Social and Ecological Services and Disservices from livestock in Makana Municipality, Grahamstown.

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Abstract

In recent years, the development of peri-urban agriculture has blurred the lines between what constitutes as ‘rural’ and ‘urban’ within the context of settlements and associated activities. This is evident in developing countries. This study takes a look at peri-urban agriculture and its implications in post-Apartheid South Africa, specifically in Grahamstown, a small town in the Eastern Cape run by the Makana Municipality. The lack of good quality grazing pastures (due to poor commonage management) has resulted in livestock foraging for food in more urbanised areas, inevitably leading to human-animal interactions. This study aims to examine the perspectives of Grahamstown residents regarding the presence of livestock and the associated services and disservices in their urban setting. We hypothesised, firstly, that perspectives of livestock will vary in different areas of the town and secondly, socio-cultural and socio-economic factors influence these perspectives of livestock. We collected data via surveys handed out to residents in five areas: Grahamstown East, Grahamstown North, Grahamstown West, Rhodes University campus and the Central Business District (CBD) as well as through key informant interviews with relevant personnel. The data was analysed and tested for significance using the Chi-square test. The results lacked statistical differences and thus we reject our aforementioned hypotheses. Such findings stress the importance of revising data collection and analyses methods in the interests of producing more accurate and useful results to further understand the impacts of livestock in urban areas.

1. Introduction

The presence of livestock is not unusual in small towns of developing regions of the world. South Africa is one such developing country where livestock play a huge role in the human population’s subsistence and lifestyle (Puttick et al., 2014). The use of livestock does not only occur in rural settings but is also carried through into urban settings and these livestock bring both services and disservices to the larger urban community (Lyytimäki and Sipilä, 2009).

This introduction will provide the background for an investigation into the social, economic and ecological effects of livestock on Grahamstown residents’ local environment and lives. We referred to these as “services” and “disservices”. This conceptualization recognises that
the overall social, economic and ecological impacts of livestock on local communities cannot be categorized as completely positive or negative. Due to different cultural, economic and social backgrounds, and the general difference in individual perspectives and values, people will have different views on the services and disservices of livestock in urban areas.

In the next section we review the background literature and provide the context for our study. We first consider the issue of livestock in peri-urban settings and their importance with specific reference to Makana municipality. Next, we provide a description of the Makana municipality and the prevalence of livestock in its urban settings as well as a brief introduction to the study area. This will be followed by an explanation of the terms “services” (positive impacts) and “disservices” (negative impacts) which will then lead onto the main discussion on the services and disservices from livestock in urban settings. Following this contextualisation, we will describe the objectives and hypothesis for the study. We will then provide further information on the study area; describe our methods and finally we will explain the possible assumptions and pitfalls of our research.

2. Background Literature

2.1. Livestock in Peri-Urban and Urban Areas

According to Thornton (2008), peri-urban and urban agriculture (UPA) occurs when rural areas in developing countries change into urban areas and there is an increase in rural-urban migration. This results in the urban-rural dichotomy becoming less pronounced, states Thornton (2008). This is the case in South Africa explains Losada et al. (1998), where many towns have both strong rural and strong urban influence and therefore become “metropolitan villages”. The socio-economic determinants of keeping livestock in urban areas were documented using surveys carried out in Ouagadougou, a semi-arid area in Burkina Faso. The surveys focused on the views of livestock owners on keeping livestock in an urban area as well as finding out the owner's’ underlying drivers and constraints of keeping livestock, (Thys et al., 2005). According to the results 26.3% of all households in Ouagadougou keep livestock, mainly to generate income, (Thys et al., 2005).
There is strong similarity between Ouagadougou and Grahamstown, a small town that falls under the Makana Municipality in the Eastern Cape. Thornton (2008) conducted a survey showing that among locals in eRhini (the isiXhosa name for Grahamstown), 32% of the residents keep livestock for consumption, 16% of them sell the livestock for money and 3% keep it for status within the community.

Due to the land reform program implemented post-1994, there has been a change to how land is used and managed in South Africa, (Thornton, 2008). Some of the land has become open-access areas leading to the poor management of most commonages, forcing livestock herders to find grazing areas elsewhere (Thornton, 2008). This brings about the need to study the complexity brought about by the presence of livestock in peri-urban and urban areas are in South Africa particularly in Grahamstown.

2.2. Services and Disservices

This study focuses on the ecosystem services and disservices attained as a result of livestock presence in Grahamstown.

The Millennium Ecosystem Assessment (2005) describes ecosystem services as benefits people obtain from ecosystems. Lyytimäki and Sipilä, (2009) define ecosystem services as the ‘good’ aspects of biodiversity and ecosystems, ignoring the ‘negative’ aspects that could affect the wellbeing of people. There is no bound definition of disservices in any academic literature. For the evaluation of the perceptions of livestock in urban and peri-urban areas we termed the positive factors which are ecosystem services as “benefits” and the negative factors which are ecosystem disservices as “costs”.

According to Gómez-Baggethun et al., (2013) disservices can range from damages caused by livestock to urban infrastructure, to the transmission of diseases by the animals. We can therefore explain disservices as the opposite or negative function of a service. Ecosystem disservices can be assessed by the absence of services or the presence of disturbed services, (Chapin et al., 2000).
2.3. Socio-Ecological Services of Livestock in Urban Areas

2.3.1 Income Generation

The Eastern Cape Province in South Africa has one of the highest poverty levels (60.8%) and lowest economic productivity in the country. Many of the poor therefore keep livestock as a means of sustenance and as a source of income (Thornton, 2008).

2.3.2 Cultural Services

Bray (2015) states that livestock is important as it is the basis of indigenous cultures, traditions and kinship organisations. The Native American tribes of the Seminole and Miccosukee view wildlife and their cattle “as part of their heritage” (White, 2015), thus emphasising the socio-economic and socio-cultural importance of livestock. Cattle provide the majority of income as most of the tribes’ revenues come from cattle ranching (Swain et al, 2013). Their social, economic and cultural status and identity is therefore based on the livestock (White, 2015). Xhosa culture in South Africa is also strongly linked to livestock, especially cattle (Bray, 2012).

Cattle are more than just sources of meat and milk in Xhosa culture, they are essential for cultural practices such as marriage ceremonies and sacrificial rituals. They also indicate prestige, economic stability and political power (Bray, 2012). In Xhosa culture, cattle are necessary gifts for a man to give to the family of the bride-to-be as a dowry (the local term for dowry is termed ‘lobola’) and they are slaughtered and sacrificed as a means of appeasing the ancestors (Bray, 2012). With Grahamstown, being a predominantly Xhosa town it is inevitable that livestock provide social and economic benefits to most of its community as it is part of their cultural heritage and livelihood.

2.3.3 Animal Traction

Simalenga et al., (2000) describes animal traction as the use of cattle, donkeys and horses for labour such as ploughing, pulling carts, and load carrying. Most of the areas in South Africa are in the process of development and do not have transport infrastructure such as tarred roads and railways roads, the donkeys are therefore used to transport goods and people (Starkey, 1995). They are also used for the fetching of water and collection of firewood (Starkey, 1995). According to the Rhodes University Library the Eastern Cape has a poor literacy rate; in 2009 as a way to encourage and improve reading Rhodes University suggested a donkey-drawn mobile cart library service, (Rhodes University Newsletter, 2009). A similar
initiative had been a great success in Matebeleland in Zimbabwe and in Ethiopia where the donkey carts were used to take books to children to towns with poor road networks (Rhodes University Newsletter, 2009).

2.4. Ecological Disservices of Livestock in Urban Settings
The prevalence of poverty in the Eastern Cape Province leads to people overstocking, resulting in the aforementioned consequences experienced in the communal areas of Sterkspruit (Goqwana et al., 2008). The interactions between humans and livestock in small urban areas cannot be avoided especially when there are large numbers of livestock grazing in small urban green spaces that which more often than not are not formally designated by the municipality for livestock grazing. Lupala, (2002) states that the main ecological disservices of keeping livestock in the urban areas are the production of dust as a result of overstocking in kraal, soil compaction, land degradation and plant defoliation (Guendel and Richards, 2002)

2.4.1. Impact on Urban Green Spaces
The disservices associated with the presence of goats, cattle and sheep in urban green spaces is often involve the damage and defoliation to recreational lawns and gardens as livestock move and graze (Lyytimäki & Sipilä, 2009). Livestock in urban areas tend forage in rubbish bins in search of food and in the process spread the litter and pollute the environment, (Lyytimäki & Sipilä, 2009).

Stangel (1993) states that overgrazing disrupts the nutrient cycle of the land as it leads to poor regeneration of grass and plants because of the net loss of nutrients leading to reduced fertility and ultimately resulting in soil erosion. Soil is a very important resource which is argued to be non-renewable as it takes approximately 100-400 years to produce 1 cm of soil and therefore soil erosion is a major disservice, Stangel (1993). High levels of erosion occur when there is overgrazing which results in the removal of the top layer soil cover and the reduction of the soils infiltration abilities as it becomes more compact from livestock trampling, this reduces the land's ability to control runoff water leading to even higher levels of soil erosion (Goqwana et al., 2008; Lyytimäki et al., 2008). The presence of some livestock can be a disservice in itself for example goats feeding on trees, shrubs and plants in various
homeowners’ gardens, destroying plants and reducing shade in some instances (Lechmere-Oertel, 2008).

3. Study Area

Our study area was Grahamstown, a small town located in the Eastern Cape, South Africa (33° 18’ 36’ South; 26° 31’ 36’ East); situated between the coastal cities Port Elizabeth and East London. Due to its historical background, Grahamstown is socially and economically divided (Thornton, 2008). The impacts of apartheid are visible through the divisions within Grahamstown, as a result Grahamstown West is mostly dominated by white people, Grahamstown North is dominated by Indian and white people and Grahamstown East is dominated by Xhosa communities and is locally referred to as eRhini (Fig. 2). It is these racial and economic segregations on which we based the choice of our sample sites (Fig. 1). For this study we defined Grahamstown East as the lowest income area, Grahamstown West as the highest income area, while Rhodes University, Grahamstown CBD and Grahamstown North made up the upper lower to upper middle income classes in that order (Fig. 2). Grahamstown’s historical background, combined with the fact that it is in one of the poorest provinces in the country with high levels of unemployment, make social and economic development strategies difficult to implement and sustain.
According to Statistics South Africa (2011), there is a total population estimate of 80 390 people, of which 78% are black, 8.7% are white, 12.1% are coloured and 0.7% are Indian/Asian. According to SSA (2011) there are 21 388 households in the municipality with an average of 3.5 persons in each household. There are about 52.5 females in the population against 47.5 males. Most households are female headed (SSA, 2011). The most dominant language in this town is isiXhosa, followed by Afrikaans than English. Within an economically active population of 28 494 there is a 32.5% of unemployed people and within this economically active population there are 7777 unemployed youth (15-34 years) (SSA, 2011). Peri-urban agriculture (which Thornton (2008), refers to as agricultural activity occurring in built up intra-urban areas and peri-urban fringes of cities and towns) has been a coping mechanism for the disadvantaged community in terms of food security and livelihood. However, the Xhosa people in eRhini, and indigenous pastoralist communities in general, have reared livestock long before socio-economic problems such as unemployment existed. They have done so not only because livestock is a source of food products and a symbol of wealth but also for traditional and cultural reasons, as is the case with most, if not all, traditional
African communities. According to Thornton (2008), 32% of eRhini residents keep livestock for consumption, 16% sell it for money and 3% keep it for their status within the community.

Figure 2. socio-economic divisions within the Grahamstown demographic, a relic of past racial segregation. (Fox, 2012).

3.1. Hypothesis
Cultural background and socio-economic status will influence people’s views towards urban livestock; their opinions and perspectives on the services and disservices of said livestock and their implications in the town.

To elaborate, we hypothesized that people’s perceptions of peri-urban livestock in Grahamstown correlated to their socio-economic status as a result of service/disservice (cost/benefit) dynamics between socio-economic groups. The service/disservice dynamics suggesting that groups that have greater or more direct benefits from the peri-urban livestock would have more positive perceptions than groups that have less benefits or indirect benefits. Therefore in the case of Grahamstown we expected that the people that utilize livestock-derived services would enjoy most of the benefits and people who do not own livestock nor use any of their associated services would bear most of the costs.
Our hypothesis additionally states that people’s perceptions of peri-urban livestock in Grahamstown vary with culture and that cultures more inclined to animal husbandry have a more positive perception of peri-urban livestock. We expected that Grahamstown, being a very culturally diverse town, would have varying perceptions of peri-urban livestock with members of the population adhering to Xhosa culture showing the most positive perceptions of peri-urban livestock due to their high cultural value. Therefore as we had defined our hypothesis with regards to what influences people’s perceptions of peri-urban livestock, with specific regard to people of Grahamstown; our objectives included determining the validity of our hypothesis and the associated implications on how this information can benefit future policy. In order to fulfil our objectives we needed to test our hypothesis using methods that are defined in the following sections of the report.

3.1.1 Objectives

- The primary objective of this study was to determine the general perspectives of the Grahamstown population with regards to the negative impacts (disservices) and positive impacts (services) on environment (built, natural and economic) caused by urban livestock.
- The secondary objectives were related to identifying trends, if any, with regards to how different demographics e.g. culture, education and social-economic status correlate to perspectives on negative impacts of livestock.

4. Methods

4.1 Data collection

The data included both quantitative data and qualitative data. Quantitative data was collected via a household survey which also had open-ended qualitative questions. In-depth interviews or conversations were conducted with key informants from different sectors to hear their professional perspectives on the impacts of livestock in Grahamstown.

4.2 Questionnaire design

In order to collect the required data on perceptions of residents in our sample areas we designed a questionnaire to conduct a survey at household level (Fig. 3). The questionnaire
was made up of 19 questions that aimed at deducing the required information from participants. Demographics like age, culture, education level and sex were obtained from the questionnaire, as well as questions that determine the participant’s perceptions towards peri-urban livestock. The questionnaire was formalized to get the perceptions of the Grahamstown population in terms of opinions on the social and ecological services and disservices of peri-urban livestock. The types of questions used in the questionnaire were dominated by yes/no answer, structured questions, open ended response questions and Likert scale questions. The quantitative data was extracted from these questionnaires and analysed using methods stated in the methodology section.

4.3 Sampling Strategy
Looking at our objectives we decided that an initial stratified sampling is required to capture perceptions of different groups of people residing in different areas of the town. The sample area was chosen to represent different socio-economic classes based on the past Apartheid boundaries which still exist as a relict today. Five areas were chosen in total, namely: Grahamstown East (the township and informal settlement areas), Rhodes University, the town’s Central Business District (CBD), Grahamstown North (a middle to upmarket area now bordering the township area due to township growth) and Grahamstown West (an upmarket suburban area). The sample size of 100 respondents was used to represent the population of Grahamstown, it was divided into 20 respondents per area. We used Arc GIS to carry out the random sampling, we generated a regularly-spaced grid of sampling points inside a polygon layer (Fig 3). This involved creating a grid over our regions (Grahamstown East, CBD, North, West and Rhodes University), the GIS grid divided the areas into many smaller areas, this information was then exported to excel. Then we randomized the data related to the fishnet grid and imported this data back into Arc GIS from Excel and allocated the 20 random sampling areas within each region/within each shapefile. The steps followed:

1. Firstly we downloaded the latest maps of the Makana region from the Rhodes geography website and placed them into Arc GIS 10 as shapefiles.

2. We had to prepare our features in which the sampling was to occur. This is a polygon feature class and we created the features in each of their respective polygon layers. In other words the regions in which we wanted to respectively sample from (our five
areas) (Fig 1.) were outlined and then the polygon layers were added respectively to the map document and the coordinate system/ map projection for the data frame was set correctly.

3. To create the Fishnet, the Fishnet (Data Management) tool was opened. This was opened using the search window and searching for *fishnet*.

4. We then had to set the output feature class of the shapefile and set the Template Extent to Same as layer (of our polygon created in step 2).

5. We set the desired point spacing in Cell Size Width and Cell Size Height. We entered 20m for both the Cell Size Width and Cell Size Height values.

6. Next we had to export our data from our fishnet grid to excel in which we then randomly selected cells as data points within excel. This was done by formatting the cell columns containing the Longitude and Latitude values as number. Descriptions of each column were changed and these changes included labelling columns ID, longitude, latitude, descriptions, etc. for the output file.

7. The data was then added from the .xlsx file as a data table and after defining the projection, click Add, Apply, and OK on the Spatial Reference Properties dialog box. Click OK on the Add XY Data dialog box.

8. Using ArcCatalog to create a new shapefile, right click on the dbf (or supported table) and select “create feature class/from x-y table”.

9. Finally we join the data from the fishnet file with the original shape file of each region. This finally then produced our random sample within each area. The resultant randomized blocks as sampling regions are shown in Figure 3 where Rhodes University shown on left hand side is comprised by the completed randomized blocks, and to the top right where the fishnet in Grahamstown West is still present before showing randomized block sites.

The households that have livestock were excluded in the GIS sample as this study wishes to only determine the perceptions of non-livestock-owners towards peri-urban livestock. The survey was carried out by two groups of three over five days to increase efficiency, with each
group having one isiXhosa and one Afrikaans-speaking member for ease of communication where necessary. With regards to the key informant interviews, we selected four key informants: Rhodes SAN Nurse (Liezel), S.P.C.A Chairman (Louise Vincent), Rhodes University Safety, Health and Environmental Officer (Nikki Köhly) and Police Officer (Funisile Phillip). We performed these interviews by approaching the selected interviewees, stating our objectives for our study and then politely requesting their participation in our study.

Figure 3. Fishnet method used to create blocks for the random sampling of the Grahamstown West, Rhodes University and CBD areas, Arc GIS.

5. Data Analysis

5.1 Quantitative data

To analyse the data obtained during this study, we used data analysis methods that we feel were most applicable to qualitative multi-response survey data. Therefore the data was first entered into spreadsheets in Microsoft Excel within which our data was processed into percentages and then used to produce graphs such as histograms and frequency tables. Doing so gave us a clear picture of what the data actually looks like on one page and directed as to
which data statistical analysis needs to be used on. Additionally, the tables assisted us in identification of patterns found within the data (Taylor-Powell, 2003). Thereafter, the statistical significance of the data was determined using the Chi-squared test in Statistica 12. With regards to our Statistical analysis we choice to compare data from three of the five areas only, Grahamstown West, CBD and East, as Grahamstown East and West represent end members of our socio-economic classes while Grahamstown CBD represents the Middle class. We choose to do this for the ease of correlation and to more directly address our hypothesis.

The Chi-Squared tests were performed to compare observed values with expected values within the dataset and determining the statistical significance of said data. Microsoft Excel was also used to determine the statistical significance of the data gathered on the most commonly used livestock-derived service (between manure and traction). For data containing multiple variables, such as people’s responses regarding the impacts of livestock, Statistica was used. In the case of such data, the variables and corresponding values were cross-tabulated across the three areas. This was achieved by arranging the areas in rows and the variables in columns. The “Basic Statistics” option was selected under the “Statistics” function; followed by the selection of the “Tables and banners” option. To cross tabulate the data, the option ‘specify variables’ was selected under the “Cross tabulation’ tab, at which the “Area” variable was selected in one list with the rest of the variables being selected within a separate list. The cross-tabulated data-through selecting the “Options” tab and ticking on the “Pearson’s/ M-L Chi-Square test”-was then entered into a two-way summary table (found on “Summary” tab) and analysed.

5.2 Qualitative data

Content analysis was used to analyse the data obtained from the in-depth interviews, in which the responses given by the participants in the interview were grouped into categories according to the different kind of responses possible regarding this study. From there, patterns and themes were assessed along with factors that may have some sort of influence on the nature of the responses of the participants (the sector in Grahamstown they come from in this case) (Berg, 1989).

We had chosen the methods we believe were best suited for data collection and analysis for our study that can produce results that are accurate and represent the population. However,
we had identified some limitations and encountered some pitfalls as stated in the next section.

6. Assumptions and Pitfalls

6.1 Assumptions:

We assumed that:

- We assumed that participants/respondents of the survey would answer truthfully
- We assumed that our sample was an accurate representation of our population
- We assumed that our sample contained evidence of respondents pertaining to relevant cultural, gender and age groups;

6.2 Methodology pitfalls:

- In the course of random sampling, we sometimes could not find a respondent in designated sampling areas as selected by GIS random sampling. In such instances, we would choose households to the left of the selected household, then to the left again, then opposite. Our bad luck never extended beyond the third attempt.
- The level of cooperation and assistance from residents varied between and within areas
- Our sampling methods (stratified and random) brings into question the accuracy with which our study represents the entire Grahamstown community

6.3 Ethical considerations

The main focus of our study was to investigate the effects of livestock on the Grahamstown community. All the researchers had read and understood the Rhodes University code of ethics so as to interact with the community in a manner that is culturally sensitive, respectful and does not infringe on their rights or offend them.

Participation was voluntary and participants were free to withdraw at any time during the interviews and questionnaire sessions. Participants were informed that the interviews we conduct and the questionnaires we used were strictly for academic purposes and their
responses and identities would be kept anonymous unless consent was given. A consent form had been drawn up and would be given to all participants who chose to participate.

7. Results

7.1 Key Informant interviews

A few key informants from varying professions were asked what their opinions on the presence of livestock in urban areas were, this is what they had to say:

Liezel: Rhodes SAN Nurse

“I have not seen any cases of injury from livestock in my profession, only dog bites. But my personal opinion is that livestock do not belong in towns. Where I live there is a dumping ground that attracts livestock and I feel this is dangerous for the small children running around. Also, I think animal dung is a health hazard for the general population.”

Louise Vincent - SPCA (Grahamstown)

“As much as livestock may be beneficial to the community, they do not belong in urban areas. Their presence in an urban setting poses a danger to the public and a danger to the livestock themselves.”

She states that the SPCA often deals with cases involving abused and injured livestock, she recalls a recent incident whereby a donkey had been drenched in used motor car oil. To decrease these incidents occurring she suggests that livestock be kept in designated areas such as commonage so that it is easier to monitor them and ensure their safety.

Nikki Köhly: Rhodes University Safety, Health and Environmental Officer

“Legally livestock do not belong here, but personally I like having them on my street. I like the smell and ambience you get from having animals around when they are not opening rubbish bags and spreading the rubbish of course. I do understand that some people don’t know how to respond to animals and might feel threatened...especially with bullocks with horns.”

“The main problems with having livestock in the city is that they can cause accidents, damage people's gardens as well as cause various health issues.”
“I think rather than expanding commonage areas, a rotational grazing system should be put into place. So areas could be fenced off into manageable lumps and proper rotational grazing because that is by far the most efficient from a livestock management point of view as well as biodiversity and resource protection.”

**Officer Funisile Phillip: SAPS ( Grahamstown)**

“Livestock do not belong in the urban areas, Grahamstown has communal farms that’s where they belong in these communal farms. They become a danger in the cities, I once was involved in a car accident because the car was trying to avoid hitting a donkey on the road.”

“They don’t have much services, they just roam around doing nothing the only people that benefit from them are the owners so I would not involve myself in their relocation.”

**Results from the Questionnaire**

Our study involved 100 participants, there was an almost equal number of female and male participants with 48 males and 52 females, the ages of our participants varied from 18 years old to over 50 years old, helping us eliminate chances of any bias.

Figure 3. shows that livestock is sighted more than three times in a week mostly in Grahamstown North, Grahamstown West and Grahamstown East, these are all residential areas, whereas Rhodes and the CBD have the least number of sightings this could be because residential areas have more greenery compared to the pavements and buildings of the CBD and Rhodes which had the most random sightings of livestock with most participants in these regions seeing livestock once a week. According to Figure 4, the greatest increase in livestock in the last couple of years, particularly in donkeys has been observed in the CBD. Grahamstown West and Grahamstown North follow closely also with high levels of increase in the presence of donkeys, as mentioned above livestock is also sighted mostly in these regions. East and Rhodes had about a 50% increase in donkeys. Overall donkeys were perceived to have increased more than cattle. The Cattle increased most in Grahamstown West followed by the Grahamstown North then Grahamstown east whilst Rhodes and the CBD had increases below 50%.
Figure 3. Frequency of livestock sightings per week by Grahamstown residents.

Figure 4. Perceived changes in livestock population by Grahamstown residents.
Looking at our results for service provision by urban livestock throughout all five areas 65% of respondents agree that urban livestock proved some form of service, while an average of 75% across all areas agree that urban livestock are most important in terms of cultural service provision (Fig. 5). Grahamstown East shows the highest agreement that urban livestock provide services (cultural or others) with an average of 85% agreement, while the CBD has the least agreement that urban livestock provide services (cultural or other services) with an average agreement of 55%. However statistical significance was only achieved with respect to urban livestock providing services (p-value: 0.02) and not with respect to urban livestock providing cultural services (p-value: 0.27) for the three areas Grahamstown west, CBD and east). As expected Grahamstown East had the largest agreement that livestock are important for cultural services.
Figure 6. Grahamstown residents’ perceptions of the services provided by livestock in urban areas.

For a more in depth look at services provided by urban livestock we choose traction and manure as the two most common services urban livestock provide to non-livestock owners. The results show that there is agreement across all areas besides Rhodes University that urban livestock are most important for provision of manure. Rhodes University had 65% of respondents stating that Traction is the aim service provided by urban livestock. Unexpectedly, Grahamstown CBD responded with traction being the most important service provided by urban livestock with 85% in favour of this option.

7.1 General Perspectives

Table 1 shows the general perspectives towards livestock considering whether livestock belong in urban areas, if livestock are considered being dangerous; if livestock are seen as nuisance in the immediate area; if livestock in urban areas are appealing and whether livestock is taken care of and managed in said urban areas, specifically within the Makana Municipality. These results were calculated based on respondents having answers agreeing, being neutral to, or disagreeing with each respective feeling/opinion.
With regards to whether livestock belongs in urban areas we saw an expectedly high percentage of 70% average in respondents disagreeing with this statement in the Rhodes University, Grahamstown West and CBD areas (Table 1). This was compared Grahamstown North having (unexpected due to their socio-economic class) a 55% disagreement, a high neutral standing point of 40% and finally compared to the deviating opinion of Grahamstown East having half the respondents agreeing to livestock belonging in urban areas.

Regarding livestock being dangerous in urban areas, we had a high average across all 5 sites sitting at 72% of respondents disagreeing with livestock being dangerous (Table 1). Only a small percentage of less than 10% of respondents on average over the 5 sites remained neutral. Livestock being a nuisance in urban had a minimum of 50% of respondents in Grahamstown East agreeing to this statement, up to a 70 in both Rhodes and CBD areas (Table 1).

Respondents finding livestock appealing was highest in East at 60%, where the West, CBD and North all had a 10% agreement among respondents that livestock is appealing, and Rhodes having almost equal disagreement to agreement (Table 1). According to the Chi-squared test associated with the appeal of livestock; this was calculated in respect to the three areas of the East, CBD and West regions, we consider a p-value of 0.003. Between these three areas this is represented by a p-value that is significant, indicating that there is a significant disparity between the East and the CBD/West region. More respondents find that that livestock in the East is appealing compared to that in the CBD and West where they find livestock is on general not appealing.

A more varying result in the question of whether livestock is well taken care of and managed in urban areas had the CBD with the most respondents disagreeing with livestock being well looked after at 80%, then Grahamstown West at 70%, North at 55%, Rhodes at 45% and East at 25% (Table 1).
Table 1. Grahamstown residents’ general perspectives on the existence of livestock in urban areas.

<table>
<thead>
<tr>
<th>LIVESTOCK BELONGS IN URBAN AREAS</th>
<th>Rhodes</th>
<th>West</th>
<th>CBD</th>
<th>North</th>
<th>East</th>
</tr>
</thead>
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<tr>
<td>DISAGREE (%)</td>
<td>70</td>
<td>75</td>
<td>65</td>
<td>55</td>
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<tr>
<td>NEUTRAL (%)</td>
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<td>10</td>
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<tr>
<td>AGREE (%)</td>
<td>15</td>
<td>15</td>
<td>10</td>
<td>5</td>
<td>50</td>
</tr>
</tbody>
</table>

DANGEROUS

| DISAGREE (%)                     | 20     | 15   | 15  | 25    | 30   |
| NEUTRAL (%)                      | 10     | 15   | 5   | 5     | 0    |
| AGREE (%)                        | 70     | 70   | 80  | 70    | 70   |

NUISANCE

| DISAGREE (%)                     | 15     | 0    | 10  | 30    | 30   |
| NEUTRAL (%)                      | 15     | 35   | 20  | 10    | 20   |
| AGREE (%)                        | 70     | 65   | 70  | 60    | 50   |

LIVESTOCK APPEALING

| DISAGREE (%)                     | 40     | 65   | 55  | 50    | 15   |
| NEUTRAL (%)                      | 15     | 25   | 35  | 40    | 25   |
| AGREE (%)                        | 45     | 10   | 10  | 10    | 60   |

LIVESTOCK WELL TAKEN CARE OF AND MANAGED

| DISAGREE (%)                     | 45     | 70   | 80  | 55    | 25   |
| NEUTRAL (%)                      | 15     | 25   | 5   | 10    | 20   |
| AGREE (%)                        | 40     | 5    | 15  | 35    | 55   |

Table 2. Grahamstown residents’ perceptions of frequently cited disservices of livestock in urban areas.

<table>
<thead>
<tr>
<th>Disservices</th>
<th>WEST (%)</th>
<th>NORTH (%)</th>
<th>RHODES (%)</th>
<th>CBD (%)</th>
<th>EAST (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Messing up Rubbish</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>70</td>
<td>90</td>
</tr>
<tr>
<td>Causing injuries</td>
<td>35</td>
<td>15</td>
<td>50</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Causing or being involved in accidents</td>
<td>80</td>
<td>50</td>
<td>65</td>
<td>65</td>
<td>50</td>
</tr>
<tr>
<td>Impacting parks</td>
<td>85</td>
<td>85</td>
<td>75</td>
<td>80</td>
<td>85</td>
</tr>
<tr>
<td>Causing smells</td>
<td>30</td>
<td>80</td>
<td>50</td>
<td>60</td>
<td>60</td>
</tr>
</tbody>
</table>
From the survey conducted the results revealed that amongst all the different areas of Grahamstown in which the survey was conducted in, the majority from all residents agreed that the most disservices that they received from livestock was the turning over of rubbish causing a mess in their areas, the destruction of community parks/gardens and the most unpopular disservice was injuries caused by livestock. This is depicted in Table 2 with the maximum agreements of livestock turning over rubbish at 95% coming from Rhodes, the North and West of Grahamstown residential area and the lowest 70% from the CBD after doing a Chi-test it showed that there is no significant difference between Grahamstown West, East and the CBD with a P-value of 0.06 (Table 4). The results also showed that smell from livestock was most noticed in the North with 80% of residents agreeing on this view and only 30% from the West residential area and a P-value of 0.09 showed that there was no significant difference between Grahamstown East, West and the CBD. The impact on community parks/gardens was highly noted in the North, East and West of Grahamstown with 85% of the residents agreeing to have seen the destruction caused by livestock in their parks and gardens and only 75% from Rhodes and the P-value was 0.88, showing no significant difference between the Grahamstown East, West and CBD. Accidents caused/involving livestock were mostly witnessed in the West of Grahamstown with a maximum of 80% of residents agreeing on being present/hearing stories concerning these kinds of accidents with the a P-value of 0.13 showing no significant difference between the CBD, Grahamstown East and West. Injuries caused by livestock were mostly heard of at Rhodes with about 50% of the residents agreeing to have seen incidents where people got injured by livestock, 15% in the North being the lowest and 40% in the East of Grahamstown with a P-value of 0.93 showing no significant difference between Grahamstown East, West and CBD. The incidents involving livestock turning and messing over rubbish was mostly experienced by the residents of the North, West and Rhodes with the percentage of agreements of 95% and the residents of the East of Grahamstown at 90% with a P-value of 0.06 (Table 4).

Based on our results and expectations, people in Grahamstown West were the most in favour of relocation of livestock to Rural Areas (RA) while those in Grahamstown North (surprisingly so based on their socio-economic status) and East were least in favour of this solution to dealing with urban livestock (Table 3). However there was no significant difference found between Grahamstown West, CBD and East with our P-value calculated at 0.49 (Table 4). The results on willingness to participate in a program to relocate livestock to RA showed that again Grahamstown West, as expected, were the most willing to participate but again the North were least willing (unexpectedly). With regards to willingness to pay towards the expansion of the Grahamstown commonage Grahamstown West and
North were the most willing to pay with 75% and 90% in agreeance respectively, while Grahamstown East was the least willing to pay with only 20% in agreeance. There was a significant difference calculated between the willingness to pay toward commonage expansion between Grahamstown West, CBD and North (Table 4). With regards to the strength of the respondents’ opinions on the urban livestock issue we can infer that Grahamstown North had the strongest opinions on livestock as they had only 8.3% of respondents in total responded with being neutral, while Grahamstown CBD had 23% of respondents responding with being neutral. Table 4 shows that there was hardly any significant difference between nearly all variables between the three areas. Only three variables had significant differences between the three areas i.e. “Are residents willing to pay for the expansion of the commonage?”, “Do livestock provide services?” and “Are livestock appealing in urban areas?” (Table 4).

Table 3: Respondents’ perceptions of relocating livestock out of urban settings and their willingness to participate in/ contribute money towards such livestock relocation.

<table>
<thead>
<tr>
<th>RESPONCES</th>
<th>AGREE (%)</th>
<th>DISAGREE (%)</th>
<th>NEUTRAL (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEST</td>
<td>Relocated to RA</td>
<td>80</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Willing to participate</td>
<td>70</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Willing to pay</td>
<td>75</td>
<td>15</td>
</tr>
<tr>
<td>NORTH</td>
<td>Relocated to RA</td>
<td>15</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>Willing to participate</td>
<td>15</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Willing to pay</td>
<td>90</td>
<td>0</td>
</tr>
<tr>
<td>RHODES</td>
<td>Relocated to RA</td>
<td>70</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Willing to participate</td>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Willing to pay</td>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td>CBD</td>
<td>Relocated to RA</td>
<td>70</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Willing to participate</td>
<td>35</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Willing to pay</td>
<td>30</td>
<td>35</td>
</tr>
<tr>
<td>EAST</td>
<td>Relocated to RA</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Willing to participate</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>Willing to pay</td>
<td>20</td>
<td>80</td>
</tr>
</tbody>
</table>
Table 4. Chi-square tests for three possible responses (yes, no & unsure) to different variables, with the highlighted figures being statistically significant (p<0.05)

<table>
<thead>
<tr>
<th>Variables</th>
<th>$X^2$ (Chi-square test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smell</td>
<td>0.09</td>
</tr>
<tr>
<td>Impact on parks?</td>
<td>0.88</td>
</tr>
<tr>
<td>Accident</td>
<td>0.13</td>
</tr>
<tr>
<td>Injury</td>
<td>0.93</td>
</tr>
<tr>
<td>Rubbish turned over</td>
<td>0.06</td>
</tr>
<tr>
<td>LA belong in UA</td>
<td>0.07</td>
</tr>
<tr>
<td>LA in UB dangerous?</td>
<td>0.29</td>
</tr>
<tr>
<td>LA in UB nuisance</td>
<td>0.39</td>
</tr>
<tr>
<td>LA in town appealing?</td>
<td><strong>0.003</strong></td>
</tr>
<tr>
<td>LA taken care of?</td>
<td>0.18</td>
</tr>
<tr>
<td>LA provide Services</td>
<td><strong>0.02</strong></td>
</tr>
<tr>
<td>LA important Culture</td>
<td>0.27</td>
</tr>
<tr>
<td>LA relocated?</td>
<td>0.49</td>
</tr>
<tr>
<td>Participate relocation?</td>
<td>0.06</td>
</tr>
<tr>
<td>Charging fee?</td>
<td><strong>0.01</strong></td>
</tr>
</tbody>
</table>
7.2 Opinions on Services from livestock

Figures 3a, 3b and 3c showed both the opinions concerning whether livestock provides useful services for the local community and whether livestock is important for cultural reasons (marriages, ceremonies, etc.). This was compared across all five areas.

50%, or 10 out of 20 of the respondents of Grahamstown North agreed on the cultural importance of livestock to cultural use as well as a 55% agreement towards livestock providing useful services to the local community (Fig. 3a). 25% of the respondents strongly agreed with the importance of the cultural use of livestock, 20% were neutral to the argument, less than 10% disagreed and no respondents disagreed strongly against livestock being important for cultural reasons. Besides 55% agreement towards the opinion whether livestock provides useful services for the local community, less than 10% strongly agreed, 30% were neutral to the argument and less than 10% disagreed and disagreed strongly respectively.

There was a significantly high proportion of respondents in Grahamstown East agreeing to the importance of livestock for cultural reasons as well as perceptions on livestock providing services for the local community (Fig. 3b). 50% of the respondents strongly agreed to the importance of livestock for cultural reasons, 40% agreed, less than 10% were neutral, and only less than 10% strongly disagreed. In terms of respondents’ perspectives on whether livestock provide useful services for the local community, 40% strongly agreed to the statement, 50% agreed, less than 10% were neutral, less than 10% disagreed and none strongly disagreed (Fig. 3b).

We observed a more even distribution concerning the Grahamstown CBD in Figure 3c. The cultural services show 15% of respondents strongly agreeing, 45% agreeing, 30% neutral and 10% disagreeing (Fig. 3c). Opinions towards services towards the local community from livestock showed that 35% agree with useful services being provided by livestock for the local community with half of the respondents agreeing, less than 10% disagreed and/or remained neutral and none strong disagreed.
8. Discussion

8.1 General Perspectives

According to our results mentioned above as well as the related data captured in Table 1; we saw a general disparity between perspectives of respondents concerning Grahamstown East compared to the other four regions.

Besides a high agreement of 70% or above for all respondents across the five sampling areas on the danger that livestock pose in urban areas; there is a general negative consensus of regarding the presence of livestock in urban areas as unappealing and a nuisance as well as disagreeing with the notion that livestock are well taken care of (with the exception of Grahamstown East). Grahamstown East however has half of its respondents agreeing to livestock belonging in urban areas where in comparison the four other areas have a general consensus of livestock not being an area for livestock to be in. This could be due to the cultural reasons (see the services section for livestock having cultural significance) where most people in Grahamstown East are living in informal residences (township) and are constantly surrounded by livestock, especially cattle. This area clearly had a higher proportion of respondents thinking livestock belong in urban regions since they are not sedentary and actually move around looking for pastures (Puttick et al., 2008). This is the case where the commonages are degraded and the question remains where livestock are supposed to be left to graze (Puttick et al., 2008).

The general agreement of livestock being dangerous in urban areas could be due to the fact that most respondents in all five areas have at least heard of an incident whereby livestock in urban areas have been or could have been the reason for or involved in an accident. The most common replies on the questionnaires in the further comments sections had people replying that cattle usually walk on roads and this poses a risk for potential accidents.

Disservices derived from livestock, according to the respondents, included livestock rummaging through trash bags, cattle damaging trees in urban green spaces and impacting
parks and simply being a nuisance in general when concerning zoning on public roads. Overall, however, there is a high opinion agreeing with the notion that livestock are a nuisance.

The appeal of livestock would refer to the presence of livestock being a pleasant sight or as one respondent referred to livestock having ‘attributable aesthetic value to urban areas’. The perspectives of appeal towards livestock in urban areas according to the results has a high agreement from respondents in the East. This could be attributed to the observation that it is most common to see livestock in the East and that the dominant Xhosa population in Grahamstown East has deep cultural ties to livestock, which are important for various ceremonies and traditions (Bray, 2012). Half or more respondents in the West, CBD and North don’t find livestock appealing. There is no evidence suggesting that the respondents find them unappealing, however there is a high degree of neutrality to this in these areas from a quarter of respondents in Grahamstown West to 40% in Grahamstown North, and this could possibly indicate the respondents’ disinterest in livestock since they don’t consider them as appealing or remain neutral. Rhodes University respondents had an almost equal opinion of livestock being appealing and unappealing and this could attribute to the fact that we see a possibly higher variation of cultural backgrounds and origin of students. Grahamstown East, which is situated closest to the commonage and is more dependent on livestock, would likely see livestock as appealing when comparing to the other regions where livestock is not directly utilised for its benefits.

The last opinion of Table 1 concerning whether livestock is well taken care of and managed has the most varying responses. Grahamstown East, once again in favour of livestock, has the highest number of respondents agreeing with the management and care of livestock and this could be because most of the residents/respondents here do not see the livestock venture into the other areas, and assuming from a cultural basis that this is how livestock are actually managed. When comparing this to Grahamstown West and CBD we have a consensus of respondents having the opinion that livestock do not belong in urban areas and this could attribute to the opinion on the mismanagement of livestock, as well as the fact that livestock commonly migrate through to the different areas. Rhodes University and Grahamstown North have both respondents agreeing and disagreeing to livestock being well managed and taken care of in urban areas. We can assume that University students will have varying opinions due
to different cultural backgrounds and access to vast amounts of knowledge within the institution, while the North could possibly have this outcome due to it being a large region and thus having more variable opinions.

8.2 Opinions on services from livestock

Roughly half or more of the respondents looking at all five areas agreed that livestock contributed to services to the local community, and the CBD had the largest amount of respondents that stayed neutral to the argument, this could be because services of livestock are not as accessible to residential areas in the CBD as they would be in the northern and eastern sectors which extend to more informal settlement regions. The general consensus however was that the majority of respondents do agree on the importance of cultural and community services to the local population derived from livestock, since there were less than 10% of respondents disagreeing on this perception regarding such benefits.

Regarding the regions, we can see clear differences in the responses in relation to the proximity of livestock. The Grahamstown East has stronger opinions concerning cultural perceptions of livestock. This area is mainly comprised of the informal settlement region (Peri-urban region) and through our field observations, we can deduce that livestock is more frequent there and more sedentary there as well. Grahamstown North, which is adjacent to the informal settlement, has been observed to often seeing livestock, and the residents there mostly agree to the cultural importance of livestock. When looking at the CBD, here we see more opinions as neutral and this could be due to a casual kind of tolerance towards livestock since many of the respondents may have not experienced the associated benefits or impacts.

When considering animal traction and transport, the CBD region occasionally sees donkey carts moving through the streets. This could explain some of the opinion outputs agreeing to the relevance of services, or inversely finding that there are no use for donkey carts due to cars and other modes of transport being prevalent in the CBD. In the North and CBD, manure is the most commonly used livestock-derived service, compared to cultural (sacrificial animals) and provisioning services (food) in the eastern part of Grahamstown. Since most of the CBD and Grahamstown North would, for example, buy beef from grocery stores instead of having cattle as available in the East, livestock wandering through the CBD and
Grahamstown North will, as previously mentioned, elicit more neutral viewpoints since the residents might not perceive livestock as a source of services nor as a negative presence.

8.3 Impacts
As mentioned and depicted on Table 2 of the results, the most prevalent disservice experienced by Grahamstown residents is the messing and turning over of rubbish by livestock. One of the reasons for this could be the fact that the North and East of Grahamstown are closer to where the Grahamstown commonage is (Davenport et al., 2012). Grahamstown commonage is said to be under the management and maintenance of the parks and recreation divisions which is under the community and social services directorate of Makana LM (Davenport et al., 2012). According to Davenport et al., (2012), there is a lack of human resource capacity and funding and because of this the municipality is unable to manage the commonage effectively. This could explain why the negative impact of livestock on community parks/ gardens is the second highest impact on all the residential areas because of inefficiency in the management and maintenance of the commonage. This indicates that there is a possibility that there is no proper fencing, not enough grazing areas and herdsmen, making it easy for the livestock to move to the residential areas where they find parks and gardens to graze on. The highest agreements on witnessing or hearing of accidents caused or involving livestock is seen in the West, Rhodes and CBD, the reason behind this view is because these areas are generally the busiest in town with the CBD having high traffic congestion which also explain why injuries caused and/or involving livestock are witnessed in the CBD (Miranda-de la Lama et al., 2011).

8.4 Solutions
The main objectives of this study was to determine how socio-economic class affects the perspectives of Grahamstown residents thus can be at the same time used to inform municipal policy and bylaws. We thus used three strategic questions to extract information on whether or not new bylaws and policy would be welcomed by the population of Grahamstown and which kind of strategy the municipality should use when formulation these new policies and bylaws. Table 3 show the results of the survey on people's perceptions on
possible strategies for dealing with urban livestock as well as the three questions asked which are as follows, “Should the livestock in urban Grahamstown be relocated to rural areas?”, “Would you be willing to participate in a program that relocates livestock?” and “Would you be willing to pay a small fee on rates, towards expanding the commonage?”.  

Looking at our results (Table 3) there was a wide range of trends of responses identified within each area. Starting with the Grahamstown East which we assume to be the lowest socio-economic class, the respondent’s strongest and most common opinion had to do with the suggestion of their willingness to pay tax towards the expansion of the commonage, which 80% responded “disagree”. This would be expected as people whom live in Grahamstown East do not have the finances to afford such tax additions as this area is characterized by low income and unemployment and thus does not have the capacity to pay additional taxes (SSA 2011). Within the East there is also problems to do with low service provision and other issues regarding the operations of the current Grahamstown municipality which further strain relationships between people within this area and the municipality. These strained relations and poor service delivery, for which the people are already taxed, are seen as the reasons for the residents’ strong negative opinion on paying for commonage expansion (Boshoff & Staude, 2003).

Another reason may be due to the cost-benefit dynamics within the urban livestock system within Grahamstown. Currently majority livestock owners are located within Grahamstown East and move their livestock between there and urban areas for feeding. This benefits the livestock owners but the disservices mentioned in the earlier sections (Table 2) negatively impact urban dwellers disproportionately (although no significant difference was found between the stated three areas). Thus we can assume that people in Grahamstown East also do not have as much of an incentive to pay for the expansion of the commonage as the people in more urban parts of town. The first solution suggested was to relocate livestock from urban areas to rural areas. This solution had a majority of Grahamstown East respondents against it. This falls back on the cost benefit dynamics as this solution will more favourably benefit urban dwellers as they no longer have to deal with urban livestock but does not solve problems of livestock in these rural areas (Grahamstown East) and may even intensify problems. This solution could lead possibly to even more overgrazing and degradation or the
commonage and parks, spread of disease and other disservices talked about earlier (Tegegne, 2004).

The three middle socio-economic class areas sampled were Grahamstown CBD, North and Rhodes University and it was found that Grahamstowns CBD’s strongest opinions on solutions to Grahamstown urban livestock was to relocate the livestock to rural areas (82% responding in favor) (Table 3). There is clear relationship for this when comparing these results with the results of impacts caused by urban livestock within the CBD (Fig. 2). There is thus strong incentive within the CBD to relocate Livestock out due to their disservices (Fig. 2) but also due to their influence on the commercial side of things. Not indicated with in the graphs are the respondents’ comments on livestock within Grahamstown of which common statements like, “livestock chase away customers” and “livestock cost us money” show the influence livestock in the CBD have on stores. However though what was unexpected was the CBD’S respondents’ unwillingness to participate in a relocation program or pay tax for the expansion of the commonage even though they felt so strongly about livestock not being suitable in the CBD. Two reasons may be proposed for this (we assumed CBD responded were employees of some sort of commercial enterprise and therefore they were speaking on behalf of their company) one being that there is already high tax on companies and more tax would further cut profits which any commercial company would not be in favour of. Second people who work with in the CBD are already limited with respect to time and thus participation in such programs would only further limit their spare time or cut profits if it be working hours. However no statistical difference was found with regards to the willingness to participate between Grahamstown West, CBD and East (p-value of 0.06).

Grahamstown West is the highest socio-economic group and as expected their perspectives with regards to the proposed solutions to the urban livestock reflected their high socio-economic status in accordance with our hypothesis. The cost benefit dynamics can explain the high percentage of people in Grahamstown West being in favor of relocation of livestock to rural areas and in favor of participating in such a program. This is because people in Grahamstown West have more negative perceptions of urban livestock (Table 1) because they do not benefit from them directly as people in Grahamstown East where the majority of livestock owners stay. People in Grahamstown East are predominantly white due to past apartheid segregation and thus do not see the cultural importance of livestock and their non-
tangible services as compared to Grahamstown East which is dominantly xhosa or Grahamstown North which is mixed, thus pay more attention to the tangible disservices caused by urban livestock (Table 2). However no significant difference was found between Grahamstown West, CBD and East (p-value of 0.06). With regards to willingness to pay towards the expansion of the commonage, a significant difference was achieved between the three areas (Table 4). This is in accordance to our hypothesis, that states higher income classes have more negative perceptions of urban livestock, and therefore will be more inclined to favour this option, as can afford it (Fox, 2012).

Grahamstown North had the most unexpected responses with regards to their socio-economic class thus a more detailed explanation of what might be happening is given in the following paragraphs. The first question of whether livestock should be relocated to rural areas had an 80% majority opposed of relocation. This contradicts the results based on the impact graphs (Fig. 5) that show the great extent of the disservices urban livestock cause with in the North. The cost benefit dynamics support the responses to relocate livestock to rural areas as people in the North are to benefit while those in rural areas will bear the cost as explained in the rural context earlier but this is not what we observed. The reason for this disparity may be due to education of people with in the North as a number of people mentioned how there are currently policies that govern the distribution, movement and stocking numbers of livestock but these are not followed. People in this area are also aware that moving livestock to rural areas will only exaggerate the problems there and that is not a solution thus are not in favour of it. With regards to peoples in the North’s willingness to participate a majority of 70% were not in favour of participating in a program to relocate livestock. This maybe because there was no suggestion of details of such a program provided thus no support for it was given. The final question had to do with peoples in the North’s willingness to pay and it was found that 90% were willing to pay with only 10% being uncertain. This corresponds to the high socio-economic status of this area as they can financially afford to pay for this tax to enlarge the commonage. The low uncertainty identified within this group relates to their higher knowledge of current and past policies to do with livestock management in Grahamstown and thus are more certain about their choices.

The overall lesson from the section on influencing bylaws and policy from our study is that there is wide range of opinions regarding how livestock in Grahamstown should be dealt with
and these opinions relate to socio-economic status, education and cost benefit dynamics. The best and most evenly accepted solution will only come about by educating people within each socio-economic class about the services and disservices of urban livestock as well as rebuilding people's trust in the municipality which is seen by people from all socio-economic areas as not having the capacity to deal with the livestock issue.

9. Conclusion

From the results produced in this study, it is suggested that the majority of Grahamstown West residents are for the idea of relocating livestock to rural areas while in favour of participating in such a program and of paying a small fee towards the expansion of the commonage. Conversely, the majority of residents in Grahamstown East are opposed to the relocation of livestock; unwilling to pay for commonage expansion yet are willing to participate in a relocation program. In the CBD, the majority of respondents were in favour of the relocation of livestock as a solution yet they were unwilling to participate and were either unwilling to pay or unsure as to whether or not they would pay towards commonage expansion.

These results would theoretically corroborate our hypotheses that Grahamstown will have varying perceptions of livestock in different areas and that socio-economic and socio-cultural factors influence the way residents view livestock. For example: residents in Grahamstown East, an area dominated by traditional Xhosa cultural values, have the most positive perception of livestock, with relatively negative perceptions being found among respondents interviewed in the CBD and Grahamstown West. However, due to a lack of statistically significant figures generated from data collection, and consequently a lack of information to substantiate our claims, we reject our hypotheses. There also needs to be investigation into the influence of other underlying factors within Grahamstown or at a larger scale that may be more important than socio-economic class when dealing with people's perspectives on livestock. Influences such as education can transect socio-economic classes and lead to unexpected results as those that were observed in this study.
These findings therefore imply that the methodology of the study needs to be further revised and refined to generate more accurate results that can be substantiated with accurate statistical analyses.

With that being said, the significance of a few of the Chi-square results present an opportunity for one to undertake research on the feasibility of using public contribution to boost the resources needed by the municipality to address specific issues in their jurisdiction, such as charging residents a small fee to expand the commonage (p=0.01) (Table 4). Further research also needs to be undertaken with regards to the presence of livestock in peri-urban areas and their associated impacts as well as the feasibility of the expansion of municipal commonages through public contribution and/or state resources. Advancements in research within this particular topic can also present implications and opportunities to influence policy regarding peri-urban agriculture, thus bringing closer to informed and integrated solutions that can be used to address this issue in a way that is appropriate for all interested and affected parties involved.
10. References


Lupala, A. (2002). A scoping study on urban and peri-urban livestock keeping in Dar es Salaam, UCLAS Consultancy Unit, Tanzania.


