DFID Department for International Development

LPP

Peri-urban and urban livestock keeping in East Africa -

A coping strategy for the poor?

Scoping study commissioned by the Livestock Production Programme (LPP)

July 2002

Study co-ordinator
Sabine Guendel, NRI

Acknowledgement

This synthesis report is based upon the findings of five city case studies conducted in Nairobi, Kisumu, Kampala, Addis Ababa and Dar es Salaam between March and June 2002. Our thanks go to the following researchers and their field teams:

Zarina Ishani, P. Kuria Gathuru and Davinder Lamba ; Mazingira Institute, Nairobi, Kenya

Moses Onim; Lagrotech Consultants, Kisumu, Kenya

Sarah Ossiya, Nelly Ishagi, Lucy Aliguma and Charles Aisu; Ibaren Konsultants, Kampala, Uganda

Azage Tegegne, Zinash Sileshi, Million Tadesse, Mengistu Alemayehu and Dereje Woltedji; ILRI, Addis Ababa, Ethiopia

Aldo Lupala; UCLAS Consultancy Unit, University College of Lands and Architectural Studies, Dar es Salaam, Tanzania

This publication is an output from the Livestock Production Programme Research Programme of the UK Department for International Development (DFID), for the benefit of developing countries. The views expressed are not necessarily those of DFID Livestock Production Programme

"As more and more people make cities their home, cities will be the arenas in which some of the world's biggest social, economic, environmental and political challenges will be addressed, and where solutions will be found"

Kofi Annan, Secretary General of the United Nations, June 2001

Front cover photograph: sheep in doorway, Kibera, Nairobi. Mazingira Institute. Note the feeds wrapped in polythene on top of the shelter

Table of contents

Summary

Until recently the main focus of agricultural development initiatives has been on rural areas with the view that improved food production in rural areas can supply the expanding urban population. This is especially true for livestock production which has received little attention from research and development initiatives in urban areas. During the International Symposium on Supply of Livestock products to rapidly expanding urban populations (FAO, 1995) peri-urban and urban livestock systems were considered as special cases. The main emphasis was given to rural livestock production systems directed towards urban demand. Consequently, information on urban and peri-urban livestock production is limited.

Data indicates that by 2025 80% of the world's urban population will be in developing countries (UNCHS 1996). Rapid urbanization has not been accompanied by equitable economic growth and has resulted in increased urban poverty. As a result of this worsening of urban poverty, many low-income households suffer from extremely limited livelihood security. The urban poor engage in urban livestock keeping as a response to limited alternative livelihood options and food insecurity. This category of livestock keepers, lacking the control over and access to basic inputs, is seldom able to access support services and is either harassed or ignored by the city planners (Waters-Bayer, 1995).

The aim of the scoping study was to understand the current situation of poor urban livestock keepers in East Africa, and identify areas where future research could make a contribution to the development and promotion of this activity. The main focus of the study was on poor livestock keepers.

Five city case studies were selected in Tanzania, Uganda, Kenya and Ethiopia. The cities were Dar es Salaam, Kampala, Kisumu, Nairobi, and Addis Ababa. Five local consultant teams were employed to conduct the case studies. Purposeful sampling targeting poor livestock keepers and a combination of questionnaires and stakeholder meetings were used to obtain the information required. Secondary information was used to supplement primary data.

The case studies reveal that urban livestock keeping benefits the poor and provides a way of diversifying livelihoods activities that are accessible to vulnerable groups. It also provides a source of locally produced food products for people living in the vicinity of the livestock keepers. However, there are various externalities (zoonoses, environmental contamination, product safety) which require addressing. The following **strengths and opportunities** have been identified from the city case studies:

1 *Multi-purpose activity.* Urban livestock keeping fits different livelihood strategies and contributes to food security, income and employment generation, saving and insurance and social status. It provides easily convertible assets for covering important expenditures (school fees, health treatments).

2 *Higher return per unit of land from livestock compared to crops.* Increasing demand for land in cities for housing favours urban livestock keeping as it

requires less or no land and promises higher returns per unit land utilized.

3 *Flexibility in terms of land use.* Compared to urban crop production, livestock can be shifted easily to other urban areas as they become available.

4 *Use of waste resources.* Urban livestock keeping offers an opportunity to make use of household waste, agro-industrial by-products such as molasses and brewery residues, weed and grass from public lands and crop residues from markets and urban farmers.

5 *Provision of a social safety net for the poor.* The different case studies show that especially vulnerable groups, such as female headed households, children, retired people, widows and people with limited formal education are particularly involved in urban livestock keeping as a form of social security strategy.

6 *Market developments that could favour urban livestock production by the poor.* The urbanization process will lead to increasing demand for livestock products. The proximity to these markets is an advantage for the poor. The case studies indicate that urban commercial livestock enterprises become less competitive due to high input prices (imported feeds and animal drugs) as a result of liberalization and structural adjustment programmes.

The **weaknesses and constraints** which affect urban livestock keepers were identified as,

1 *Inappropriate waste management.* There is strong evidence from all the case studies that animal waste disposal exacerbates the human waste disposal problem and causes environmental and public health dangers, which will become even more severe as urban livestock numbers increase.

2 *Water availability.* At present urban livestock keeping competes for water resources with humans as the demand for water for this activity is not taken into account by the supply services. In many slum areas municipal water has to be bought and, therefore, other water sources, which are often contaminated, are accessed for livestock and men.

3 *Poor livestock health and high cost of veterinary services.* The case studies show that animal health is often poor due to inadequate husbandry practises. Poor livestock keepers seldom vaccinate their livestock, especially smaller species such as goats, sheep and poultry. Due to the high cost of veterinary services and livestock drugs treatment is sub-optimal.

4 *Feed availability and quality.* Feed availability is a particular constraint for larger livestock species such as cattle, which are usually zero-grazed. Feed quality is a problem for free-roaming livestock as there is no, or very limited, control over feed sources. The Nairobi case study shows that foraging at waste dumps is common in the slum areas.

5 *Low production levels.* Due to limited feed availability and quality and poor management practices the production level of livestock is generally low.

6 *Poor networking and organization among poor livestock keepers.* Poor livestock keepers are not organized and can, therefore, not express their demands in a concerted way.

7 *Lack of research and services provision.* Information access and adoption of improved technologies is limited for poor urban livestock keepers. This is made worse by the fact that existing services are not tailored to the needs and circumstances of the poor (e.g. extension services and training courses promote species which are less relevant for the poor).

8 *Limited knowledge of livestock husbandry practices.* As information sources and advice services are lacking, poor livestock keepers often have limited knowledge of livestock husbandry practices.

Research studies are required to assess in more detail the current and potential impact these externalities have on the livelihoods of urban people and to contribute to the development of strategies to overcome or minimise these.

1 *Livestock waste management.* The existing evidence of the negative impacts caused by inappropriate livestock waste management on water resources and public health calls for a more detailed analysis of the problem. A predictive research programme is required to understand how this problem will develop with increasing livestock numbers and over time. Parallel to understanding the scope and dimensions of this problem, research is required to provide improved waste management technologies adapted to the specific circumstance of the poor. An important research component would be the potential for the intensification of urban/ peri-urban and rural linkages in terms of nutrient flow.

2 *Water availability. F*or urban livestock, water supply is another issue which needs to be understood more thoroughly. Currently, city planners do not take into account the demands of urban livestock keepers. This results in competition for resources, over-use and conflicts between neighbours. Studies are needed which quantify the current and future water demand by urban livestock keeping. A participatory and multi-stakeholder approach is needed to identify potential water management strategies.

3 *Zoonoses.,* The existing and potential health risks for humans caused by the transmission of diseases from livestock have to be assessed in more detail. As Mantovani (2000) points out there are a range of local factors involved which may increase the risk of zoonoses and which will put at risk especially vulnerable groups, such as children, pregnant women and poor people in general.

4 *Policy making.* Relevant information is needed to advise policy makers and city authorities on these issues in order to provide guidance for the formulation of pro-poor urban livestock legislation. An aspect related to zoonoses, which needs to be taken into account for the formulation of new legislation is food quality standards and quality control processes.

5 *Empowerment of the poor.* The study also shows that poor livestock keepers are marginalized from existing knowledge and improved technologies. There is a

clear opportunity to improve the current management system through capacity development and information sharing. However, in order to achieve this, organization and networking among poor livestock keepers is required to improve the access to services, information, technologies and markets.

6 *Promotion.* Finally, there is a need to identify appropriate strategies to promote urban livestock keeping to other vulnerable groups who have not yet entered this activity. As a first step a participatory constraint and opportunity analysis with these vulnerable groups is required to identify the potential contribution urban livestock keeping could make to their livelihoods.

1. Why this study?

Recent data indicate that two thirds of the world's poor people will be found in urban areas by 2030 (UNCHS, 1996). Urban population was estimated at about 2.9 billion in 2000, and is projected to reach 4.9 billion by 2030. Most of this increase will be in cities of less developed countries, which had an urban population of about 1.9 billion people in 2000, and are projected to increase to about 3.9 billion by 2030. The increase in most developing countries will partly be due to rural-urban migration, but mostly due to transformation of rural settlements into urban areas added to natural urban population growth (UNCHS, 1996).

Rapid urbanisation has not been accompanied by equitable economic growth and has resulted in increased urban poverty. We can now speak of the "urbanisation of poverty". Today half of the poor are living in urban areas and it is estimated that by 2025, the proportion will have risen to almost two thirds (UNCHS, 1996). As a result of this worsening of urban poverty, many low-income households suffer from extremely limited livelihood security. Access to infrastructure and physical assets is limited. For example, in Nairobi, 55 % of the total population lives in 78 slums, comprising 5% of the total land area of Nairobi (Ishani el al. 2002).

According to a survey in 1999 (CBS, 1999) 29% of Nairobi household members are living below the overall poverty line. In comparison, in Kisumu 48% of the household members are falling below the poverty line.

Until recently the main focus of agricultural development initiatives has been on rural areas with the view that improved food production in rural areas can supply the expanding urban population. This is especially true for livestock production which has received little attention from research and development initiatives in urban areas. During the International Symposium on Supply of Livestock products to rapidly expanding urban populations (FAO, 1995) peri-urban and urban livestock systems were considered as rather particular cases. The main emphasis was given to rural livestock production systems directed towards the urban demand.

Peri-urban agriculture (PUA) is recognised not to be a recent phenomena; however its importance and potential for urban livelihoods has been neglected in the past. FAO (1999) estimates that 800 million urban residents worldwide are engaged in PUA. The status of PUA has changed from illegal to tolerated and only in recent years PUA has begun to receive attention from donors, researchers and development organisations as a "new" development strategy.

Most of the existing PUA studies have focused on crop production in urban and peri-urban areas, leaving to one side the role of livestock production. Others have emphasised the overall importance of PUA without distinguishing between crop and livestock production or social groups. Consequently, information on urban and peri-urban livestock production from a pro-poor perspective is limited.

1.1 Objectives and focus

The DFID Livestock Production Programme (LPP) commissioned the present study to achieve the following objectives:

- To understand better the role and functions of urban livestock keeping and the issues that poor livestock keepers face in urban and peri-urban environments.
- To identify current knowledge gaps and potential research issues of both reactive and predictive nature, which can be shared with policy makers and donors.

In accordance with DFID's agenda on poverty reduction, the study focuses on poor livestock keepers. As mentioned earlier, today half of the poor are living in urban areas and it is estimated that by 2025, the proportion will have risen to almost two thirds (UNCHS, 1996).

1.2 Methodology used

Five city case studies were selected in Tanzania, Uganda, Kenya and Ethiopia. The cities were Dar es Salaam, Kampala, Kisumu, Nairobi and Addis Ababa. Local consultant teams were employed to conduct the case studies. Purposeful sampling targeting poor livestock keepers and a combination of questionnaires and stakeholder meetings were used to obtain the information required. Secondary information was used to supplement primary data. The issues covered in the case studies included the following:

- Characteristics of livestock keepers incl. gender aspects
- Peri-urban and urban livestock keeping
- Reasons for keeping livestock
- Livestock species/breeds and numbers
- Husbandry practices with opportunities and constraints
- Ownership and decision making processes
- Tendencies and trends
- Support services and information sources
- Policy framework
- Environmental and health aspects

The findings and recommendations of this review are based on a cross-cutting analysis of the city case studies.

2. Urban livestock keeping

Results of a comprehensive urban household survey carried out by Lee-Smith and Memon (1994) which covered 6 cities in Kenya, showed that 17% of the respondents kept livestock. The estimated 1.4 million head of livestock kept in all Kenyan towns at the time of the survey were worth about $17 million USD. National statistics quoted by van der Bliek (1992) for the livestock population in Nairobi: 25,000 cattle, 30,00 small ruminants, 30,000 pigs, 8,500 rabbits and 350,000 poultry hint at the important contribution of the sector to protein needs of the urban population.

According to Baah (1994), 25% of the 4.5 million small ruminants in Ghana are raised by people living in and around cities and towns. He indicates that urban producers keep these animals not only to contribute substantially to the animal protein needs of the urban community, but also benefit economically, with a resultant improvement in their standard of living.

A survey carried out by Gefu (1992) in Zaria, a Nigerian university town, reveals that 80% of respondents keep livestock, raising goats, poultry and sheep, primarily to meet immediate household needs, but also to supplement family income.

Centres (1991) also stresses the economic benefit accruing to a large number of people that supply inputs and marketing services to the 20,000 households that rear animals in and around Bamako in Mali.

The findings of the five city case studies confirm the existence and diversity of livestock in and around cities. For instance, the Kisumu study recorded 14 different livestock species kept in urban and peri-urban areas (Onim, 2002). In Ethiopia the livestock numbers in major in urban and peri-urban areas in 2001 were estimated at 169,264 cattle, 64,767 sheep, 22,630 goats 15,886 donkeys and 415,680 chickens (Tegegne *et al*,. 2002). Similar situations were reported from Kampala, Dar es Salaam and Nairobi (Ossiya *et al*., 2002; Lupala, 2002 and Ishani *et al*,. 2002)

2.1. Who are the urban livestock keepers and why do they keep livestock?

As in urban agriculture generally, urban livestock keeping is not only practised by the poor. Different social groups have different reasons to engage in urban livestock keeping.

Control over and access to basic inputs, such as land, labour, and capital mean that middle-income families are often heavily involved in urban agriculture, including livestock keeping, as a commercial activity to supplement household incomes (Bangura and Gibbon, 1992). These livestock keepers receive or can access government and private support services and either receive approval or are at least tolerated by the city authorities (Waters-Bayer, 1995).

On the other hand, the urban poor engage in urban livestock keeping as a response to limited alternative livelihood options and food insecurity. This category of livestock keepers lacks the control over and access to basic inputs, is seldom able to access support services and is either harassed or ignored by the city planners (Waters-Bayer, 1995).

Contradicting opinions exist over who the main urban livestock keepers are. Whereas Foecken (2000) concludes that livestock keeping in urban areas in East Africa is an activity which becomes more common as income rises, Maxwell and Zziwa (1997) note that 72% of those practising urban agriculture and livestock keeping in Uganda fall into the low-income bracket.

It is important to distinguish between the different social groups involved in urban livestock keeping as they face different constraints and opportunities and have different reasons to engage in urban livestock keeping. Whereas for the middle-income households urban livestock keeping can be seen as a response to growing urban demand and markets, for the poor it is in the first place a response to crisis.

The city case studies offer examples for both types of responses. For instance, commercially oriented egg production in Dar es Salaam and Kisumu is catering for a growing urban market. Dairy production in Addis Ababa responds to the increasing urban demand for milk, whereas goat keeping in Nairobi and Kampala slums provides the only safety net and insurance for retired and widowed households.

The case studies show that the middle aged are the most numerous group of urban livestock keepers, followed by those of retirement age (> 60 years). Only in Nairobi a significant number of keepers were below 35 years. The table below presents the age distribution of urban livestock keepers in Addis Ababa.

Table 1 Age composition of urban livestock keepers in Addis Ababa

Age class of respondent	**No**	**%**
<=30	1	5
30 to 50	8	40
>= 50	11	55
Total	20	100

This age distribution pattern may reflect that young people are less depended on urban livestock keeping as they can find alternative formal and informal employment. For people between 35 and 60 years urban livestock keeping seems to supplement other informal or formal employment. For instance, a large group of keepers are civil servants who need an additional source of income and food production to compensate for low wages. For older people livestock keeping provides a coping strategy for retirement.

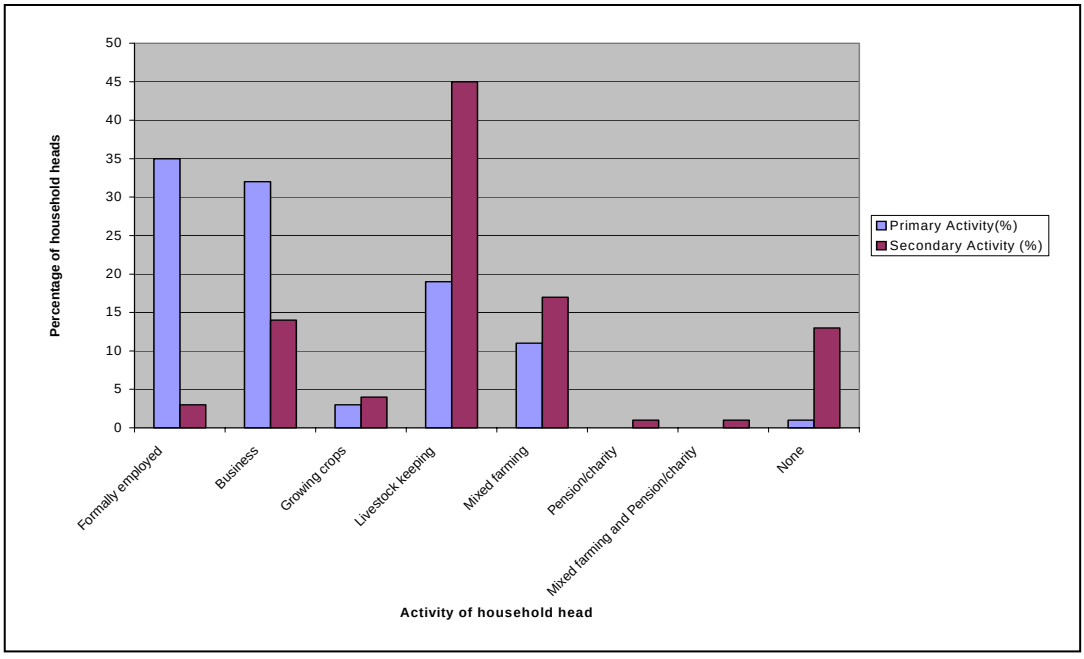
The Kampala case study captured these tendencies very clearly. Livestock keeping was cited by 45% of the household heads as their most important secondary activity and 38% of the households rely on livestock production as their secondary source of income (see Figure 1) . Furthermore, the study revealed significant gender differences

in terms of primary and secondary activity and income source. The predominant primary activity for female household heads was livestock keeping (44 % of household heads) and 42 % derived their major source of income from it. A high proportion of livestock keepers was found to have low levels of formal education. One third of the livestock keepers in Nairobi were reported to have no formal education.

These tendencies were confirmed by the other case studies, pointing out that livestock keeping is usually not the main occupation of households, however in some cases the contribution to income generation is significant. This is especially true for vulnerable groups (eg. women, retired people, people without formal education) who relied more on livestock keeping due to their limited alternative choices of livelihood options.

An interesting variant was reported from Addis Ababa, where donkey transportation enterprises seem to be a common feature of urban livestock keeping. In Addis Ababa donkey transport was reported by 90% of urban household heads to be the most important occupation and primary income source, whereas in peri-urban areas farming takes the first place followed by donkey transportation.

Figure 1 Primary and Secondary Income Generating Activity of the Household Head in Kampala



The case study findings indicate that many urban livestock keepers are also engaged in urban crop production. The Nairobi study found that more than a third of the households engaged in livestock keeping are also growing crops. In Addis Ababa crop production was stated to be the main occupation by 75 % of the livestock keepers. Involvement in urban farming and livestock keeping is particularly relevant when looking at manure management, an aspect that will be discussed further.

In terms of land ownership there were notable differences between the cities. Whereas in Nairobi more then two thirds of livestock keepers are squatters, in the other cities

between 40% and 80% of livestock keepers own the land they use for livestock production. The remainder either rent private land or use public land for livestock rearing. Average land holdings are small, in Addis Ababa half of the households had farm sizes of 0,05 ha or less. Land allocated to livestock was on average 0,02 ha, which shows that urban livestock keeping can be practiced with limited land resources.

2.2. Contribution of urban livestock keeping to the livelihoods of the poor

Improvement in household food security through livestock production is a contribution one would expect. The urban poor have two principle means of access to food, either purchase or self-production, with the latter being important not only for subsistence but also for income generation (Smith, 1992). Considering that households in nearly half of the largest cities in low-income countries spend on average 50 - 80 % of their income on food (PCC, 1990), the purchase option is unlikely to cover all the food requirements of poor households, particularly for higher priced goods such as livestock products.

Many authors have asserted that urban livestock keeping provides an important contribution to the protein needs of urban population (Smith and Olaloku 1998, Lee-Smith and Lamba 1998). However, the focus on urban livestock production as only a contribution to food security is too narrow and has been over-emphasised in the past.

Ellis and Sumberg (1998) reviewed case study material on urban agriculture in sub-Saharan Africa and summarise the reasons for engagement in food production as follows:

(a) as a means of survival for the very poor, this social group being most likely to farm on unused public or private lands and therefore most prone to punitive action by city authorities or private landowners (Sanyal, 1985; Freeman, 1991; Sawio, 1994)

(b) as a personal strategy of women, enabling them to secure a proportion of family food security in the face of insufficient, uncertain or unstable cash allocation by male wage-earning household heads (Maxwell, 1995)

(c) as a contribution to food security more generally, enabling families to withstand declining real wages, unemployment of family members, and variations in cash income from diverse other sources (Freeman, 1991; Drakakis-Smith, 1992)

(d) as a substitute for cash purchases of food, especially for higher value items such as eggs, meat, milk, fruit and vegetables, so that cash can be used for other purposes (Sanyal, 1986; Jamal and Weeks, 1988)

(e) as a means of supplementing the cash earnings of the family and achieving other objectives such as children’s schooling (Freeman, 1991)

(f) as a commercial rather than subsistence activity, undertaken to take advantage of growing markets for high value and import-substituting food and livestock products within cities and towns (Lee-Smith and Memon, 1994).

The city case studies reported here reveal a portfolio of other socio-economic functions urban livestock keeping has for the poor. For poor urban dwellers livestock production is often an "assets strategy", which can provide cash through sales in emergency, or a source of food for consumption on special festival days (Yasmeen, 2001).

The reasons uncovered in the case studies for keeping livestock varied depending on the type of livestock. Whereas goats, sheep, pigs and ducks were kept to obtain income derived from their sale in emergency situations, chickens and cattle were mainly kept to sell or consume their products on a regular basis. Donkey transportation provides a regular service for income generation and to purchase day-to-day household requirements such as salt, sugar and soap.

There exists strong evidence from the different case studies that the education of children was an important objective for the livestock keepers. The sale of animals for the payments of school fees was reported as a common practice. Furthermore, the provision of a safety net for vulnerable groups such as retired people and women without formal employment opportunities, is also important. Taking into account that these people have limited options to access credits, pensions or other social security schemes, livestock keeping provides an accessible option for convertible assets. During a PRA exercise in Kampala the livestock keepers stated that *livestock can be kept in the smallest possible area within the city* and is therefore more accessible for resource poor households than for instance crop production.

It was beyond the scope of this study to determine in quantitative terms the contribution of livestock keeping to food security and livelihood improvement.

2.3. Livestock husbandry practices

2.3.1 Livestock species and breeds

There is no clear trend in terms of the livestock species kept in the different cities. Whereas in Nairobi the most common livestock types were goats, followed by chickens, ducks, cattle and sheep, in Kampala cattle were the most common livestock type to be found. In Dar es Salaam and Kisumu chickens seem to be the most important livestock type followed by cattle, goats and sheep. In Addis Ababa, sheep are kept by more than 50 % of the households, whereas goats by only 13 %. Rabbits, geese, bees and other small species were uncommon in most of the cities. Pigs were rare in Nairobi, but more common in Kampala, Dar es Salaam and Kisumu (see Table 2). Cultural reasons are likely to influence preferences for certain species. For example the Kampala and Addis Ababa studies reveal that the livestock keepers followed their parents tradition in terms of livestock husbandry and species selection.

As a general tendency over the last few years there seems to have been a move away from small-stock to medium size species such as goats. Reasons include the poor

health of small stock and consequently low production levels and loss of animals. The majority of the households in the different cities would like to expand their livestock production. Preferences in terms of the livestock species people would like to have are dairy cattle, followed by small ruminants.

A pattern emerges in terms of local and improved species. There seems to be a tendency toward improved breeds of cattle and chicken, whereas goats, sheep, pigs and ducks tend to be local breeds.

Table 2 Livestock species and breeds encountered in Kisumu

Type of livestock	**Total** No. of livestock	**Grade** No. of livestock	**Crosses** No. of livestock	**Local** No. of livestock
Cattle	199	18	6	175
Goats	272	0		272
Sheep	102	0		102
Pigs	326	0		326
Chicken	1,578	484		1094
Ducks	161	0		161
Turkeys	10	0		10
Rabbits	4	0		4
Others	0	0		0

Men predominantly own cattle, goat and sheep. Men also take a larger share in owning improved species, whereas women more frequently own local breeds. Poultry keeping seems to be dominated by women, who own the larger share of improved and local chickens. The same is true for pig rearing in Kampala, where women own 50% of pigs, men own 35% and the remaining 15% are co-owned. In Nairobi, all livestock is owned jointly, which might be explained by the cultural background of the livestock keepers, who are predominantly of the Kikuyu tribe.

The sources of purchased animals for livestock production in urban areas are mainly urban livestock markets. This finding is important in terms of rural-urban linkages, as it could be assumed that livestock supply depends on existing relations between urban and rural relatives.

2.3.2 Livestock rearing systems

Poor livestock keepers may specialise in one type of livestock, which is explained by the limited resources available and the keepers preference to try to optimise the use of existing resources for one production type, or they keep a mix of livestock species. In Nairobi slightly more then 50% of the livestock keepers interviewed kept only one type of livestock. In Addis Ababa 33 % keep one type of livestock whereas 20 % of keepers have a combination of dairy cattle, poultry, small ruminants and donkey.

Table 3 Types of livestock kept by urban livestock keepers in Addis Ababa

Type of livestock species	No	%
Cattle	9	45
Cattle + Poultry	2	10
Cattle + Small ruminants	1	5
Cattle + Poultry + Small ruminants	5	25
Cattle + Poultry + Small ruminants + Donkey	3	15

Two main types of husbandry practices have been identified across the cities. Livestock is either kept under zero-grazing or scavenging and foraging conditions. The reasons for choosing one or the other management system are diverse and include:

- Level of intensification of management system: livestock kept for more commercial purposes is usually kept under zero-grazing with investment of financial and labour resources. Livestock kept for mainly subsistence purposes is often encountered scavenging and foraging supplemented with household waste. Dairy cattle are most commonly kept under zero-grazing conditions suggesting that it is a commercially oriented activity.
- Resources available: space is a major factor determining where animals are kept. In Nairobi for instance a third of the keepers have their livestock living within their own house due to limited space for the construction of livestock shelters.
- Safety situation of the neighbourhood: in some of the slums the livestock keepers have to confine their animal to protect them against theft.
- Legal situation: In some cities by-laws try to regulate and control free-roaming livestock. However most of the city case studies suggest that law enforcement is relatively weak and very few livestock keepers have been harassed by city authorities. Another aspect related also to resource availability is the security of tenure. Squatters will be more reluctant to invest in permanent structures than people who hold legal titles for their properties.

2.3.3 Feed supply and sources

Feeding practices are a major component of the rearing system. Free-roaming animals feed on whatever they find; observations from Nairobi for instance show that livestock foraged on garbage in dumpsites. Household kitchen waste, left-overs from hospitals, hotels, schools, markets and crop residues are other possible feed sources in addition to grazing on vacant plots and along roadsides. In Nairobi for instance, formal arrangements exist with crop growing neighbours who supply the livestock keepers with kale stalks free of charge.

Other feed sources are grass from peri-urban areas, where people have started to develop informal enterprises to grow or collect grass which is then sold to urban livestock keepers. Grass supply is affected during the dry season as availability of water for irrigation purposes is limited. This has led in some cases to the use of sewage water for grass production as reported from the Nairobi case study.

Example of the collection of fodder from the peri urban areas of Dar es Salaam, Lupala et al

Concentrates seem to be mainly purchased for dairy cattle and intensive chicken production. Goats, sheep, pigs and local chickens have to rely on non-commercial crop sources as most of the poor livestock keepers cannot afford to purchase feed on a regular basis.

Access to clean water was an issue highlighted in the case studies. Whereas in some areas livestock keepers had access to spring water, in others livestock compete directly with humans for consumption. Water sources for livestock included standing water, waste household water and contaminated industrial water.

Sheep feeding on garbage, Kawangware, Nairobi. Mazingira Institute

2.3.4 Waste management

Waste management has been identified as a major constraint and problem for urban livestock keepers. In the case of scavenging livestock waste management is non-existent apart from the manure accumulation over night, when animals are confined in the homesteads. The city case studies reveal that in many cases manure is accumulated and only from time to time discharged into streams or along roadsides. This means that the family members are constantly exposed to the livestock waste. During the raining season part of the excrement will be washed away.

In Addis Ababa much cow dung is made into cakes and sold for fuel or used by the households as plastering material for houses.

It appears that the situation is worse in the inner-urban areas where there is limited demand for manure for crop production and the proximity between people and livestock is closer. In peri-urban areas the manure is more frequently used on crop plots or sold to farming neighbours.

Waste disposal method, Kahawa West, Nairobi. Mazingira Institute

2.3.5 Markets for urban livestock products

Although the majority of poor urban livestock keepers do not keep livestock as a purely commercial activity, the selling of products is part of their livelihood strategy. The case studies show that the larger share of products is sold at farm gate or to neighbours. Only a small proportion is sold through formal market channels. Milk and eggs are the two products that are sold on a regular basis. The Dar es Salaam case study provided evidence for a more organised marketing system for eggs, where informal employment opportunities were created for people transporting the eggs from the producer to urban markets.

Meat derived from goats and sheep is only sold occasionally, especially during festive seasons and in emergency situations. The Kampala case study showed that the goat prices would rise sharply (up to 100%) during festive seasons. As for milk and eggs, meat is mainly sold at farm gate and to neighbours.

The Dar es Salaam case study and the Addis Ababa case study suggest that the current informal marketing strategies of poor urban livestock keepers could possibly be improved by forming market co-operatives for certain products, which would enable the poor to enter formal market channels. This would also contribute to a quality control and increased food safety of products, which currently does not exist.

2.3.6 Rural-urban linkages

It is often supposed that urban livestock systems are closely related to or dependent upon rural resources. Potential linkages with rural areas include the supply of livestock, feed resources and knowledge and information to urban areas. Interestingly, the case studies show clearly that this is not the case for poor urban livestock keepers in East Africa.

All the case studies conclude that livestock keepers are not recent migrants from rural areas. Most of the informants had been involved in urban livestock keeping for more than 10 years. This means that their rural linkages would have weakened and new urban linkages established.

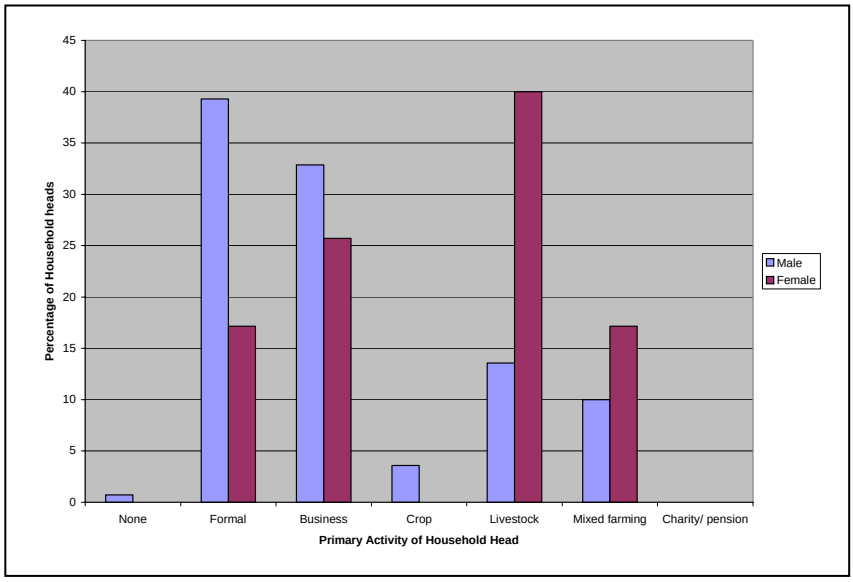
The livestock keepers pointed out that they are too poor to own land in rural areas and that additionally transport costs are too high to access rural feed resources. High transport costs will also limit selling manure to rural crop producers.

The case studies also conclude that livestock is not purchased directly from rural areas. Urban livestock markets account for the major source of livestock. An exception is reported from Kampala, where nearly 25% of the livestock keepers obtain their goats from relatives living in rural areas.

2.3.7 Gender aspects

The information obtained from the different case studies demonstrates that there are gender differences in urban livestock keeping. The Kampala case study showed that for women urban livestock keeping is a more important activity in terms of income generation. As women are also usually in charge of the provision of family food the contribution of urban livestock keeping to food security is more important for them. The case studies also point out that there is a tendency towards a higher workload for women and that child labour, especially girls, is common.

Figure 2 Relationship between sex of household and primary activity of household head in Kampala



In terms of livestock ownership there are also clear gender differences. Whereas men usually own improved breeds and larger livestock, women tent to keep local breeds and small livestock. Only the Nairobi case study reports shared ownership of livestock as common. Men also seem to dominate the decision making processes in terms of livestock management, especially when it comes to economic decisions like buying and selling livestock and products. Again this was different in Nairobi, where decision-making was shared between men and women.

There is not sufficient data available from the case studies or from other secondary sources to analyse the distribution of benefits obtained from urban livestock keeping within the family. This is however an important aspect which would require further investigation.

Female livestock keeper in Kisumu

2.4 Access to support services and information

A critical aspect for many poor urban livestock keepers is access to support services and information (Waters-Bayer, 1995). Although most of the government extension and veterinary services are based in urban areas, they mainly focus on rural agriculture or they do not address the issues faced by poor livestock keepers. In Kampala for instance nearly 60% of the livestock keepers interviewed rely on private veterinary services. However, the poor livestock keepers rank the cost of accessing private services and the cost of veterinary drugs as a major constraint. The case studies show that the majority of livestock keepers prioritise dairy cattle in terms of investing in veterinary services. A high proportion of the keepers vaccinate their dairy cattle, whilst vaccination of goats or chickens is rare. The prioritisation of cattle is also reflected in other service provisions. Organisations offer artificial insemination for improved cattle, credit schemes and extension services directed to intensive dairy production. In Kampala a few farmers obtain services from NGO's (e.g. Christian Children Fund) who provided a cow and free veterinary services to their beneficiaries for a period of one and a half years. Training courses, if available, also focus on dairy production and on commercial poultry production and not on subsistence goat or sheep rearing.

The Nairobi case study revealed that government institutions that work with poor livestock keepers do exist in theory. However, due to resource constraints they do not visit poor households and the majority of poor livestock keepers are unaware of their existence. Many of the poor farmers rely on veterinary pharmacies and the stockist's advice or on traditional remedies.

The major sources of information on livestock production are informal. Livestock keepers rank friends, neighbours and family as main information sources. Government extension and research institutions and printed materials ranked low. The case studies also show that the participation of poor urban livestock keepers in training courses and "urban field days" is very rare. This is due to the lack of organisation among the poor livestock keepers and their reluctance to approach official institutions.

Overall the case studies confirm that there are no organisations in place to represent the needs and aspirations of poor livestock keepers, and no institutions to promote their interests.

2.5 Policy issues

The legal situation in terms of urban livestock keeping ranges from illegal to tolerated. Although the general attitude towards urban agriculture and livestock keeping is changing and city councils are recognising the existence and potential of urban agriculture, the supporting legislation and its implementation is lagging behind. By-laws and regulations often date back to colonial times (Kironde 1992) and are excessive, unenforceable or inappropriate to local conditions. In Dar es Salaam, for instance, a by-law exists which allows a maximum of four cows per keeper. This number seems to be established without any objective foundations, nor are similar numbers in place for other livestock species. A general lack of policy coherence and

coordination has been pointed out by the Nairobi case study, where 5 different ministries are partly responsible for urban livestock keeping.

Land tenure issues are another potential and existing legal conflict. In Nairobi, for instance, many of the livestock keepers are squatters and are living in the slums under an illegal status. In the other cities, livestock keepers use public land for grazing and for dumping of animal waste without permission from the city authorities.

The majority of poor livestock keepers are not aware of the exiting legal frameworks and is also not involved in discussing future changes. Harassment of urban livestock keepers by city authorities continues to exist; however, it is the minority of keepers who are affected. This shows the lack of enforcement of the existing legal framework. Formulating new regulations without the necessary will and power to implement these regulations would thus be a useless exercise.

2.6 Health, environmental, and animal welfare issues

City authorities are concerned about pollution and public health problems caused by urban livestock. The existence and promotion of urban livestock keeping has been criticised as potentially dangerous for the urban population.

Generally farmers are unaware of the public health concerns associated with livestock keeping in confined areas and in close proximity to human beings. There is lack of information on potential health risks. The majority of poor urban livestock keepers only considered the flies and the strong odours as a nuisance. The case studies revealed that hygiene and disease control measures in handling and housing livestock are minimal.

Zoonoses is one important aspect to consider in urban livestock keeping. For example, anthrax, brucellosis, cysticercosis, trichinosis among others are reported to be transmitted from animals to humans through inappropriate management practices for urban pig farming (Santandreu *et al*. 2000). The use of poultry manure which is not stored for long enough to prevent the contamination of food crops (e.g. leafy vegetables) and water with pathogens (faecal coliforms) is reported from Kumasi (Drechsel, *et al* 2000).

A series of factors increase the risk of zoonoses including economic conditions (Mantovani 2000), which makes the poor urban livestock keepers more vulnerable as they are forced to keep livestock in close proximity to humans due to limited space. The Nairobi case study showed that over 30% of livestock are kept inside the keepers' house. Sanitation is poor in most of the slum areas. This means that scavenging livestock have easy access to human waste, which is particularly dangerous if pigs get in contact with it. Often children are involved in cleaning livestock shelters and animal waste disposal, which exposes them to disease.

Another potential health risk is the lack of product safety control. As most of the livestock products produced by poor livestock keepers are either directly consumed by the household members or sold through informal channels there is no control of product safety. For instance, the Kampala case study uncovered that the livestock

keepers are not aware of the importance of a time period between drug administration and consumption of livestock products.

Contamination of water sources through inappropriate livestock waste disposal is another problem which affects public health and the environment. As described in section 2.3.4 the dumping of animal waste in river, dams, etc. is a common practice; however, studies to show the scale and impact of these practises on water quality are lacking. Considering that water is one of the most scare resources for millions of poor people, there is an urgent need for action. Dust pollution especially for intensive poultry production (Ossiya *et al*. 2002; Lupala 2002) is another environmental concern.

Animal welfare issues include inadequate housing, crowding into small spaces, dampness and heat, injuries due to old harnesses for donkey transportation business are uncovered by the city case studies. Unaffordability of drugs and veterinary services and consumption of contaminated drinking water are causing poor animal health and have led to numerous deaths in livestock (Ishani *et al* 2002).

Goats and sheep roaming freely, Kibera, Nairobi. Mazingira Institute

3. Opportunities and constraints of urban livestock keeping

Livestock keeping for the urban poor takes place under challenging circumstances as we have seen from the foregoing description. Resources, such as space, capital and feed are limited and the institutional and legal environments appear to be unfavourable. However, the continuing existence and increasing importance of urban livestock keeping for the poor indicate that the positive aspects of urban livestock keeping outweigh the negative aspects.

The following ***key strengths*** have been identified from the city case studies:

- Market developments that could favour urban livestock production by the poor: the urbanisation process will lead to increasing demand for livestock products. The proximity to these markets is an advantage for the poor. The case studies indicate that urban commercial livestock enterprises become less competitive due to high input prices (imported feeds and animal drugs) as a result of liberalization and structural adjustment programmes.
- Higher return per unit land from livestock compared to crops: increasing demand for land in cities for housing favours urban livestock keeping as it requires less land and promises higher returns per unit land utilised.
- Flexibility in terms of land use: compared to urban crop production, livestock can be shifted easily to other urban areas as they become available.
- Use of existing resources: urban livestock keeping offers an opportunity to make use of household waste, agro-industrial by-products such as molasses and brewery residues, weed and grass from public lands and crop residues from markets and urban farmers.
- Provision of a social safety net for the poor: the different case studies show that especially vulnerable groups, such as female headed households, children, retired people, widows and people with limited formal education are involved in urban livestock keeping as a form of social security strategy.
- Multi-purpose activity: urban livestock keeping fits different livelihood strategies and contributes to food security, income and employment generation, saving and insurance. It provides easily convertible assets for covering important expenditures (school fees, health treatments).

Weaknesses and constraints which affect the present situation of urban livestock keeping are the following:

- Inappropriate waste management: there is strong evidence from all the case studies that animal waste disposal in its current form causes environmental and public health problems, which will become even more severe as urban livestock numbers increase.
- Water availability: at present urban livestock keeping competes for water resources with humans as the demand for water for this activity is not taken into account by the supply services. In many slum areas water has to be bought and therefore other water sources, which are often contaminated, are accessed for livestock.

- Poor livestock health and high cost of veterinary services: the case studies show that animal health is often poor due to inadequate husbandry practices. Poor livestock keepers seldom vaccinate their livestock, especially not smaller species such as goats, sheep and chickens. Due to the high cost of veterinary services and livestock drugs, treatment is sub-optimal.
- Feed availability and quality: feed availability is a particular constraint for larger livestock species such as cattle, which are usually zero-grazed. Feed quality is a problem for free-roaming livestock as there is no or very limited control over feed sources. The Nairobi case study shows that foraging at waste dumps is common in the slum areas.
- Low production level: due to limited feed availability, poor quality and poor management practices, the production level of livestock is generally low.
- Poor networking and organisation among the poor livestock keepers: poor livestock keepers are not organised and can therefore not express their demands in a concerted way.
- Lack of research and services provision: information access and adoption of improved technologies is limited for poor urban livestock keepers. This is made worse by the fact that existing services are not tailored to the needs and circumstances of the poor (e.g. extension services and training courses promote species which are less relevant for the poor).
- Limited knowledge of livestock husbandry practices: as information sources and advice services are lacking, poor livestock keepers often have limited knowledge of livestock husbandry practices.

Opportunities for the future development of urban livestock keeping for the poor are the following:

- Increasing recognition of the importance of urban livestock keeping by donors, NGOs and municipal authorities: in the five case study cities, there was evidence of an increased recognition of urban livestock keeping among different stakeholders. Municipal authorities have in most areas stopped harassing livestock keepers, NGO's have started to provide support through advisory services, and credit and extension services recognise urban livestock keepers as a potential target group.
- Potential of low cost/ high impact interventions: in Kampala and Nairobi, the case study authors conclude that there is an opportunity to achieve substantial impact through capacity development of poor livestock keepers as current production levels are constrained by poor management practices.
- Organisation and networking among poor urban livestock keepers to improve access to information and other services: urban livestock keepers are becoming more aware of the potential benefits of organisation and networking as a means to access information and services and improve marketing strategies.
- Market development: increasing urbanisation and hence demand for food products may have positive impacts on the development of urban livestock keeping.
- Improved animal waste management: available technologies for animal waste disposal (improved composting technologies and biogas production) provide an opportunity to improve current waste management practices. These have

ecological and economic benefits in addition to reducing public health problems.

- Improved urban/ rural linkages: the case studies conclude that current rural-urban linkages are weak or non-existent. However, there is an opportunity to improve these linkages for fodder production and animal waste disposal.

The following ***threats*** have been identified from the city case studies. Some of them do not only affect the urban livestock keepers directly but also represent threats for the general public.

- Increasing land shortage and continuous insecurity of land tenure: space is an increasing constraint in urban areas and as population numbers are raising the problem will increase. But it is not only a lack of land which threatens the successful development of urban livestock keeping, but also the absence of tenure systems which give the poor legal rights to land.
- Limited access to input capital: urban livestock keeping by the poor is carried out with a minimum of external inputs (feed concentrates, veterinary drugs, etc,). This is due to the lack of capital and credit services which provide facilities accessible for the poor.
- Product safety/ zoonoses: public health risks caused by unsafe products and zoonoses may lead to more restrictive legislation for urban livestock keeping
- Environmental contamination: increasing numbers of livestock and continuing inappropriate waste management strategies will lead to further deterioration of the urban environment.
- Lack of pro-poor policies: new legislation and policies may fail to address the specific needs and opportunities of poor livestock keepers.

4. Researchable issues and outlook

The aim of the scoping study was to understand the current situation of poor urban livestock keepers in 5 major East African cities, and identify areas where future research could make a contribution to the development and promotion of this activity. The case studies reveal that urban livestock keeping has significant benefits for the poor and provides a way of diversifying livelihoods activities that are accessible to vulnerable groups. Urban livestock keeping also provides a source of locally produced food, which improves the nutritional basis for livestock keeping households and people living in the vicinity.

The scoping study identified three major intervention areas that are important to address to achieve a more sustainable and pro-poor focused development of urban livestock keeping. The three areas are the following:

- Improved understanding and management of externalities caused by urban livestock keeping;
- Contribution to policy formulation and implementation through generation of policy relevant information; and
- Improved access to information and knowledge for urban livestock keepers to existing technologies and management practices through networking and organisation.

As cities are growing rapidly the number of poor people depending upon informal livelihood strategies is increasing, which suggests that urban livestock keeping will continue to expand. The scoping study reveals that various externalities such as environmental contamination, zoonoses, and lack of product safety are serious threats for the sustainable development of urban livestock keeping. Most affected by these externalities are, and will be, the poor who currently live in urban slums characterised by poor hygienic conditions and deteriorating sanitation services and water supply. However, the negative impacts and the related environmental and public costs resulting from these externalities will affect the city communities in general.

The existing evidence of the negative impacts caused by inappropriate livestock waste management on water resources and public health calls for a more detailed analysis of the problem. Inappropriate waste management leads to the contamination of already scarce water resources and threatens public health. A recent study conducted by Manase *et al* (2002) shows that in South Africa diarrhoea is endemic and kills 43,000 people each year and costs the country half a billion dollars in lost productivity. The consumption of unsafe water is one important cause for diarrhoea and affects mainly the poor who can't afford to purchase safe drinking water.

Related to the above is the existing and potential health risks to humans caused by the transmission of diseases from livestock. As Mantovani (2000) points out there are a range of local factors involved which may increase the risk of zoonoses and which will expose especially vulnerable groups such as children, pregnant women and poor people in general. Livestock product safety plays an important role for the transmission of diseases from animals to humans. The consumption of contaminated eggs, meat and milk products is a real problem, as poor livestock keepers produce and

process their products without quality control and often in environments which are conducive to contamination.

Research can play an important role to assess in more detail the current and potential impact these externalities have on urban people and their environment and to contribute to the development of strategies to overcome or minimise these. It is crucial to understand how these problems will develop with increasing livestock numbers and continuing urbanisation trends.

Specific research aspects include:

- Quantification of impact of current waste management practices on water resources,
- Identification of improved waste management technologies adapted to the specific circumstance of the poor,
- Intensification of urban/ peri-urban and rural linkages in terms of nutrient flows,
- Assessment of current and potential scales and impact of zoonoses, contributing factors and mitigation strategies,
- Development of effective and applicable food quality standards and quality control processes accessible for the poor,
- Policy related research on the legal status/legislative control of livestock keeping in East African cities.

A second intervention area is the development of policy relevant information that is needed to advise policy makers and city authorities on the above issues in order to provide guidance for the formulation of pro-poor urban livestock legislation. The scoping study shows that exiting legislation is outdated and does not take into account the situation faced by the poor. Two major aspects for future policy formulation are land distribution and water availability. Currently, policy makers and city planners do not take into account the demands of urban livestock keepers. This results in unfair competition for resources, over-use and conflicts between neighbours. Studies are needed which quantify the current and future land and water demand by urban livestock keeping. A participatory and multi-stakeholder approach is needed to identify potential land and water management strategies taking into account the specific situation of the poor. Unless policy makers and city planners learn to be more responsive to the needs, demands and interests of poor communities, urban environments are likely to become ever more unsanitary, unsafe and inhuman.

Manase *et al*. (2002) found that in Southern Africa the lack of coordination between government agencies combined with lack of clear policies and conflicting legislation contribute to the general failure to deliver services to the poor. In none of the three countries studied are the urban poor effectively represented. The structure, reporting systems and chains of command for local authorities are vertical and allow only limited community participation. Community based organisations (CBOs) are often regarded with suspicion, even when granted legal recognition.

These findings underline the importance of the third intervention area identified by the present scoping study. Poor urban livestock keepers are not represented by formal or informal organisations, which excludes them from effectively communicating their

demands and opinions. Furthermore they are marginalised from existing knowledge and improved technologies. There is a clear opportunity to improve the situation of poor urban livestock keepers and their management practices through capacity development and information sharing. However, in order to achieve this, organisation and networking among poor livestock keepers and other stakeholders is required to improve the access to services, information, technologies and markets. This can be encouraged through participatory action research processes, which brings together the different stakeholders involved.

Finally, there is a need to identify appropriate strategies to promote urban livestock keeping to other vulnerable groups who have not yet entered this activity. As a first step a participatory constraint and opportunity analysis with these vulnerable groups is required to identify the potential contribution urban livestock keeping could make to their livelihoods.

5. References

BAAH, J. (1994) Selection and evaluation of feedstuffs for urban and peri-urban small ruminant production systems in Ghana - a systems approach. Ph.D. Thesis. The University of British Columbia. Vancouver, British Columbia, Canada. pp. 140.

CBS (1999) Popular version of the first poverty report in Kenya, Government of Kenya. Nairobi. Central Bureau of Statistics and the Human Resources and Social Services Departments of the Office of the Vice-President and the Ministry of Planning and National Development

CENTRES, J.M. (1991) Améliorer l'approvisionnement de Bamako en produits maraichers et en protéines animales. 1. Agriculture et élevage à Bamako, Paris, France, GRET.

DRAKAKIS-SMITH, D. (1992) Strategies for meeting basic food needs in Harare. pp 258-283. In: *The Rural-Urban Interface in Africa: Expansion and Adaptation*. Scandinavian Institute of African Studies, Uppsala, Sweden.

DRECHSEL, P.; AMOAH, P.; COFIE, O. and ABAIDOO, R. (2000) Increasing use of poultry manure in Ghana. *Urban Agriculture Magazine,* **1** (2).

ELLIS, F. and SUMBERG, J. (1998) Food production, urban areas and policy responses. *World Development,* **26** (2): 213 -225.

FAO. (1995) Global issues in the supply of livestock food products to urban populations. In: *Supply of livestock products to rapidly expanding urban populations*, pp. 27-34. *Proceedings of the joint FAO/WAAP/KSAS symposium, 16-20 May 1995, Hoam Faculty Club, Seoul National University, Seoul.* Wilson, R.T. (Ed.)
Rome. 224 pp.

FREEMAN, D.B. (1991) A City of Farmers: Informal Urban Agriculture in the Open Spaces of Nairobi, Kenya. McGill-Queen's University Press, Montreal, Canada.

GEFU, J.O. (1992) Part-time farming as an urban survival strategy: a Nigerian case study. pp. 295 - 302. In: *The rural-urban interface in Africa: expansion and adaptation.* Baker J. and Pedersen, P.O. (Eds.) Scandinavian Institute of African Studies, Stockholm, Sweden.

ISHANI, Z.; GATHURU, P.K. and LAMBA, D. (2002) Scoping study of Urban and Peri-urban poor livestock keepers in Nairobi. Mazingira Institute, Nairobi, Kenya.

JAMAL, V. and WEEKS, J. (1988) The vanishing rural-urban gaps in sub-Saharan Africa. *International Labour Review,* **127** (3): 271-292

LEE-SMITH, D. and MEMON, P.A. (1994) Urban Agriculture in Kenya. In: *Cities Feeding People: An Examination of Urban Agriculture in East Africa,* IDRC, Ottawa, Kenya.

LEE-SMITH, D. and LAMBA, D. (1998) Urban Food, fuel and shelter. CPF 29 A, IDRC Report, Canada.

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

MANASE, G., MULENGA, M. and BEN FAWCETT (2002) Linking urban sanitation agencies with poor community needs: a study of Zambia, Zimbabwe and South Africa, ID21, DFID.

MANTOVANI, A. (2000) Veterinary urban hygiene in developing countries. *Urban Agriculture Magazine*,.**1**: (2).

MAXWELL, D.G. (1995) Alternative food security strategy: A household analysis of urban agriculture in Kampala. *World Development,* **23** (10): 1669 – 1681.

ONIM, M. (2002) Scoping study of urban and peri-urban livestock keepers in Kisumu City, Lagrotech, Kisumu, Kenya.

OSSIYA, S.: ISHAGI, N.; ALIGUMA, L. and AISU, C. (2002) Urban and Peri-urban livestock keeping in Kampala City – a scoping study, Ibaren Konsultants, Kampala, Uganda.

PCC POPULATION CRISIS COMMITTEE (1990) Cities: life in the world's 100 largest metropolitan areas. Washington DC. PCC

SANTANDREU, A., CASTRO, G. and RONCA, F. (2000) Urban pig farming in irregular settlements in Uruguay. *Urban Agriculture Magazine*, **1** (2).

SANYAL, B. (1985) Urban agriculture: who cultivates and why? A case study of Lusaka, Zambia. *Food and Nutrition Bulletin,* **3** (7): 197 – 207.

SANYAL, B. (1986) Urban Cultivation in East Africa: Peoples response to Urban Poverty. The Food Energy Nexus Programme, United Nations University, Paris, France.

SAWIO, C.J. (1994) Tanzania: who are the farmers of Dar es Salaam. In: *Cities Feeding People: An Examination of Urban Agriculture in East Africa.* IDRC, Ottawa, Canada.

SMITH, D.W. (1992) Urban food systems and the poor in developing countries.

SMITH, O. and OKOLULU, E. (1998) Peri-urban livestock systems. CPF 24, IDRC Report, Canada.

TEGEGNE, A.. SILESHI, Z., TADESSE, M., ALEMAYEHU, M. and WOLTEDJI, D. (2002) Scoping study on urban and peri-urban livestock keeping in Addis Ababa, ILRI, Ethiopia.

VAN DER BLIEK, J. (1992) Urban agriculture: possibilities for ecological agriculture in urban environments as a strategy for sustainable cities. Leusden, ETC, the Netherlands.

WATERS-BAYER, A. (1995) Living with livestock in town: urban animal husbandry and human welfare. Keynote paper presented at the Eighth International Conference of Institutions of Tropical Veterinary Medicine. Livestock Production and Diseases in the Tropics: Livestock Production and Human Welfare, 25-29 September 1995, Berlin, Germany. ETC Foundation, Leusden, the Netherlands.

YASMEEN, G. (2001) Urban Agriculture in India: A survey of expertise, capacities and recent experiences. CFP 32, IDRC Report, Canada.

UNCHS (1996) An Urbanising World, Global Report on Human Settlements. Oxford University Press, Oxford, UK.