause climate change. The contribution of livestock farming to climate change has been well established (van de Steeg, et al., 2009). They opined that livestock production systems globally contribute up to 18% of all our human-induced green house gases, the cause of global warming. This is likely to be more in urban than rural areas because demand for livestock product is rising rapidly due to increasing urbanization (Van de Steeg, et al., 2009). It is therefore necessary to create awareness, so that the farmers know the contributions of livestock to climate change and be encouraged to take necessary precautions for urban livestock farming. Intensification of livestock farming can reduce methane emission and other green house gases per unit weight of livestock produced. Urban farmers in Morogoro, Tanzania identified erosion, dirtiness, noise, accidents, destruction of gardens and water sources as hazards posed by livestock keeping in the area. Similarly, in Nakuru, Kenya, farmers indicate bad smell, erosion, diseases, destruction of fences and flowers as hazards from livestock keeping.

The findings of this study therefore imply that ULF can pose some threats to health and environment. City authorities have often been reluctant to accept farming as a formal urban land use because of perceived health and environmental risks. However, prohibitive laws have proved to be largely ineffective. Hence, policies are required that lead to an active management of the potential health and environmental risks associated with ULF. Government should therefore show interest in urban farming to ensure healthy production systems. Health and safety of the farmer and that of his staff, along with an environment that is safe, are preconditions of having an effective farm venture.

Strategies to minimize hazard from urban livestock keeping

As shown in Table 3, effective strategies to mimimize hazard from urban livestock keeping included proper disposal of waste (M = 1.53), cleaning animal house weekly (M = 1.52), restraining animals (M = 1.38) from entering farms and neighbours compound. Others included seeking veterinary services (M = 1.47) to keep diseases at bay, feeding animals well (M = 1.31) to limit noise. The strategies of reducing the number of animals (M = 0.99) and that all animals should be kept under intensive system (M = 0.81) were not perceived to be effective by the respondents. The farmers may not have enough to sell if the number of animals are reduced, thereby reducing the income they generate from sales and this may have implication in their social and economic well being which may increase their being food insecure. However, limiting the number of poultry reared was used to control hazards posed by livestock in Soshanguve, South Africa (Pasquini *et. al.* 2009).

Again, keeping all livestock in intensive system may be a problem, since finding fodder for sheep and goat during dry season will be difficult. Most of the farmers are poor and cannot afford supplemented feeding using compounded feed. This finding is in consonance with that of Foeken et al. (2006) who reports that feeding animals well, seeking veterinary services and reducing the number of animals are measures used by farmers in Nakuru, Kenya to control

hazards posed by livestock keeping. It is essential to educate farmers in the study area, to see the importance of imbibing these measures in order to protect producer, their families and consumers from contaminated foods and environmental pollution. Intensification will also help to secure the support of municipal authorities and other government officials who have remained wary and sometimes even hostile to ULF due to the health and environmental risks.

Table 3: Strategies to minimize hazards from urban livestock keeping

Strategies	Mean	SD
Proper disposal of waste	1.53*	0.639
Use of waste from livestock for crop cultivation	1.40*	0.651
Reducing the number of animals	0.99	0.762
Restraining animals	1.38*	0.619
Feeding animals well	1.31*	0.786
Seek veterinary services	1.47*	0.604
Cleaning animal house weekly	1.53*	0.555
Keeping all animals in intensive system	0.81	0.556
Provision of vital information by extension services	1.53*	0.594

***Effective strategies**

Factors influencing knowledge of hazards posed by urban livestock keeping

The regression results in Table 4 show that the socio-economic characteristics of the farmers have a significant (F=6.366) influence on their knowledge of hazards posed by livestock keeping. The R square value and the adjusted R square value were 0.303 and 0.256, respectively. Nearly 26% of the variance in the knowledge of hazard from livestock keeping was explained by the variables included in the model. These include: age, sex, marital status, years spent in school, household size, years spent in city, years of farming experience, membership of social organization, number of extension contact, total stock size and estimated income from ULF.

As shown in Table 4 years of farming experience ($t = -2.216$; $P = 0.028$) and stock size ($t = -2.347$; $P = 0.020$) had significant negative influence on knowledge of hazards from livestock keeping. This implies that the more the years of experience in farming the less they

had knowledge about hazards generated by livestock. Also, the smaller the stock size, the higher the knowledge of hazards by farmers. The negative influence of farming experience on knowledge of hazards, may be attributed to the fact that farmers who have been keeping livestock for many years may be more interested in the benefits they derive from livestock keeping than knowing and paying attention to the hazards associated with the venture. This is dangerous, as they may not make any efforts to see that hazards are reduced. It is necessary to draw their attention to this so that they become aware and take precautions to reduce hazards which are detrimental to human health. The negative relationship between stock size and knowledge of hazards may be attributed to the fact that the smaller stock size is easier to manage and the owner therefore does not see any hazards pose by the animals. Also, increase in the number of animals kept may lead to increase interest in the hazard caused by them probably because the higher the number of animals, the higher the tendency to rear the livestock on commercial basis. Therefore the farmer may pay attention to hazards and make efforts to reduce them so that their profits will not be jeopardized.

Membership of social organization ($t = 2.512$; $P = 0.013$) and number of extension contact ($t = 3.503$; $P = 0.000$) had significant positive influence on farmers' knowledge of hazards generated by keeping livestock in urban area. Belonging to an association may give the farmers opportunity to get information from people. Farmers working closely and cooperatively may share knowledge and information on hazards with one another and with other communities. There is power in networking as this may encourage knowledge sharing and may lead to enhancement and sustainability of ULF. Also, the more the number of extension visits, the higher the chances that the farmers obtain information on hazards posed by keeping livestock in urban areas and therefore the more knowledgeable they become with respect to the hazards. Extension service is one of critical components of agricultural development. It contributes to the reduction of hunger and poverty by improving knowledge

and information sharing among farmers. This may increase farmers' capacity which may go a long way to increase profits and improve food security. However, observations have shown that extension does not reach out to urban farmers as much as they do to rural farmers. There is a believe that agriculture takes place only in the rural areas and so majority of urban farmers are deprive of sufficient and suitable agricultural information and extension visits as shown on Table 1. There is an urgent need to make improved access to information that is adequate and relevant for urban farmers by increasing the number of extension visits.

Table 4: Factors influencing knowledge of hazards posed by urban livestock keeping

Variables	Unstandardized Coefficient		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig
(Constant)	6.689	2.130		3.141	0.002
Age	-.0014	0.031	-0.043	-0.454	0.650
Sex	-0.169	0.508	-0.025	-0.333	0.739
Marital status	1.525	0.850	0.134	1.796	0.075
Years spent in school	-0.123	0.066	-0.161	-1.860	0.065
Household size	0.062	0.122	0.44	0.508	0.612
Years spent in the city	0.005	0.023	0.022	0.232	0.817
Years of urban livestock farming experience	-0.093	0.042	-0.228	-2.216	0.028*
Membership of social organization	1.506	0.599	0.191	2.512	0.013*
Number of extension contact	1.910	0.502	0.293	3.803	0.000*
Stock size	-0.424	0.181	0.180	-2.347	0.020*
Major occupation	0.037	0.538	0.006	0.069	0.945
Estimated income in a year	2.422	0.000	0.111	1.556	0.122

Dependable variable: Knowledge score R Square = 0.303; R^2 = 0.256; F-value = 6.366; P ≤ 0.05

Variation in knowledge of hazards associated with urban livestock farming in the three states

As shown in Table 5, there was a significant (F= 4.317; P = 0.015) variation in the knowledge of hazards associated with urban livestock keeping, among urban farmers in the

three states. The mean of knowledge of urban farmers in Ebonyi State (M = 5.743) did not differ significantly with the mean of respondents in Imo State (M = 6.200). However, the mean for respondents in Enugu State (M = 7.271) differed significantly from that of respondents in Ebonyi and Imo States. The implication of these results is that individual farmer's extent of knowledge of hazards was higher in Enugu State compared with Imo and Ebonyi States. A deliberate regional policy to educate farmers on knowledge of ULF in Southeast Nigeria should therefore commence in Imo and Ebonyi States.

Table 5a: Variation in the knowledge of hazards associated with urban livestock keeping in the three states of southeast Nigeria.

	Sum of squares	Df	Mean square	F	Sig
Between groups	86.181	2	43.090	4.317	0.015
Within groups	2066.414	207	9.983		
Total	**2152.595**	**209**			

Table 5b: Comparison using Duncan's Test (Homogenous subsets)

	Subsets
States	**Mean knowledge**
Ebonyi	5.743[a]
Imo	6.200[b]
Enugu	7.271[c]

a,b: Mean with different superscript differ significantly (p≥0.05)

Conclusion

Farmer had a high knowledge of hazards caused by livestock keeping in urban areas. However, urban farmers did not know that rearing of livestock causes climate change and that

heavy metals can contaminate livestock products. One way to increase awareness and knowledge could be by comprehensive campaigns in urban areas providing educational and illustrative information and participatory practical training courses. More importantly, farmers must trust their educators, and training must be performed with respect to the beliefs and norms of the region. The study also highlights that the extension contact is low, and that there is a significant positive relationship between extension contact and knowledge of hazards. The observation that extension visit rural farmers more and invariably give more information to them than urban farmers should be reconsidered by agricultural extension organizations. There is an urgent need to make improved access to information that is adequate and relevant for urban farmers by increasing the number of extension visits.

References

Afrane, Y. A., Klinkenberg, E., Drechsel, P., Owusu-daaku, K., Garms, R. and Kruppa, T. (2004). Does irrigated urban agriculture influence the transmission of malaria in the city of Kumasi, Ghana? *Acta Tropica*, 89, 125 – 134.

Ambrose-Oji, B. (2009). Urban food systems and African indigenous vegetables: Defining the spaces and places for African indigenous vegetables in urban and peri-urban agriculture. In: Shackleton, C. M., Pasquini, M. W. and Drescher, A.

W. (eds). *African Indigenous Vegetables in Urban Agriculture*, Earthscan, London, pp. 1 – 27.

Anongoku, C. P., Obinne jO., Daudu J.S. (2008). A socioeconomic analysis of livestock pilferage in rural and urban areas of Benue State, Nigeria. *Journal of Social Sciences*,17(2):169-172.

Brock, B. and Foeken, D. (2006). Urban horticulture for a better environment: A case study of Cotonou, Benin. *Habitat International,* 30, 558 – 578.

Grace D. Mutua F. Ochungu P. Kruska R. Jones K. Brierley L. Lapar L. Said M. Herrero M. Phuc M. P. Thao N. B. Akuku I. and Oguto F. (2012). Mapping of poverty and livelihood zoonosis hotpots. Report to the UK Department for International Development. Nairobi: ILRI. Available from http://dspacetest.cigar.org/handle/10568/21161 .

De Haan C. (2013). Urbanization and farm size changes in Africa and Asia: implication for livestock research. Paper prepared for foresight study on urbanization and farm size by the Independent Science and Partnership Council (ISPC). Available from www.sciencecouncil.cgar.or/fileadmin/templates/ispc/document/strategy_and_Trend/2013/foresight.deHaan.pdf .

FAO (Food and Agriculture Organization) (2001). Urban and Peri-urban agriculture: A brief guide for the successful, implementation of urban and peri-urban horticulture in developing countries. The special programme for food security. FAO: Rome.

FAO (2004). The state of food insecurity in the world. FAO, Rome.

Foeken, D. Sofer, M, and Mlozi, M. (2004). Urban agriculture in Tanzania: Issues of Sustainability. African Study Center, The Netherlands.

Foeken, D. (2006). Urban agriculture in East Africa as a tool for poverty reduction: a legal and policy dilemma. ASC Working paper, no. 65. African study center: Leiden.

Groot MJ, van't Hooft KE (2016) . The hidden effects of dairy farming on public and environmental health in the Netherlands, India, Ethiopia, and Uganda, considering the use of antibiotics and other agro-chemicals. Front Public Health 4:12.10.3389/fpubh.2016.00012

Illiyasu Z., Kabir M. and Galadanci H.S. (2005). Awareness and attitude of antenatal clients towards HIV voluntary counseling and testing in Aminu Kano Teaching hospital Kano, Nigeria. Niger Journal Medicine, 14, 27-32.

Ishagi N., Ossiya, S. Aliguma, L. Aisu, C. (2002). Urban and periurban livestock keeping among the poor in Kampala city Kampala Karen Consults.

Klinkenberg, E., McCall, P. J. Wison, M. D., Amerasinghe, F. P. and Donelly, M. J. (2008). Impact of urban agriculture on malaria vectors in Accra, Ghana. *Malaria Journal,* 7, 151 – 162.

Kumolu, C. (2010). Nigerian food security: Experts make case for urgent action on small scale farming. Retrieved on 29th January, 2011 from http://www.vanguardngr.com.

Kuye R, Donham KJ, Marquez SP, Sanderson WT, Fuortes LJ, Rautiainen R, et al. (2006). Agricultural health in the Gambia I: agricultural practices and developments (review). *Ann Agric Env Med* AAEM 13,1–12.

ILO (2004). Towards a fair deal for migrant workers in the global economy. Available from: http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/meetingdocument/kd00096.pdf

Mougeot, L.J.A. (2006). Growing better cities: Urban agriculture for sustainable development. International Development Research Centre (IDRC): Ottawa, Canada.

Nigeria Population Commission (NPC) (2006). Report of Nigeria's National Population Commission on the 2006 Census.

Pasquini, M. W. , Assogba-Komlan, F., Vorster, I., Shackleton, C. M. and Abukutsa-Onyango, M. O. (2009). The production of African indigenous vegetables in urban and peri-urban agriculture: A comparative analysis of case studies from Benin, Kenya and South Africa. In: Shackleton et. al. (eds.) *African Indigenous Vegetables in Urban Agriculture*. Earthscan, London, pp. 177 – 219.

Spore (2012). Urban agriculture: City farmers. *Spore Magazine.* No 157, February-March, 2012, CTA.

Trading economics (2019). Nigerian food prices. Available from https://tradingeconomics.com/nigeria/food-infl.ation. Accessed 12/02/2019.

van de Steeg, J., Notenbaert, A., Herrero, M. and Thornton, P. (2009). Livestock and climate change. Rural 21: *The International Journal for Rural Development,* 43, 19 – 21.

Vanguard News (2018). Tuesday February 12. Available at https://www.vanguardngr.com/2018/05/un-68-percent-world-population-will-live-urban-areas-2050.accessed 12/02.2019

Unamma, R.P.A., Odurkwe, S. O., Okereke, H. E., Ene, L.S.O. and Okoli, O. O. (1985). Farming system in Nigeria. Report of the benchmark survey of the farming systems of Southeast Agricultural Zone of Nigeria NRCRI: Umudike.

UN (2006). *World Urbanization Prospects: The 2005 revised population database*. United Nations Population Division: New York.

Yongabi K, Avery L, Pertiwiningrum A. (2014). A commentary on occupational infectious diseases due to agricultural practices in sub-Saharan Africa. *Biomass Bioenergy* 70:99–111.