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*Full Length Research Paper*

# Environmental Effects of Urban Livestock Keeping: Which Types of Livestock Pose more Serious Problems?

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Urban livestock keeping has remained one of the key urban livelihoods in spite of the negative environmental consequences it causes to urban dwellers. Livestock cause waste heaps, noise, bad odour, dust, destruction of infrastructure and health hazards often leading to conflict. The idea that certain types of livestock cause more serious environmental consequences than others is not straightforward. A study was conducted in two municipalities of Dodoma and Morogoro, examining the effects of livestock keeping on the environment and on the community. Primary data were collected at household level through interviews and focused group discussion. Secondary data were collected through documentary review on environmental pollution and conflict due urban livestock keeping which were obtained from Municipal Offices, libraries and internet. Using a sample of 298 respondents, The chi-square test of association between keeping livestock and environmental pollution and social conflict rejected the null hypothesis of independence at 5% level of significance on almost all pollution variables for different types of livestock, implying that keeping livestock could result into noise, heaps of waste, odour, dust, plant destruction and social conflict. The only areas where the Chi-square test failed to reject null hypothesis of independence were between keeping sheep and noise, odour, and social conflict (at  $P \geq 0.05$ ); and between poultry and noise ( $P \geq 0.05$ ) and between all types of livestock and dust (at  $P \geq 0.05$ ); . The conclusion was that environmental effects of urban livestock keeping are demonstrated by all types of livestock at varying degrees. Livestock keeping of any type in urban areas has, therefore, negative environmental and health consequences when there is weak enforcement of relevant bylaws.

**Keywords:** Urban livestock keeping, Environmental consequences, Livestock types, Conflict

## INTRODUCTION

Urban livestock keeping has historically been part and parcel of development of cities such that some urban

development experts see it as indispensable urban activity (Thys *et al*, 2006). In developing countries, urban livestock keeping is considered important in addressing food security, income and employment (Schierre and Hoek, 2001). Despite its important role, urban livestock keeping is associated with environmental pollution; invasion and

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damage of gardens, fences, lawns and ornamental plants and, spread of diseases (Mlozi *et al.*, 2012; Mvena, 1999; Gaynor, 2007; Fuller, 2003). Studies have also found that, despite its negative impacts on urban health and environmental issues, there was no willingness among livestock keepers to abandon the activity (Guang *et al.*, 2013; Alam *et al.*, 2016; Covarrubias, *et al.*, 2012) The aim of this study was to examine the environmental challenges caused by various types of livestock under urban livestock keeping and recommend appropriate measures to address them.

## METHODS AND MATERIALS

This study was conducted between September 2017 and March, 2018 in two municipalities namely Dodoma and Morogoro. The sampling frame was division, wards, and finally a household with or without livestock. The study involved one urban division from Dodoma Municipality where eight (8) wards were selected; and Morogoro Urban Division which also constitute the Morogoro Urban District where seven (7) wards ( Figure 1 & 2) were selected based on livestock population densities; making a total of 15 wards. There were 345,884 households in the study area where 2,681 of them were keeping livestock. A cross-sectional survey involving 298 households was conducted.

### Sample size

The determination of this sample was based on the formula by Cochran (1977) as follows:

$$n = \frac{Z^2(1-p)p}{(ME)^2}$$

Where,

$n$ , is a sample size,  
 $Z$ , is critical value (1.96 for 95%

confidence interval);

$p$ , is proportion of the livestock keeping households in the population; (2,681/345,884 )

ME, is marginal error (1%)

Out of the 298 respondents, 158 were drawn from Dodoma Municipal Council and 140 were from Morogoro Municipal Council

### Data collection

Data collection methods included interviews to household heads using semi-structured questionnaire, discussion with key informants and observation. Both closed and open-ended questions were included in the household questionnaires. The information sought included respondent's characteristics (age, gender, education, marital status and type of occupation), number of livestock, types of livestock (cattle, pigs, goat, sheep and poultry), grazing systems), bylaws, awareness of bylaws, number of

extension staff, environmental pollution (odour, animal waste heaps, dust, noise plants' destruction), waste disposal, and occurrences of conflict.

### Data analysis

Data collected through interviews were coded and entered into Statistical Package for Social Sciences (SPSS) software for windows versions 20. Both descriptive and quantitative techniques were used to analyse data. The statistics were used to assess respondents' socio-economic characteristics, categories of environmental pollution, and effects of livestock keeping on the environment.

## RESULTS

### Socioeconomic and demographic characteristics of respondents

Five important characteristics were considered in view of their influence on livestock keeping namely gender, age, marital status, education level, and occupation. Majority of the households (72.8%) were male-headed households.

### Environmental effects of urban livestock keeping

The common environmental effects of livestock keeping that were considered in this study to be likely associated with livestock keeping in urban areas were categorized into four major groupings: first, effects related to environmental pollution *per se* namely waste heaps, odour, noise and dust; second, were those effects threatening human health; third were those related to destruction of infrastructures (such as water taps, gardens, fences and ornamental plants) and lastly, are those affecting social relations. Table 2 gives a summary of respondents' responses on their knowledge of the existence of a particular effect of keeping livestock in their area.

According to the results in Table 2, more than 50% of the respondents were familiar with environmental pollution due to urban livestock keeping. Little was known to them on diseases that are caused by livestock (16.4%). This is different from results by Alam *et al.*, (2016) who found from selected municipality areas of Bangladesh that all respondents (100%) were awareness of the negative effect on urban health and environment caused by urban livestock keeping.

The respondents' encounters with various environmental effects caused by different types of livestock in the study area were sought as summarized in Table 3. The environmental effects which were considered included: accumulation of livestock wastes in open spaces; noise that disturbs people and distracts their concentration on important tasks; dust caused by powdery feeds and dried

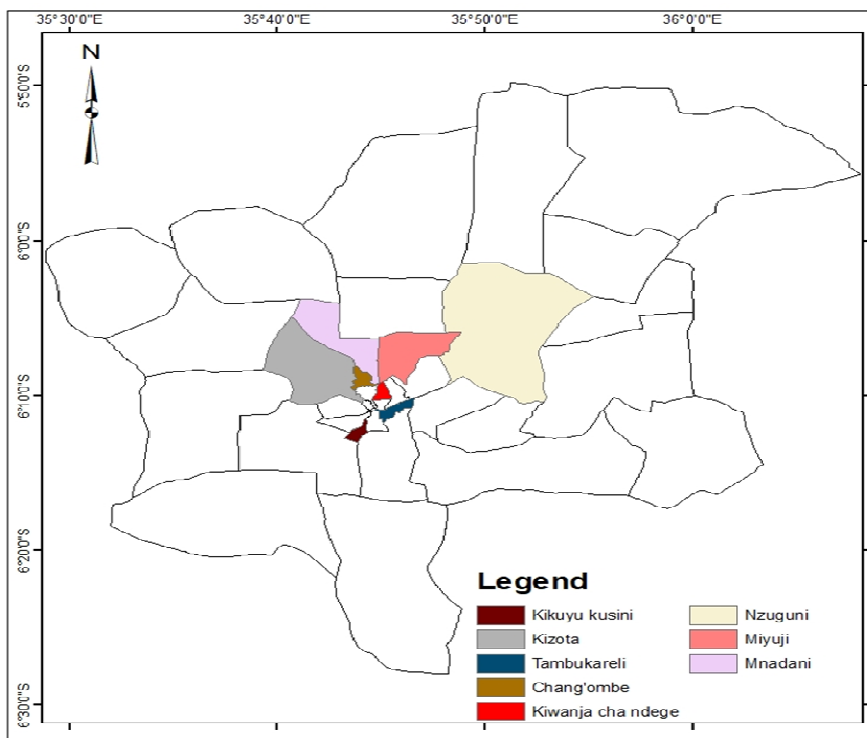


Figure 1: A Map showing Location of Wards Covered by the Study in Dodoma Municipality Tanzania

Source: NBS (2012)

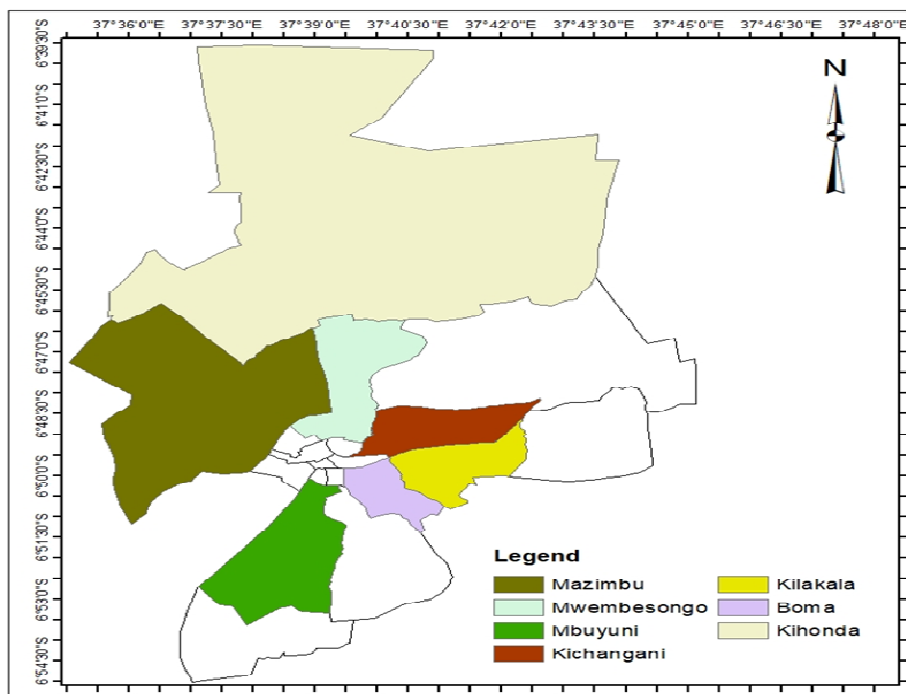


Figure 2: A Map Showing Location of Wards Covered by the Study in Morogoro Municipality Tanzania

Source: NBS (2012)

Table 1: Socioeconomic and demographic characteristics of respondents

Characteristic	Dodoma	Morogoro	Total
<b>Gender</b>			
Male	<b>65.8</b> (104)	<b>80.7</b> (113)	<b>72.8</b> (217)
Female	<b>34.2</b> (54)	<b>19.3</b> (27)	<b>27.2</b> (81)
<b>Total</b>	<b>100.0</b> (158)	<b>100.0</b> (140)	<b>100.0</b> (298)
<b>Age Group</b>			
Between 18 – 40	<b>25.3</b> (40)	<b>15.7</b> (22)	<b>20.8</b> (62)
Between 40 – 45	<b>29.1</b> (46)	<b>40.7</b> (57)	<b>34.6</b> (103)
Between 46 - 60	<b>29.7</b> (47)	<b>30.0</b> (42)	<b>29.9</b> (89)
Above 60	<b>15.8</b> (25)	<b>13.6</b> (19)	<b>14.8</b> (44)
<b>Total</b>	<b>100</b> (158)	<b>100.0</b> (140)	<b>100.0</b> (298)
<b>Level of education</b>			
No Formal Education	<b>0.6</b> (1)	<b>0.0</b> (0)	<b>0.3</b> (10)
Standard Seven	<b>10.1</b> (16)	<b>2.1</b> (3)	<b>6.4</b> (19)
Form Four	<b>50.6</b> (80)	<b>45.0</b> (63)	<b>48.0</b> (143)
Form Six	<b>20.3</b> (32)	<b>30.7</b> (43)	<b>25.2</b> (75)
Certificate	<b>3.8</b> (6)	<b>2.1</b> (3)	<b>3.0</b> (9)
Diploma	<b>8.2</b> (13)	<b>8.6</b> (12)	<b>8.4</b> (25)
Degree	<b>6.3</b> (10)	<b>11.4</b> (16)	<b>8.7</b> (26)
<b>Total</b>	<b>100.0</b> (158)	<b>100.0</b> (140)	<b>100.0</b> (298)
<b>Marital status</b>			
Single	<b>23.4</b> (37)	<b>24.3</b> (34)	<b>23.8</b> (71)
Married	<b>58.2</b> (92)	<b>65.7</b> (92)	<b>61.7</b> (184)
Widowed	<b>13.3</b> (21)	<b>7.9</b> (11)	<b>10.7</b> (32)
Separated	<b>5.1</b> (8)	<b>2.1</b> (3)	<b>3.7</b> (11)
<b>Total</b>	<b>100.0</b> (158)	<b>100.0</b> (140)	<b>100.0</b> (298)
<b>Occupation</b>			
Self employed	<b>71.5</b> (113)	<b>67.9</b> (95)	<b>69.8</b> (208)
Private Entity	<b>12.1</b> (19)	<b>11.4</b> (16)	<b>11.7</b> (35)
Government Employee	<b>8.2</b> (13)	<b>16.4</b> (23)	<b>12.1</b> (36)
Others	<b>8.2</b> (13)	<b>4.3</b> (6)	<b>6.4</b> (19)
<b>Total</b>	<b>100.0</b> (158)	<b>100.0</b> (140)	<b>100.0</b> (298)

Bolded figures are percentages and those in brackets are numbers of respondents

In this study, more than one-third of the respondents (34.6%) were aged 40-45 years; Majority of them had completed secondary education (73.2%); were married (61.7%) and were self-employed (69.8 %).

Table 2: Respondent's response on knowledge of effects of urban livestock keeping (N = 298)

Variable	Frequency	Percent
Environmental Pollution	150	50.3
Diseases	49	16.4
Infrastructure Destruction	87	29.2
Social Conflict	132	44.3

Table 3: Respondents' encounters on effects by type of livestock (N = 298)

Variable Type of Livestock	Challenges encountered						
	Heaps of waste	Noise	Dust	Odour	Destruction of plants	Conflict with neighbour	
<b>Cattle</b>	45.6 (136)	16.8 (50)	14.1 (42)	26.8 (80)	33.2 (99)	33.9 (101)	
<b>Pig</b>	19.1 (57)	25.8 (77)	5.0 (15)	66.4 (198)	12.4 (37)	72.1 (215)	
<b>Goat</b>	17.8 (53)	22.1 (66)	12.1 (36)	15.4 (46)	45.6 (136)	37.6 (112)	
<b>Sheep</b>	14.7 (44)	8.4 (25)	12.8 (38)	13.1 (39)	24.8 (74)	22.1 (66)	
<b>Poultry</b>	39.6 (118)	26.5 (79)	11.7 (35)	24.2 (72)	62.4 (186)	59.1 (176)	

The figures in brackets are the number of respondents involved and bolded figures are percentages

Table 4: Effects of Urban Livestock Keeping on Environment and community

Livestock Keeping	Environmental Pollution		Noise		Heaps		Dust		Plant Destruction		Conflict	
	chi2	P-value	chi2	P-value	chi2	P-value	chi2	P-value	chi2	P-value	chi2	P-value
Cattle	64.03	0.000	108.91	0.000	59.42	0.000	0.95	0.330	53.67	0.000	45.80	0.000
Pig	209.45	0.000	185.09	0.000	159.53	0.000	0.7382	0.390	172.09	0.000	163.49	0.000
Goat	275.13	0.000	191.75	0.000	185.49	0.000	2.1552	0.142	98.31	0.000	206.79	0.000
Sheep	0.0535	0.817	0.2982	0.585	186.44	0.000	1.8262	0.177	63.19	0.000	0.5716	0.450
Poultry	158.55	0.000	1.1645	0.281	242.80	0.000	0.7634	0.382	117.88	0.000	84.92	0.000

wastes that are poorly managed; bad odour from certain types of animals such as male goat, fresh animal wastes, or rotting remains of animal feeds and, destruction of plants and infrastructure.

According to Table 3, cattle keeping is leading in causing heaps of waste in urban areas as pointed out by majority of the respondents (45.6%); followed by poultry (39.6%); poultry was the noisiest livestock of all in the study area (26.5%), The results show that environmental pollution through dust was the least of all other forms of pollution caused by urban livestock keeping in the study area; pigs were considered the leading animals in producing bad odour in the study area (66.4%) and poultry was considered the most destructive livestock to plants (62.4).

The chi-square tests were conducted to ascertain whether the two categorical variables under the study (keeping livestock and environmental pollution ; social conflict ) were independent or not. Table 4: shows the test results on independence between livestock keeping (cattle, pig, goat, sheep, poultry) and environmental pollution (odour, noise, heaps of wastes, dust, plant destruction and conflict) .

The chi-square test of association between keeping cattle and environmental pollution rejected the null hypothesis of independence at 5% level of significance on pollution variables except one (dust), implying that keeping

cattle could result into noise, heaps of waste, odour, and plant destruction. Also, the null hypothesis of independence between cattle and conflict were also rejected at 5% level of significance indicating that keeping cattle could results into conflict among community members in the study area. The fact that the Chi-square test failed to reject null hypothesis of independence at  $P \geq 0.05$  between keeping cattle and environmental pollution resulting to dust implies that there is little or no evidence to suggest that keeping cattle could cause dust among the community in the study area.

The chi-square test of association between keeping pig and environmental pollution rejected the null hypothesis of independence at  $P < 0.05$  on all cases variables except one (dust), implying that keeping pig in urban areas could result into environmental pollution namely odour, noise, plant destruction and heaps of waste. Further analysis indicated that keeping pig in urban areas could also result into conflict among the community in the study areas at 5% level of significance.

Similarly, the chi-square test of independence between keeping goats and environmental pollution rejected null hypothesis of independence at 5% level of significance on all cases variables except one (dust), implying that keeping goats in urban areas also could result into environmental pollution namely odour, noise, plant destruction and heaps

of waste. Further analysis indicated that keeping goat in urban areas could also result into conflict among the community in the study areas ( $P < 0.05$ )

Following a Chi-square test of independence conducted to ascertain whether keeping sheep could result into environmental pollution and conflict, the test results rejected the null hypothesis of independence at 5% level of significance on two cases (plant destruction and heaps of waste); implying that keeping sheep in urban areas could result into environmental pollution namely plant destruction and heaps of waste. The test statistic failed to reject null hypothesis of independence between keeping sheep in urban areas and environmental pollution namely, odor, noise and dust respectively, also test statistic failed to reject null hypothesis of independence between keeping sheep in urban areas and social conflict ( $P \geq 0.05$ ). In this category of there is little or no evidence to suggest that keeping sheep could cause odor, noise, dust and social conflict among the community in the study area on the basis of the data provided.

With regards to poultry keeping the chi-square test of independence rejected null hypothesis of independence at 5% level of significance on all cases, except two cases (noise and dust) implying that keeping poultry in urban areas could also result into environmental pollution namely, odour, plant destruction and heaps of waste. In this category of livestock the analysis indicated that keeping poultry does not result into noise and dust respectively; but could result into conflict among the community in the study areas at 5% level of significance.

While these results cannot be taken on absolute terms as voiced out by the respondents, they are nevertheless an important reflection on how people feel bad to see the problems that are caused by urban livestock keeping in their areas on daily basis. One respondent whose vegetable garden was occasionally invaded by different groups of livestock in Dodoma Municipality had the following lamentation:

*“You see this garden, it was very beautiful. It was a great toil on my side to prepare it as I spent almost 300,000/= to dig up the well - water table is just near. Then I fenced it locally using thorny trees. I grew tomatoes and Chinese cabbage, and was expecting to get at least 40,000/=daily from sales. When the vegetables were about to be harvested, cattle destroyed everything! Since then, the garden has been under constant attacks by goats, chickens and cattle. It is just impossible to continue with this activity!”*

## CONCLUSION AND RECOMMENDATIONS

Based on the foregoing discussion on environmental effects of urban livestock keeping in the two Municipal cities of Dodoma and Morogoro, it can be argued that as much as livestock keeping has continued to be integral part of urban life, its management has continued to fall short of proper urban development dynamics. There is poor animal waste disposal resulting into absurd waste heaps, noise, destruction of infrastructure and gardens, dusty conditions, nasty smell and, spread of diseases to urban dwellers. Generally, all types of livestock cause environmental challenges with varying degrees of magnitude. The gravity of each type of challenge will certainly differ with the type of livestock involved. The main conclusion is that environmental effects of urban livestock keeping are inherent in all types of livestock at varying degrees. Livestock keeping of any type in urban areas has negative environmental and health consequences that can be mitigated through effective enforcement of relevant municipal bylaws.

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