Livestock keeping in and around cities is a practice that can be traced back to ancient times. The functions and forms of urban livestock have changed over time, and after decades of neglect, the roles of urban livestock are now being recognised again by urban officials. This chapter reviews the categorisations, relevance and logic of urban livestock keeping in past and modern society. It stresses that animals can be both a nuisance and a benefit, serving several direct and indirect functions in urban ecosystems, each with different priorities at household, city and national level.

‘For want of a nail the war was lost …’
ancient story

‘The city requires an awful lot of countryside to be able to breathe’
Geert Mak
Livestock keeping in urbanised areas, does history repeat itself?

Hans Schiere  
Eric Thys  
Francine Matthys  
Barbara Rischkowsky  
Jaap Schiere

Introduction

Livestock keeping has been and is important in and around ancient and modern cities (Waters Bayer, 1996; Schiere, 2001). It is but one form of urban agriculture, and it often occurs in integration with others such as urban horticulture. Animals were kept in biblical towns, in ancient and medieval cities of Europe, and in Mayan as well as Chinese civilisations. Horse-, camel- and/or bullock carts carried - and continue to carry - goods and armies. Many ‘modern’ cities still have ‘cow-streets’ and ‘hay-markets’ as remnants from times when livestock was part and parcel of urban life. Just 100 years ago, the city of Copenhagen fed cows with the ‘wastes’ of beer production, and rabbits thrived on London balconies in World War II whilst sheep “mowed” the lawns of Capitol Hill. Even today, slum dwellers get extra cash from backyard chickens, the urban elite keep pets, and urban livestock actually helps to remove organic wastes while being blamed for causing pollution. Strangely, the Victorian English were glad to see horses being replaced by cars because that would reduce the pollution (=horse dung). No doubt livestock keeping in urban conditions has its drawbacks, from being noisy and smelly, to causing serious pandemics such as SARS and illnesses such as tapeworm infections.

Urban livestock is now being (re)discovered by officials, research and development workers, but it exists regardless of official recognition. In many countries livestock or urban farming is an activity that does not have an official status. For example, officials of Mexico City denied the presence of pigs on roofs of apartment buildings until they found animals walking in the rubble in the aftermath of an earthquake that destroyed the buildings in the early eighties. When there is lack of official acknowledgement, research-, policy- and development agencies can neither address the risks, nor use the potential benefits of animal keeping in and around cities (box 12.1). In fact, livestock is often banned in countries where poor people depend on it for their livelihood. But also in wealthier places like Singapore, nuisance and pollution have been reasons for doing away with most forms of livestock keeping. Often, such bans are a reflection of a narrow view on the multiple functions of livestock.

This chapter reviews the categorisations, importance, opportunities and threats of urban livestock keeping around the world. In doing so, we support a livelihoods approach which stresses that a singular focus on food and/or income generation cannot do justice to the many functions of animals in society (Thys et al., 2006; or see the case of Sweden). The direct roles of livestock may be small but the indirect roles can be crucial, in socio-cultural and bio-physical aspects. Livestock keeping may fulfil crucial roles (see table 12.2), whether they can be quantified (income or physical health) or not (social networks and mental wellbeing). In addition to the livelihoods analysis, we stress the need for non-linear thinking that focuses...
on variation and similarity, as well as on inherent logic and necessity of urban livestock systems (Schiere, 2001). This chapter reviews short- and long-term action regarding livelihoods, public health, poverty reduction, CO₂ emissions and biodiversity. It also emphasises the need to address future priorities, and attempts to raise issues for discussion rather than to only settle disputes.

Box 12.1 Historical differences between continents (UNDP, 1996).

Urban agriculture in Asia was well established in the 19th century resulting in a tradition and recognition of benefits of recycling waste for agricultural uses. Up to date it is accepted as a normal urban function guaranteeing a continuity of development. Grazing of public land tends to be officially accepted, as most urban land use regulations based on Hindu and Muslim tradition allow livestock keeping in cities.

Urban agriculture in Africa also has traditional roots, but these did not fit into the image of urban space propagated by the colonial rulers in the 19th and early 20th century. This colonial image was taken over by other generations of public officials who undervalued and resisted urban agriculture until recently. In some African cities, eg, in Burkina Faso, livestock keeping is even illegal (Siegmund-Schultze et al., 1999). According to the law, the urban territory serves commerce, habitation, industry, handicrafts, public services, generally all activities related to urban life, and is not for keeping horses, cattle, donkeys, pigs, sheep, goats, etc.

In another part of the world, it was the American Indians in Latin America who managed highly developed, intensive agriculture systems which collapsed after the European takeover. Rapid urbanisation after the Second World War resulted in the re-emergence of urban agriculture in shanty towns. Large modern producers exist, but also small farmers use improved technology.

Importance and Categories of Urban Livestock Systems

The role of urban livestock is now recognised in many poor and wealthy countries. Although Box 12.2 and table 1 provide statistics that confirm the importance of urban livestock, there is more to it than data alone. Poor people tend to keep animals to cope with poverty, while wealthier sections of society justify the need for urban livestock to keep pets, and/or to secure a steady supply of animal produce. The functions and forms of urban livestock keeping vary, but we stress the need to look at variation and similarity. Variation is change (=development) in the forms and functions of urban livestock, as well as the recurrence of basic forms. In capturing this variation, we loosely characterise rather than strictly define urban livestock systems:

Urban livestock systems occur in a large variation of forms and functions, in and around densely populated areas, and they strongly interact with surrounding communities, poor as well as wealthy, at several levels of system hierarchy, as well as with rural areas.

This characterisation complements the one on urban areas by UNDP (1996):

Urban encompasses the entire area in which a city’s sphere of influence (social, ecological and economical), comes to bear daily and directly on the population.

Characterisation instead of definition reflects non-linear system thinking. It prefers to use surprise and change rather than average solutions and standard approaches. For example, in non-linear thinking livestock can be a labour opportunity for poor people, rather than being a problem in terms of labour demand for wealthier groups; animal excreta can be a resource rather than a waste; and animals can help to clean the city by removing garbage rather than cause disease by producing garbage. Strict definition cannot do justice to the
variation of systems - keeping of pets by urban elite, to industrial poultry keeping to goats in slums. Use of variation helps to see patterns that repeat themselves, which can be a basis to design classifications for useful discussion (Schiere, 2001; or see the case of Addis Ababa).

Some classifications use the difference between city-types, eg. between inner city and the outskirts, depending also on whether one considers relatively open or dense cities. It is indeed quite common to distinguish “rings”, eg. urban (inner city), urbanising (fringe), and more rural systems. Such rings as in figure 12.1 are useful notions, but they are neither static nor isolated from each other. They also occur at different levels within and between neighbourhoods. For example, a poor lady keeping backyard chickens may live next door to a wealthy merchant in an affluent area, wealthy people produce left overs in urban restaurants that help poor farmers keep animals, and a small city may actually be part of a larger one. Less common distinctions are based on scale and the use of fossil fuel energy (table 12.2 and figure 12.1). They relate to issues such as community resilience, resource flows, social structure or CO₂ emissions. The recent outbreaks of SARS and avian influenza may require distinctions based on health risks, eg. by being especially alert for systems where waterfowl and people interact closely.

<table>
<thead>
<tr>
<th>Per capita consumption (kg/yr.)</th>
<th>1985</th>
<th>1995</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Urban</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read meat</td>
<td>26.0</td>
<td>34.5</td>
</tr>
<tr>
<td>Poultry</td>
<td>3.0</td>
<td>7.8</td>
</tr>
<tr>
<td>Eggs</td>
<td>14.0</td>
<td>16.6</td>
</tr>
<tr>
<td>Milk products</td>
<td>14.0</td>
<td>15.1</td>
</tr>
<tr>
<td><strong>Rural</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read meat</td>
<td>9.8</td>
<td>12.8</td>
</tr>
<tr>
<td>Poultry</td>
<td>0.3</td>
<td>1.6</td>
</tr>
<tr>
<td>Eggs</td>
<td>5.6</td>
<td>5.8</td>
</tr>
<tr>
<td>Milk products</td>
<td>0.0</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Based on Bingsheng, 1998.
Figure 12.1 a and b System structure and aspects of control in different urban livestock systems

In Figure 12.1.a and b, the scale, system structure and aspects of (social) control in different urban livestock systems is presented. It aims to show variation and similarity, as well as different magnitudes of resource flows and cycles. The concentric circles in both graphs represent resp. inner city, urbanising area, peri-urban regions and the rural districts. Small scale livestock keeping (left side of the two semi-circles) tends to use small animals and small enterprises, as well as local recycling and -thus- little waste as represented by the small semi-cycles with arrow. In this case some young stock and feed is imported from the rural regions, but animal keeping takes place mostly at local level (within-city). The large-scale enterprises (right hand circles) tend to use larger animals and/or larger production units. Feed, young stock and even skills, medicine and fossil fuels are largely imported from the countryside in case of bulky roughage for ruminants, and from external sources in the case of more sophisticated feedstuff. Leftovers from large-scale agro-industry are processed. The inflow of resources from bottom and top right can be considered as part of a cycle, if waste is not disposed of into canals and drains. In all cases the resource flows of the larger animals and enterprises are of a larger magnitude than those of smaller animals / enterprises, generally requiring more prime quality feed and (fossil) energy for transport. They, therefore tend to be under control of larger businesses than the livestock systems with smaller scales and cycles as depicted in the picture on the left. These sketches are based on personal observation and generalisation.
Table 12.2 Categorisations of urban livestock systems

<table>
<thead>
<tr>
<th>Urban conditions</th>
<th>Type of enterprise</th>
<th>Production objective</th>
<th>Type of animals</th>
<th>Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Inner cities</td>
<td>- Subsistence</td>
<td>- food/income</td>
<td>- pigs</td>
<td>- producers</td>
</tr>
<tr>
<td>- Fringes</td>
<td>- semi (commercial)</td>
<td>- drought</td>
<td>- layers/broilers</td>
<td>- consumers</td>
</tr>
<tr>
<td>- Garden cities</td>
<td></td>
<td>- dung</td>
<td>- dairy-cows</td>
<td>- housewives</td>
</tr>
<tr>
<td>- ...</td>
<td></td>
<td>- status</td>
<td>- rabbits</td>
<td>- banks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- pleasure</td>
<td>- small ruminants</td>
<td>- neighbours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- ...</td>
<td>- ...</td>
<td>- ...</td>
</tr>
</tbody>
</table>

Based on UNDP, 1996; Waters Bayer, 1996; Schiere, 2001.
Note: dotted lines indicate that more patterns exist than shown here. Columns are divided by double lines since they are independent listings.
The fact that urban livestock continues to be found around the globe implies advantages for local “stakeholders” to embark on some form of urban livestock keeping. These advantages could be in one or more of factors such as food supply, income, emotion, tradition, savings, ecological functions (like scavenging) and social coherence, in spite of the nuisance of a noisy goat or a smelly pig. Singling out of one of these factors would most likely miss out the essence of urban livestock keeping and agriculture in general; but simple calculations may illustrate processes that repeatedly lead to similarities and differences of such systems. For example, a simple calculation during a lunch break in Nakuru (some 150 km. west of Nairobi) helped explain changing functions and forms of livestock keeping when approaching the city (table 12.4). This common sense reasoning in 1997 strongly resembles the ‘rings’ found by the German economist Von Thünen some 150 years ago. Such calculations show how forms and functions of livestock systems change based on environmental pressure and/or socio-cultural attitudes. They also illustrate system dynamics and often unnoticed movements of resources and animals from rural to (peri)-urban areas for fattening or milking, now referred to as urban-rural linkages. Flows of young animals to the city as illustrated in figure 12.1 are often accompanied - in the case of dairy- with a reverse flow of dry and barren animals that recover on the range and are brought back to the city again for higher yields with higher density feed. These are given the term “flying herds” in urban livestock jargon. Milk is a valuable product in the city, where it can be too expensive to rear young animals. But milk in distant regions cannot be sold well where it makes more sense to raise animals. And feeds fetch higher prices when fed to animals in cities than in rural areas. Similar reasons explain why large-scale hatcheries are established in the countryside, while the actual production of eggs takes place in peri-urban regions. Factors such as climate, disease pressure, local politics and labour costs may complicate these processes but not the general patterns. In short, urban animal keeping has its advantages and disadvantages, like everything else in real life (table 12.5).

### Table 12.3 Issues of scale and energy use

<table>
<thead>
<tr>
<th>Animal system</th>
<th>Scale</th>
<th>Energy use</th>
<th>Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Balcony/</td>
<td>Peri-</td>
<td>Rural</td>
</tr>
<tr>
<td></td>
<td>backyard</td>
<td>Urban</td>
<td></td>
</tr>
<tr>
<td>Rabbit keeping</td>
<td>++++</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>Backyard poultry</td>
<td>++++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial poultry</td>
<td>----</td>
<td>++++</td>
<td>++</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beef production</td>
<td>----</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Sheep and goat</td>
<td>+/-</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>keeping</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dairy</td>
<td>+</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>consumers</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In this table approximations are used based on common sense and are meant to stimulate rather than to freeze discussion.

Note 1: exception proves the rule; rabbits etc. can also be kept on the balcony as pets by wealthy urbanites.

Note 2: question marks imply uncertainty regarding this aspect due to local differences.

### Logic and Advantages of Urban Livestock Systems

The fact that urban livestock continues to be found around the globe implies advantages for local “stakeholders” to embark on some form of urban livestock keeping. These advantages could be in one or more of factors such as food supply, income, emotion, tradition, savings, ecological functions (like scavenging) and social coherence, in spite of the nuisance of a noisy goat or a smelly pig. Singling out of one of these factors would most likely miss out the essence of urban livestock keeping and agriculture in general; but simple calculations may illustrate processes that repeatedly lead to similarities and differences of such systems. For example, a simple calculation during a lunch break in Nakuru (some 150 km. west of Nairobi) helped explain changing functions and forms of livestock keeping when approaching the city (table 12.4). This common sense reasoning in 1997 strongly resembles the ‘rings’ found by the German economist Von Thünen some 150 years ago. Such calculations show how forms and functions of livestock systems change based on environmental pressure and/or socio-cultural attitudes. They also illustrate system dynamics and often unnoticed movements of resources and animals from rural to (peri)-urban areas for fattening or milking, now referred to as urban-rural linkages. Flows of young animals to the city as illustrated in figure 12.1 are often accompanied - in the case of dairy- with a reverse flow of dry and barren animals that recover on the range and are brought back to the city again for higher yields with higher density feed. These are given the term “flying herds” in urban livestock jargon. Milk is a valuable product in the city, where it can be too expensive to rear young animals. But milk in distant regions cannot be sold well where it makes more sense to raise animals. And feeds fetch higher prices when fed to animals in cities than in rural areas. Similar reasons explain why large-scale hatcheries are established in the countryside, while the actual production of eggs takes place in peri-urban regions. Factors such as climate, disease pressure, local politics and labour costs may complicate these processes but not the general patterns. In short, urban animal keeping has its advantages and disadvantages, like everything else in real life (table 12.5).
In fact, it is particularly the larger urban livestock systems that are linked to the rural areas and other urban systems, through exchange of inputs of feed, animals, labour, and outputs of cash for extended families in the rural areas or manure for vegetable farming (see figure 12.1). The resource flows from city to rural areas and vice versa are seen in West Africa where a part of Fulani families settle in the cities and keep high milking cows to sell the milk, while the main part of the herd is kept by other family members under pastoral production conditions. Dairy farmers in the Pakistani Punjab buy the best cows in rural areas soon after calving and keep them in cities to get high prices for the buffalo milk on the urban market (Seré and Neidhardt, 1994). Traders of forage in Maroua/ Cameroon tend to be farmers from the surrounding rural areas at a maximum distance of 40 km. In other words, the logic of urban livestock keeping is based on the positive roles of livestock in urban and rural areas.

**Table 12.4 Forms, functions, interrelationships and problems in dairy production systems**

<table>
<thead>
<tr>
<th>distance to the city</th>
<th>&lt;3 km (&lt;2km)</th>
<th>3-10 km (4km)</th>
<th>10-30km (15km)</th>
<th>Beyond 50km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of concentrate</td>
<td>12 (14)</td>
<td>15 (14)</td>
<td>18 (15)</td>
<td>Not available</td>
</tr>
<tr>
<td>Price of milk</td>
<td>18 (10)</td>
<td>15 (9)</td>
<td>12 (8-9)</td>
<td>Not marketable</td>
</tr>
<tr>
<td>Milk yield at peak (l/day)</td>
<td>&gt;20 (7.9)</td>
<td>Around 20 (5.7)</td>
<td>Around 10 (4)</td>
<td>5 to 10</td>
</tr>
<tr>
<td>Ratio concentrate/ grass</td>
<td>High</td>
<td>High/medium</td>
<td>Low</td>
<td>Very low</td>
</tr>
<tr>
<td>Type of keeping</td>
<td>Stall-feeding</td>
<td>Stall/grazing</td>
<td>Grazing/stall</td>
<td>Grazing/herding</td>
</tr>
<tr>
<td>Environmental problems</td>
<td>Dung disposal</td>
<td>??</td>
<td>damage to crops</td>
<td>Overgrazing</td>
</tr>
<tr>
<td>Public health hazard</td>
<td>Flies/parasites</td>
<td>Flies/parasites</td>
<td>??</td>
<td>??</td>
</tr>
<tr>
<td>Main production goals (=functions)</td>
<td>Cash/milk</td>
<td>Income/milk security/asset</td>
<td>milk for home/dung/income security/asset</td>
<td>tradition/calves income/milk for home</td>
</tr>
<tr>
<td>Milk market</td>
<td>Direct</td>
<td>Private vendor</td>
<td>Co-operative</td>
<td>Absent</td>
</tr>
<tr>
<td>Resources from other zones</td>
<td>Lactating cows, grains</td>
<td>Lactating cows, breeding stock</td>
<td>breeding stock</td>
<td>Dry cows</td>
</tr>
<tr>
<td>Resources to other zones</td>
<td>Dry cows</td>
<td>Dry cows</td>
<td>calves, lactating cows</td>
<td>calves, lactating cows</td>
</tr>
</tbody>
</table>

This table is based on a case from Nakuru (Kenya; prices in KSh/kg). The assumption is that 1 kg concentrate feed yields 1.5 kg of milk. In the first column (close to city) it makes sense to feed concentrates for milk, while it makes no sense to do so in areas far from the city. The row “milk market” comes from data collected at Pondicherry (India), as are the prices and yields between brackets (Ramkumar, pers. comm., 2004)
Table 12.5 Potentially positive and/or negative aspects of animal keeping.

<table>
<thead>
<tr>
<th>Positive (or negative)</th>
<th>Negative (or positive)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- produce (healthy) food</td>
<td>- dung and urine disposal problems</td>
</tr>
<tr>
<td>- use waste / clean or scavenge the</td>
<td>- disease risk</td>
</tr>
<tr>
<td>environment</td>
<td>- theft</td>
</tr>
<tr>
<td>- provide income and emotional value</td>
<td>- zoonoses / hygiene</td>
</tr>
<tr>
<td>- status, savings, tradition</td>
<td>- nuisance</td>
</tr>
<tr>
<td>- dung for garden</td>
<td>- much work</td>
</tr>
<tr>
<td>- draught</td>
<td></td>
</tr>
</tbody>
</table>

The list does not give absolute “values”, it leaves final value-judgements on positive / negative aspects to local context and stakeholders’ opinions, and in that sense some issues occur in both the left and right hand column.

Figure 12.2 Movement of sheep from the countryside to Dakar (Senegal)

This is from low to high energy density feed areas, and from producer to consumer (Diaw et al., 1999)

Disadvantages of Urban Livestock

Urban livestock keeping has its advantages, but also its disadvantages. Non-linear system thinking and common sense accept such trade-offs as a fact of life. But mainstream thinking tends to exclude livestock from cities almost across the board, e.g. due to notions of backwardness and risks associated with keeping livestock such as disease and nuisance. A complicating matter is that (in non-linear thinking) a disadvantage in one place can be an advantage elsewhere or for someone else. And indeed urban livestock does have its drawbacks, perhaps more than urban horticulture (see chapter 11). Some disadvantages threaten the general public, e.g. in the case of SARS and avian influenza. Others are just a nuisance, as is the noise of a goat (in spite of so many other noises in the city), smell, dust, flies (what about rats appearing if garbage is left uneaten by livestock), damage to gardens (ignore damage by cars or house builders to trees and plants), or a notion of backwardness implied in
urban livestock keeping (wealthy people like to show off with horses or exotic birds). Table 12.5 lists advantages and disadvantages, which depend on stakeholders’ priorities and conditions.

Following up on the earlier categorisations and rings of urban systems it is safe to say that problems of urban livestock increase with high concentrations of animals and people, particularly in unhygienic urban environments. Animals near homes and workplaces may be a nuisance to neighbours (odour, noise), clog sewage systems, cause traffic problems and/or contaminate water sources (UNDP, 1996). Pollution can be high in systems based on imported feed (the rich systems), not in the “poor” systems where animals serve to clean the environment by scavenging and eating leftovers. Animals may also cause disease and inequality by increasing the workload of women and children, while at the same time contributing to their independence and health by providing essential nutrients or savings. Such contradictions are the core of what we call a “surprise” in non-linear system thinking and form the basis on which we stress the need for tailor-made solutions and useful categorisations. Participatory technology development gains favour around the world because it helps find local solutions for local problems, also in urban livestock keeping. And last but not least, it is the disadvantages that harbour opportunities, if properly addressed.

Critical Issues and Opportunities for Short and Long Term

Much is now documented on technical and socio-cultural aspects of urban farming and livestock keeping and major issues are summarized in table 12.6. Issues of short term-, farm- and society-level actions are covered in journals and books, in the other cases of this section, in the RUAF journal, in Schiere & Van Der Hoek (2001) and in handbooks and practical literature on backyard animals. Many practical cases of urban livestock are also known, e.g. as described for poultry and dairy in Eastern Africa by Sumberg (1998/1999) or by Tegegne (see the case on Addis Ababa), or on small ruminants in the USA (see box 12.3 by Bellows, et al., 2000).

We therefore chose to address issues other than dung disposal or hygienic food preparation when discussing the future of urban livestock keeping. These ‘other’ issues are not more important than farm-level work, but they tend to get lost in the rush of the day and short-term solutions. And they do need policy back up, whether in poor or wealthy countries. By and large they are:

- global concerns regarding food security, poverty, energy use, CO₂ and biodiversity
- public health hazards from SARS to parasite infections and hidden issues of community ‘health’ like social cohesion and resilience.
- the need for flexible public administration and the notion of tailor-made solutions

The challenge is to provide new vistas for work with urban livestock, and one should not justify urban livestock because one happens to like it, or because it happens to exist. The future of good urban livestock keeping practices lies in the analysis of how and why it occurs, and on how or why it could be of use in the future. Some arguments overlap with those for urban agriculture in general, but livestock has its own issues such as dung and noise over pesticides and herbicides, or avian influenza over weeding and pruning.
CHAPTER 12: LIVESTOCK

Work on urban livestock can be justified or criticised on many grounds, but an important set of arguments, concerns and obligations are contained in the international conventions such as Rio (biodiversity), Kyoto (on CO₂) and Johannesburg (food security and poverty alleviation). Put together, these obligations are painful, contradictory and inherently hard or impossible to fulfil. For example, how can the need for lowering CO₂ emissions be reconciled with the political urgency of creating jobs and increasing consumer spending? And how can notions to stimulate industrial animal production to supply increasingly wealthy urban consumers with animal proteins be reconciled with the approach of poor urban producers to consider animals as scavengers. Much of what follows in this chapter focuses on the keeping of livestock by the poorer sections of people in urban areas, focusing on small-scale systems with mostly small animals in slums and backyards, in balconies and on rooftops, as well as on larger animals in peri urban regions. Industrial systems require their own approach, but that discussion is beyond this chapter, in spite of the useful lessons that different systems can learn from each other, e.g. regarding notions of multi-functionality (livelihood-analysis!), small-scale gardening or recycling, and re-establishing links between consumers and the countryside.

The above mentioned international conventions offer good arguments, particularly for keeping of smaller animals and related enterprises, for example:

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**Box 12.3 Urban Livestock in the USA (based on Bellows et al, 2000)**

Urban livestock keeping in the USA is an activity that is hardly known and poorly regulated. Keeping animals in the city has multiple meanings for those involved and can be economic, cultural or religious. Successive waves of immigrants to cities in the USA from all over the world, as well as rural migrants from within the country, have brought with them the knowledge and practices of keeping rabbits, chickens, and occasionally goats and other animals for domestic use.

Livestock in the city is kept under diverse legal, illegal, and quasi-legal conditions. Since many of the livestock keepers tend not to be part of the dominant culture, issues of invisibility, distrust, and/or animosity between regulators and practitioners of urban livestock are occurring. This is founded more in the lack of attention paid by policy makers to food systems and food security in and around cities.

The following are opportunities and barriers to urban livestock keeping in the USA

**Barriers**
- Little known, unknown, and/or illegal experience on which no information is available
- Disparate and un-coordinated legal codes at municipal level on urban livestock keeping
- Space restrictions
- Inadequate knowledge and/or unsafe (eg. unsanitary) practices
- Cultural resistance to raising animals for food and other economic purposes
- Often practised by marginalised groups and regulated by elite groups.

**Opportunities**
- Survives because of economic need, cultural endurance, and social resistance
- Produces fresher and tastier meat
- Experiences brought by immigrant and rural migrant communities
- Local dialogue between practitioners and regulators can proceed in tandem with new development international level
- Species for small areas like fish, guinea pigs, rabbits, and chickens incomplete
- Technical training; workshops; community engagement in urban livestock
- Community-wide food systems education
- Community dialogue on food security needs

**Food security and poverty, energy and CO₂, biodiversity and scale**

Work on urban livestock can be justified or criticised on many grounds, but an important set of arguments, concerns and obligations are contained in the international conventions such as Rio (biodiversity), Kyoto (on CO₂) and Johannesburg (food security and poverty alleviation). Put together, these obligations are painful, contradictory and inherently hard or impossible to fulfil. For example, how can the need for lowering CO₂ emissions be reconciled with the political urgency of creating jobs and increasing consumer spending? And how can notions to stimulate industrial animal production to supply increasingly wealthy urban consumers with animal proteins be reconciled with the approach of poor urban producers to consider animals as scavengers. Much of what follows in this chapter focuses on the keeping of livestock by the poorer sections of people in urban areas, focusing on small-scale systems with mostly small animals in slums and backyards, in balconies and on rooftops, as well as on larger animals in peri urban regions. Industrial systems require their own approach, but that discussion is beyond this chapter, in spite of the useful lessons that different systems can learn from each other, e.g. regarding notions of multi-functionality (livelihood-analysis!), small-scale gardening or recycling, and re-establishing links between consumers and the countryside.
- food security is served both by the actual supplies of nutrients and income, as stressed by the use of livelihood approaches. A focus on food-output by industrial systems overlooks significant roles of small urban livestock in terms of scavenging, and of producing local food where needed and affordable, thus supporting community resilience.
- small and diverse animal production systems fit well in notions to enhance local (bio)-diversity. If well done, small scale urban agriculture can be a seedbed of diversity, in terms of ingenuity as well as resilience. The associated notion of “requisite variety” as it is called in academic terms, implies that systems need a variation of organisms [and sectors] to clean its waste, thus potentially increasing local hygine.
- small scales tend to depend less on fossil energy than larger scales, eg. by requiring less transport, refrigeration and packaging, and may also better use local leftovers.

One study of food systems in the UK showed that a meal from imported ingredients generates nearly 650 times the transport and related CO2 emissions than when made from the same but locally-grown ingredients (Halweil, 2002).

Table 12.6 Areas for further work on a rather short-term and local scale

<table>
<thead>
<tr>
<th>Main category</th>
<th>Sub-topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketing and input supply</td>
<td>Marketing strategies; pricing; information systems/ seed supply; young stock</td>
</tr>
<tr>
<td>Urban planning / land use management, incl. use of temporarily vacant plots</td>
<td>Land tenure, land-use and evaluation, decentralised urban development, intensification, forest and cities</td>
</tr>
<tr>
<td>Water &amp; waste management; urban environment; public health</td>
<td>Waste water conservation, irrigation technologies, public health indicators, waste management, integrated pest management, organic farming, compost, recycling</td>
</tr>
<tr>
<td>Diversification of crop-livestock systems</td>
<td>Animal health, small ruminants, micro-livestock, fattening, diversification, rabbits and backyard chickens (or even snails and worms)</td>
</tr>
<tr>
<td>Feed resources / strategies</td>
<td>Crop-residue management, pesticide residues on feed, feed conservation and storage, ration formulation, post-harvest techniques and processing, alley cropping, fodder legumes</td>
</tr>
</tbody>
</table>

Note: prepared during a workshop on urban livestock in West Africa (ITC, The Gambia) in January 2005. They are mainly technical. The sub-topics were listed by participants, and clustered by Okike and Kofi.

Studies on the value of urban livestock for food alone is of little value or even misleading, as are more detailed studies on purely the numerical importance of livestock without speciation of categories, relations and multifunctionality. Studying the roles of livestock with livelihoods analysis can provide new clues for planners and policy makers. Work on issues like feeding of particular by-products is likely to be “more of the same” and is probably better done [in cooperation] with ‘farmers’ themselves who are the best location-specific experts. The future of urban livestock keeping depends on a better understanding of underlying issues such as food security, poverty alleviation, resource use efficiency, and trade-offs between these.
Public health and emerging zoonotic diseases

Disease risks of urban livestock systems are likely to need much more attention in the near future. This should, however, be a reorientation towards a more holistic focus on social issues and system specificity, moving away from a single focus on disease as a clinical issue. Recent cases of SARS and avian influenza in densely populated areas of Asia have made zoonoses a major concern in public health (Aldhous, 2005). Indeed, the combination of high densities of people and animals in the same location can increase the risk of disease, but is not true that industrial animal production necessarily increases these risks. Poor hygiene and a lot of direct contact between people and animals can have the same high risks. Disease is transmitted from animals to people in many ways, by direct contact and also through consumption of animal products. Some of this can also lead to epidemics and transmission from humans to humans, e.g. in the case of yellow fever (Van Der Stuyft et al., 1999). Human health inextricably links to animal health and production, where animals play an important cultural and socio-economic role (WHO, 1999). Urbanisation causes changes in behaviour of humans in food purchases or contact with animals and pets and increases risks for spread of zoonotic diseases in poor hygienic conditions.

Zoonoses can be distinguished into viral (rabies, SARS, avian influenza), bacterial (e.g. tuberculosis, brucellosis) and parasitic (e.g. cysticercosis and tapeworms) forms. Some viral forms, e.g. rabies and avian influenza, are the result of direct contact between animals and humans. But others zoonoses such as yellow fever, plague or trypanosomiasis have animal carriers and are transmitted from animals to humans by mosquitoes, fleas and/or flies. Parasitic diseases could be tapeworm related as in hydatidosis and human neuro-cysticercosis (Van t’Hooft, 2000). Brucellosis and tuberculosis are linked to increased dairy production in the urban and peri-urban context, inadequate milk processing and uncontrolled market chains (Muchaal, 2001). Recently, Traoré et al. (2004) reported 13 percent brucellosis and 28 percent tuberculosis among intra-urban dairy cattle in Ouagadougou (Burkina Faso), but little is known on numbers of human cases of tuberculosis caused by Mycobacterium bovis. Also, tuberculosis is an opportunistic infection in HIV+ persons in sub-Saharan Africa. M. bovis may also become opportunistic in HIV infected populations, as happens with zoonoses such as listeriosis.

Food-borne zoonotic diseases also become more important due to a higher demand for meat by a growing urban population. Poor slaughter hygiene can lead to contamination of carcasses, and larger scales can increase risks of mass-transmission diseases. Drinking water and vegetables contaminated with slaughterhouse wastewater can transmit pathogenic agents such as Salmonella sp., Campylobacter sp., and Escherichia coli producing toxins (Pal et al., 1999). Food that is poorly preserved in refrigerators due to frequent power cuts may amplify the problem of food contamination. These diseases, with the exception of toxin poisoning, can be transmitted from person to person, but little is known on the importance of these diseases. For example, diarrhoea is frequent and therefore considered rather banal in many countries, i.e., the causes are rarely investigated. In the early stages of the production process, contamination of feed with infected faeces (e.g. Salmonella) can lead to infection in animals. Animal products can further contain residues of antibiotics or pesticides, and allergens from livestock waste or dust can cause occupational diseases in farm workers and proximity diseases in neighbours (McBride, 1998).

Guinea Pig (Cuy) breeding in Lima, Peru. The materials needed are cheap and locally available.
The growing trend of health problems relates in part to the inadequacy and deterioration of public health and veterinary infrastructure in poor countries (WHO, 1999). For example, Coulibaly and Yameogo (2000) reported a lack of collaboration between public health and animal production services in controlling zoonosis in Burkina Faso. Currently veterinary services in many cities of developing countries seem more concerned by rabies and eradication of stray dogs (Meslin et al., 1996). On the other hand, the prohibitive costs of private or state veterinary services make smallholders reluctant to ask for help, and more so because they tend to be part of an informal or even clandestine sector. In addition, there are often no adequate testing facilities, farmers can easily evade the public health systems and many are unaware of the public health risks associated with keeping of animals in proximity to human populations (UNDP, 1996; Guendel, 2002).

In spite of all this, not much research has been up to now in comparing the specific risks of urban to rural livestock keeping. Real risks do exist, depending on the location (rural, peri-urban, inner city), the kind of livestock and the way they are kept. A survey among African experts from 27 West and Central African cities showed that only 43 percent of them had heard of diseases transmitted to humans from animals in urban contexts, but not all these cases were confirmed (Thys & Geerts, 2002). Protective frameworks are required to deal with the upward trends in disease occurrence due to increasing population pressure and densities and the multidimensionality of health. Intensification of animal production in and around cities combined with changing food habits make food safety a priority issue. Climate change coupled with increased population density can favour the further spread of vectors and diseases (Wittmann & Baylis, 2000; Ungchusak, 2005; Aldhous, 2005). In this context, there is a grave risk in paying too much attention to politically-sensitive diseases as SARS that divert interest away from more fatal disorders. Municipal, veterinary and public health services should work together and search for newer approaches because of the relations between human and animal health, and the socio-economic importance of animal production especially for the poorer people in the city.

**Public administration and policy**

The final ‘higher-level issue’ addressed in this chapter is the thinking about public policy, and the need for paradigm shifts. Steps are needed to move away from thinking in standard / linear solutions to one aspect (eg. to cure disease) toward approaches that consider combinations of factors (disease, population density, community organisation), multiple functions as stressed in livelihoods analysis, differences between communities, and surprise and tension due to different perceptions in participatory approaches. A few of the points that could be considered are that:

- it may be better to accept and regulate (in a non-linear way), than to ignore a sector that clearly fulfils a need of urban inhabitants. An example could be the provision of official status for selected forms of urban livestock keeping, particularly in urban zones where it is now illegal (see box 12.4). Possible systems are (cleanly kept) small animals such as rabbits, guinea pigs and small fowl on balconies and goats, sheep or even larger animals in the peri-urban areas. Waterfowl are a type of animal to be wary of with respect to avian influenza.
- educators, administrators and policy makers are key to rediscovering opportunities of urban livestock. Educators can teach hygiene and good forms of

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**Traditional Cisticercosis control at a weekly market in Bolivia**

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- educators, administrators and policy makers are key to rediscovering opportunities of urban livestock. Educators can teach hygiene and good forms of

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urban livestock (Arias, 2002). Administrators may start by considering the differences between regions and the wealth of communities when addressing problems and opportunities. Policies that ban livestock can be enforced in affluent places like Singapore but they often promote illegal livestock keeping with associated problems of public health.

**Box 12.4 Legislation for urban livestock keeping in Burkina Faso**

The "decree" on the reorganisation of agriculture and land tenure of 1991 (KITI N°AN VIII-0328 Ter/FP/PLAN-COOP from 4th June 1991) indicates two categories of land: urban and rural (article 83). Accordingly, the urban territory serves habitation, commerce, industry, handicraft, public services and all activities related to urban life in general (article 84). This is further specified in another article (no 134) that concerns land reserved for habitation: "Keeping horses, cattle, donkeys, pigs, sheep, goats, etc. is forbidden in the urban centres." A note at the end explains that any exception to this rule needs authorisation from the respective authority. If animals are found scavenging in the streets with no one looking after them, the city representatives in conformity with a resolution of the community may seize the animals and impose a fine to release the animals to the owner (n°002/PHUE/CB from 29th of June 1995).

- innovative and generally participatory work is needed to show impact and sustainability.
- creative use of public statistics and record keeping can help to give urban livestock the status that it deserves. Too much focus on numbers can divert attention from the insights into how urban systems evolve.
- reassessment of national development plans is required. Many such plans invest public money in cheap feed and tax-holidays for investors and to ensure a supply of cheap animal products, while at the same time causing costs to society in terms of pollution, use of water and oil, and shifting food waste into landfills rather than to be recycled.

Fortunately, there is increasing awareness on the opportunities of urban livestock for poverty alleviation and food production. Several African governments even officially support urban agriculture now, eg. in cities of Mozambique, Zambia and Tanzania.

Reasons for this may be opportunistic, eg. Page (2002) argued that the government of Cameroon started to support urban agriculture as a safety valve for social unrest that was expected after salary cuts were announced for civil servants. Whether due to opportunistic politics or to enlightened individuals, change is possible.

**Urban Livestock and the City of the Future, Concluding Comments**

The final (and linear) question here is about our vision for the ideal city of the future. But, cities change over time, and perceptions of ideals differ among stakeholders. Most urban livestock keeping occurs in places of poverty, and in unsafe and unhealthy conditions. Livestock keeping in such places is a way to make the best out of the worst, rather than to perfect urban life as a stairway to paradise. In contrast, for the urban elite, the keeping of animals refers to pets, education, feeling good (case Ledin), getting tax benefits or hiding black money. In between these extremes are systems that have evolved out of a demand for fresh products, e.g. the case of milk described in the case on Addis Ababa. The obvious non-linear answer to the linear question is that there is no such concept as an ideal city or an ideal system of urban livestock keeping. Sketches of an ideal can nevertheless be useful, depending on the present and the thinking for the future. Such sketches include visions that consider cities as potential gardens and Utopia (box 12.5), or have utilitarian notions as found with Le Corbusier, i.e. considering cities as a good place for cheap labour to serve the economy, a step toward Utopia but at a different level.
Possible forms of future cities are suggested in the boxes, cases and literature of this section. Our ‘ideal’ would be a city (as a first Utopia) that is open-spaced, cooled by plants and shaded by constructions. Such a city should encourage citizens to experiment on small scale, exercising local control on major problems. Smaller livestock could play a good role in such systems. We know this will be hard to achieve, but one could, still aim for a city to incorporate aspects of urban agriculture where specific forms of livestock serve the combined roles of scavenger, pet, savings account, social activator, source of ingenuity and buffer, to name a few. Common sense can help to paint the outline, but more study is required to effectively address issues such as those raised in the global forums of Rio, Johannesburg and Kyoto. Such study should help policymakers to get to grips with ways to facilitate on-the-ground action to obtain more consistent results. Technical aspects of livestock production are sufficiently widespread to get started on the ground and/or to continue what is being done even without official recognition. Most of the issues need to be solved at farm level.

Unfortunately, many “ideal” dreams belong to contexts that are far from ideal, often miserable urban conditions around the world. Urban livestock can provide small but crucial options for the poor, while it is often the wealthy and powerful who manage the large industrial enterprises which have their own problems of pollution and resource use. Livestock keeping by the poor is likely to continue in crevices, with animals being fed on what is leftover. At the same time and as is typical of non-linearity, it might be a crucial weakness and strength of urban livestock to function as a scavenger while providing food and livelihoods for the poor and the wealthy. A main weakness and strength in this respect is the multi-functionality of scavenging-animals that cannot produce enough food for entire urban populations, but that serve more than one goal at one time. These functions are hard to administer by conventional thinking in public sectors, but it is there perhaps where programmes for urban livestock keeping need to turn their attention to, and where most gains can be made. Even rich societies might re-discover the benefits such as education or local employment, to re-establish links between consumers and producers, short cycles for energy and resource saving, and flexible rules combined with alertness for critical issues such as SARS or Avian Influenza (see box 12.6).

Keeping of animals has always been part of the city, and a link between the countryside and cities. Its potentials are slowly being rediscovered, while related issues require attention at farm as well as ‘higher’ levels. Urban livestock keeping is back on political agendas thanks to the efforts of pioneering women and men in slums, offices and the academia who see the advantages of this form of urban agriculture, in spite of inevitable drawbacks.
**Acknowledgements**

Particular thanks are due to Ramkumar from Pondicherry (India) and Okike from Western Africa for their valuable suggestions and comments to the first draft. Thanks are also due to the main editor (René van Veenhuizen) for his patience and constructive comments.

**References**


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**Box 12.6 Supporting Endogenous Livestock Development (ELD): An alternative vision of livestock development for the poor**

The ELD initiative was born out of the concern that, in spite of renewed interest in livestock, the international debate did not seem to be leading to truly innovative approaches that could effectively support the poorest livestock-dependent peoples in the world. The ELD approach seeks to support poor and marginalised livestock-keeping communities, and has been developed by a group of people involved in various international networks related to livestock and poverty.

There is a need to focus specifically on the role of livestock from a people-centred perspective, based on the livelihoods and strategies of livestock keeping peoples themselves. This implies maintaining the multi-functionality of livestock, as well as focusing on the equilibrium between crop and animal agriculture. The bias towards crops that prevails within government policies, production subsidies, education and research, has often led to poor understanding of the livestock component. Though initiated on the basis of experiences in poorer regions of developing countries, Endogenous Livestock Development may have a role to play in more developed regions and countries as well.

The objectives of the ELD initiative are:

- Creating a global umbrella for exchange, collaboration and networking
- Deepening the understanding and implications of people-based livestock development
- Stimulating field-based ELD initiatives
- Influencing livestock policies, research and education

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Urban and peri-urban dairy production systems are among the many forms of dairy production systems in the tropics and sub-tropics. These systems involve the production, processing and marketing of milk and milk products to consumers in urban centres (Rey et al., 1993; Staal and Shapiro, 1996). Urban and peri-urban dairy production systems have evolved in response to the increasing demand for milk in urban centres as a consequence of increasing urbanisation, rising per capita income and increasing costs of imported milk and milk products. They contribute to overall development through income and employment generation, food security, asset accumulation, poverty alleviation and improving human nutrition and health.

The development and sustainability of urban and peri-urban dairy production systems requires a relatively large initial investment and long-term commitment. In addition, the major technical and non-technical constraints associated with these dairy production systems such as the availability and cost of genetic materials, breeding systems, feed resources, feeding systems, animal health, processing, marketing, public health, waste handling, management, and policy issues need to be addressed. In this case study, the characteristics of the production systems, feed resources and feeding systems, genetic resources and breeding systems in urban and peri-urban dairy production in Ethiopia are assessed.

A study on market-oriented urban and peri-urban dairy production systems in Addis Ababa was undertaken to characterise general dairy systems and specific sub-systems and to identify major constraints. A total of 147 dairy farms (market-oriented smallholder and commercial) were selected for characterisation, and 49 farms were used for a further detailed study.

**Production Systems**

Seven, market-oriented, dairy production sub-systems were characterised. The ‘milk shed’ approach considered systems that supply fluid milk to the city. Both rural and urban systems develop in a dynamic way and shifts between them occur. All these systems are basically market driven due to the large urban demand for milk. In fact they have developed in response to the market demand and have emerged depending on available resources (land, labour, feed, capital, etc).

*Traditional crop/livestock farms in rural areas:* These farms are located between 25 and 130 km from Addis Ababa, the average distance being 68 km from the capital. They are small farms with an average of four dairy cows, and provide very little or no specialised inputs (new breeds, supplementary feed, housing, veterinary care, etc) to their dairy enterprise. They sell fresh milk on a daily basis to the government-owned Dairy Development Enterprise.
Excess milk is processed into butter and a local cottage cheese (known as *Ayib*) and sold at local markets.

**Intensified dairy/crop livestock farms:** These are smallholder farms located around Addis Ababa and exercise some form of intensive dairying. These farms have had experiences with dairy development projects under the Ministry of Agriculture. Projects such as the Selale Dairy Development Project and the Smallholder Dairy Development Project have been operational in these areas and have influenced the production system on these farms. New genotypes, artificial insemination, improved forages, concentrate feeding, housing, calf bucket feeding and early weaning are common practices used by farmers. Compared to the traditional crop/livestock farmers, the land holding in this category is about half the size and milk production is 15 percent higher, but the number of cows per household is similar.

**Crop/livestock farms with intensive cropping:** These farms are located relatively closer to Addis Ababa city, between 25 and 60 km. The farms and herds are 25 percent larger than those of the traditional crop/livestock farmers. The cropping system is more intensive, particularly in terms of frequent fertiliser use. The animals are given supplementary feeds. Fresh milk is sold to the DDE and they seldom process milk into dairy products.

**Specialised dairy farms:** These farms are located between 15 and 60 km from Addis Ababa. They are large farms with an average holding of 8.9 ha and 17 cows. They widely use specialised inputs such as new genotypes, artificial insemination, forage production, housing, concentrate feeding, veterinary care, etc. They sell fresh milk in relatively large quantities of over 30 litres per day primarily to local informal markets or to the DDE. Most farm owners have additional off-farm activities that often generate more income than the livestock enterprise.

**Peri-urban farms in secondary towns:** These farms are located in and around secondary towns within 25 to 50 km from Addis Ababa. Cattle are grazed on own or rented land. Special inputs are linked to the genotype and involve artificial insemination and supplementary feeds in addition to grazing and stall-fed roughage. These farmers, on average, own five dairy cows. The primary outlet for milk is either the DDE or local informal markets.

**Intra-urban dairy farms in Addis Ababa:** These dairy farms are specialised and intensive production units based on zero grazing of cross-bred and high grade cows. There is little or no grazing within the city and stall-feeding is based on purchased hay and concentrates. The level of exotic blood in the herd is among the highest found in the sample. Annual milk production per cow is high and the milk is directly sold at the local markets.

**Urban dairy in secondary towns:** These are specialised dairy farms found in most secondary towns within the milk shed. In these small towns, farmers have more access to grazing; stall-feeding is therefore less intensive. The level of exotic blood in the herd is high, but the herd size is the smallest of all the categories and averages about two cows per farm. Milk is sold fresh to local markets or the DDE, or processed into butter and *ayib* and sold. Most farm owners have off-farm activities representing about two-thirds of their income.

This detailed study conducted on three production sub-systems showed that 76 percent, 22 percent and 54 percent of the farms in secondary towns, peri-urban and intra-urban areas respectively are owned by female farmers. The percentage of illiterate farmers (owners) was highest in intra-urban (50 percent) farms followed by those in secondary town (37.5 percent) and peri-urban (12.5 percent) areas.

Conserved hay, agro-industrial by-products and commercial concentrates are the major feed resources used by urban and peri-urban dairy farmers. Hay makes up almost the entire basal diet of cattle on peri-urban dairy farms. Agro-industrial by-products are fed as
supplements to roughage-based diets, and are mainly accessed by peri-urban dairy production systems, due to the fact that most of the by-product processing industries are located around cities and towns where the demand for the major products is high. The use of commercial concentrates is restricted to institutional farms and certain large peri-urban dairy farms. Non-conventional feed resources such husks of pulses and other crops, residues of traditional breweries, poultry waste, vegetable and fruit wastes (Yoseph Mekasha, 1999) are cheaper and play a significant role in peri-urban dairy production systems.

Cross-bred and grade animals are preferred by 85 percent, 67 percent and 44 percent of farmers, while pure temperate breeds are preferred by 10 percent, 33 percent and 56 percent of farmers in secondary towns, peri-urban and urban areas, respectively. Among the temperate dairy breeds, the Friesian is the most preferred. About 92 percent of urban farmers increase their herds through crossbreeding zebu cows with exotic bulls. Purchasing of heifers or cows from other dairy farms is the main source for 29 percent of the farmers in secondary towns and 17 percent in peri-urban areas. The criteria for selection of animals vary. Milk yield potential, reproductive efficiency, disease resistance, breed or size are the most important criteria for bull selection.

Cash income from the sale of milk and/or breeding animals and utilisation of available resources (land, feed, labour, capital) are the most important reasons for keeping dairy animals in urban and peri-urban dairy production systems.

**Production, constraints and opportunities for development**

Market-oriented urban and peri-urban dairy production systems are emerging as important components of the overall milk production system in Ethiopia. These systems are contributing immensely towards filling the large demand-supply gap for milk and milk products in urban centres, where consumption of milk and milk products is remarkably high.

A survey undertaken by the Addis Ababa Agricultural Bureau shows that there are a total of 5,167 small, medium and large dairy farms in and around Addis Ababa city. The total milk production from these dairy farms amounts to 34,649,450 litres per annum. Of this, 73 percent is sold, 10 percent is left for household consumption, 9.4 percent goes to calves and 7.6 percent is processed mainly into butter and ayib (Azage Tegegne and Alemu Gebrewold, 1998). The total amount of milk available to Addis Ababa is 43,849,675 litres per annum.

The large demand for milk on the one hand and the small supply of milk and milk products for the major urban centres in Ethiopia on the other hand shows the untapped potential for the development of urban and peri-urban dairy farms. Market-oriented smallholder peri-urban dairy production systems have a tremendous potential for development and could play a significant role in minimising the acute shortage of dairy products in urban centres. Current increases in economic pressure, competition for limited resources and market forces have led to an increase in the level of intensification in these production systems.

In order to sustain high productivity and profitability, high levels of management in appropriate feeding, health care, and reproductive activities are essential. These urban and peri-urban dairy farms are currently facing new challenges associated with intensive production systems. Availability of land, management skills, labour force, feed and water
resources and feeding systems, genetic improvement, control of diseases and parasites, udder health and mastitis, calf mortality, reproductive problems, waste management, quality control, public health, processing and marketing and other socio-economic considerations are becoming important factors influencing and determining the survival of these production systems.

References


Interest in using grazing animals in the management of parks and other urban green areas has grown in Sweden in recent years. Through grazing and trampling these animals create the conditions for a rich flora and fauna.

This study was undertaken to document the use of grazing animals for management of urban green areas in Swedish municipalities. A questionnaire with 40 questions concerning the activities, organisation, results, public reactions, among others, was sent to the persons responsible for the management of green areas in 49 (of a total of 290) municipalities that use animals in urban areas.

Common Characteristics of Municipalities

Most of the municipalities were in areas with a vegetation period greater than 190 days and consisted of cities or larger towns. In areas where the vegetation period is shorter, the people will probably be less interested in making all the necessary arrangements to keep grazing animals. The same can also be said of rural communities that have small central urban areas and limited park land and that are moreover surrounded by farms with grazing animals. The grazed areas varied to a great degree but most areas were between 0.3 and 5 ha in size. The primary reason for the activities was a desire to keep the land open, but another important motive was to keep or recreate a certain flora, especially valuable trees.

Choice of Animal Species

More than 70% of the municipalities in the study used sheep. Some municipalities used more than one species on the grazed area, eg. sheep and cattle, which often gives a better grazing result. The choice of animal species and breed depends on the properties of the land that is going to be grazed and the desired grazing result. Since the grazing land is in urban areas it is also necessary to consider the affected public. Smaller animals are perceived as less dangerous than big animals, but there are often fewer problems with vagrant dogs and injured animals if cattle and horses are used.

The most common situation was that the animals were privately owned, but in some cases the animals were owned by the municipality or various associations such as riding schools. Using privately-owned animals was in the short term the most economic alternative and experienced people were available and willing to take responsibility for the animals and observe the laws and regulations.
Practical Preparations are Needed

Most municipalities had done some preparatory work before letting the animals in for grazing eg. clearing of shrubs and unwanted trees, sowing of special plants, building of fences around valuable trees, removal of potentially harmful objects (plastic bags or metal pieces) and making an inventory of the vegetation.

The type of fencing used for the areas differed depending on the animal species used and the functional and aesthetic demands. Fences should be efficient and not dangerous for animals or children. From an aesthetic point of view, a fence should not disturb the general view of the landscape and the fence design should be in keeping with the period of history.

Planning Land Management

The written management plans of the municipalities generally contained some background description with the historical aspects, a description of the present character of the area, visions for the future, starting measures, maintenance measures, a time plan, and a plan for evaluation and budgeting. The management measures consisted of recommendations for aspects such as shrub clearing, pasture trimming, species of animals to be used, and whether the use of fertilisers, herbicides or supplementary feeding was allowed. The visions concerned the number of trees in the area and the look and condition of the sward. The result of the grazing was reported to be satisfactory, even better than had been achieved with mechanical management.

Table 12.7 Comments on Grazing Animals

<table>
<thead>
<tr>
<th>Grazing result</th>
<th>The animals</th>
<th>Miscellaneous</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Positive comments</strong></td>
<td><strong>Positive comments</strong></td>
<td><strong>Positive comments</strong></td>
</tr>
<tr>
<td>- Beautiful open landscape.</td>
<td>- Seeing the animals makes me happy. (A frequent comment!)</td>
<td>- Gets people out into the urban green areas.</td>
</tr>
<tr>
<td>- The grove has returned.</td>
<td>- The animals give variety.</td>
<td>- Nice place for an outing or a picnic.</td>
</tr>
<tr>
<td>- Lots of berries now that the area has been opened up.</td>
<td>- Seeing animals is relaxing.</td>
<td>- Children come into contact with living animals.</td>
</tr>
<tr>
<td>- The landscape is “alive” in a different way.</td>
<td>- To be able to meet, caress and maybe feed the animals is a factor of great satisfaction.</td>
<td>- Children learn to take responsibility for the animals.</td>
</tr>
<tr>
<td>- More flowers.</td>
<td>- Don’t appreciate the animals’ dung, especially by the gate.</td>
<td>- Highly appreciated place for visits for school children and nursery schools.</td>
</tr>
<tr>
<td>- A pastoral view of the landscape.</td>
<td>- The animals smell and bleat.</td>
<td>- Combine business with pleasure, teach about animals.</td>
</tr>
<tr>
<td>- Fewer seeds from weeds found their way into the nearby gardens.</td>
<td>- The animals attract flies.</td>
<td>- Opportunity to learn about the relation between humans and animals.</td>
</tr>
<tr>
<td></td>
<td>- The animals are too close when people want to have a picnic.</td>
<td>- Neighbours help each other to look after the animals - creates a feeling of solidarity.</td>
</tr>
<tr>
<td></td>
<td>- The animals break through the fence sometimes.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- The animals may cause allergies.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- People who are scared of animals are afraid to be in the area.</td>
<td></td>
</tr>
</tbody>
</table>

Positive comments
- Not nice with barbed wire.
- The fence poles remain during the winter.
- Difficult to pass through styles and gates.
Positive public response

Formal evaluations conducted among the neighbours after the grazing season were all positive. Some of the comments expressed are listed in the table below. The positive comments were mainly from neighbours and parents of small children, while the negative comments were made by tourists and senior citizens.

Some problems recorded were vagrant dogs, destroyed fences and molesting of animals. The municipalities that used only sheep or sheep in combination with another species were over-represented among those who had problems.

The majority of the affected public perceived the animals as a very positive aspect; and aside from their effect on the landscape and the environment, the animals had an important social function as well. To get continuous positive responses from the public it is important that the animals are not only well looked after, but also that they are comfortable. Contaminated drinking water or lack of feed or shelter are likely to catch the attention of the neighbours and result in negative reactions.

To maintain the positive attitude of the public it is also important to consider and improve facilities for other activities in the area. Discussions should be held with, for example, the health office (allergies, manure), the leisure office (tracks for riding, skiing and running), and the building and planning office for suitable locations of gates and openings in the fence. Informative and easily readable signs about the objective of the grazing and the animals will also help to get the support of neighbours in protecting the animals.

Evaluating the Method

It was not considered possible to get the same results with more conventional management methods, and therefore it was not meaningful to put a price tag on the activities. It was concluded that extensive work at considerable costs would have been necessary to achieve at least similar results. The alternative was often no management at all, and even if this method is cheaper than grazing, a value can be put on keeping the area attractive for people.

Practical Implications

It is very clear from the study that the preparations and the way a grazing project is initiated are crucial for its success. This concerns the land, the animals, the owners of the animals and the affected public as well as the vision for the area and the desired grazing result. Careful planning and preparations of all aspects, e.g. documents concerning management plans and contracts with the owners of the animals, and a clear idea about what should be achieved, will have a major influence on the success of a grazing project.

The present study relates to the situation in Sweden, however, the positive effects of grazing as a means of managing vegetation can also be obtained elsewhere. Other factors such as availability of animals, ethical opinions on and interest for animals, interest of community officials etc. will determine whether it is possible to use the method successfully. These factors are site specific and have to be looked into on a case by case basis.
One of the survival strategies developed by the residents of urban settlements in the department of Montevideo, is the collection and sorting of household solid waste (organic and inorganic). While inorganic waste is sorted and sold to the local recycling industry, organic waste is used mostly as animal feed (mainly for pigs). Pig breeders form a distinct group among the urban solid waste sorters and are referred to as sorters-breeders.

**Pig Farming in Montevideo**

Pig raising is a widespread practice in and around Montevideo. The importance of pig farming in the peripheral areas of the city of Montevideo has increased consistently, particularly since 1970 (Moreira, 1997). Pig farming in the rural areas is permitted and regulated by the Municipality of Montevideo (IMM y OSV, 2003). In the urban areas pig farming is not legal and thus not controlled by the municipality.

In urban areas, pig farming is mainly concentrated in the so-called slums or cantegriles, located in marginal areas and characterised by sub-standard housing and a lack of urban services. Large contingents of labour that the productive system cannot absorb are concentrated in these slums. The sorters-breeders and their families carry out their activities here.

**Sorters–Breeders**

As the inhabitants of these slum settlements have difficulties in finding jobs, many are forced to develop other strategies for family survival. The most widespread is the collection and sorting of household solid waste. Many sorters divide their time between animal husbandry and other occupations such as street vending or construction work.

Sorting is an economic activity based on the collection of household solid waste (organic and inorganic) which is then sorted and sold to the local recycling industry. Typically, the sorting is performed by several members of the family who scour the city’s middle- and upper-class neighbourhoods, gathering household solid wastes with bicycles or hand- or horse-drawn carts. Sorters who do not raise pigs, feed the organic waste to their horses or discard it along river banks or public roads.

Of the informal waste collectors who roam the streets of Montevideo, 47 percent collect more than 25 tonnes of organic waste per day, which is used to feed approximately 40,000 pigs in urban and peri-urban areas of the city (IMM and OSV, 2003). Sorting inorganic household solid waste is the main activity of the sorters-breeders, while pig raising is a supplementary activity. Studies show that only 8 percent of surveyed sorters consider pig raising as their only source of income, others work in fruit markets (18 percent) and in construction work or receive a pension (both 8 percent). For most sorters–breeders, animals
fill the role of a “piggy-bank”, which they can access to cope with unforeseen expenses (Vitale et al., 1996; Moreira, 1997; Tommasino et al., 1998).

The process whereby a sorter becomes a breeder can be outlined as follows: a supplier provides a sorter with pigs to fatten up. By selling them the sorter earns extra income, and this motivates him to continue production; gradually, he becomes a sorter-breeder.

Main Features of the Pig Raising System in Urban Squatter Settlements

According to Vitale et al. (1996) most sorters–breeders are small family producers who are responsible for the full cycle which includes not only breeding but also selling of the pigs. Here, a full cycle encompasses the process from birth to fattening prior to slaughtering. More than 67 percent of sorters–breeders involved in this activity have an average of four sows. Others are engaged in raising which refers to the practice of looking after animals from birth until they are weaned from the mother and sold to fatteners, slaughtered, or sold as suckling pigs. Finally, finishers or fatteners only fatten the animals until they are sold for slaughter (Vitale et al., 1996).

In third-party production forms, “capitalists” (term used by sorters–breeders to refer to intermediaries or suppliers) provide the pigs to be fattened. Typically the “capitalist” provides sorters–breeders with pigs weighing between 20 and 50 kg. As this is an illegal activity carried out by the low-income population in marginal areas, the suppliers often lend money or help the breeders to cope with ill health or other problems. This leads to an implicit relationship of fidelity that may hinder the regularisation of this practice.

Once the pigs enter the squatter settlement, the entire process of raising and eventually slaughtering, processing and selling the meat takes place within the city. Pig farming in squatter settlements implies a significant reuse of household solid waste as feed, although commercial (bakery leftovers, restaurants and fairs) and industrial waste (offal from slaughter houses) are also used. Most settlement breeders buy their animals in Montevideo Metropolitan Area, or in the rural areas around the capital.

The final product sold by the breeders depends on the productive cycle they develop. Thus, breeders sell suckling pigs (both live and slaughtered) to intermediaries, or directly to consumers (only intermediaries sell directly to slaughter houses). Fatteners sell fattened pigs (90-120 kg) to be slaughtered or slaughter the animals themselves. Those who perform the full cycle may sell both suckling pigs and fattened animals. Thus, consumers (who are mainly people from the same settlement) have access to a variety of products (cured or fresh meat) from several sources.

Health and environmental problems caused by pig farming in urban settlements

Pig farming in the city is a survival strategy developed by families, involving all members, and carried out in the place where they live. For this reason, transmission of diseases from animals to humans (see Table 12.8) and the environmental impacts (houses located next to pig sties, inadequate disposal of waste and food preparation systems) of this activity are significant.
Health problems are ranked high on the list of concerns by those who work with sorters-pig breeders. Pig farming is carried out in squatter settlements where overcrowding and lack of services (sewage and potable water) are inherent problems. After all, pig farming is still an illegal activity.

### Table 12.8 Main diseases that humans can catch from pig farming

<table>
<thead>
<tr>
<th>Bacterial</th>
<th>Viral</th>
<th>Parasitic</th>
<th>Mycotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthrax (Carbuncle)</td>
<td>Vesicular stomatitis</td>
<td>Trichinosis</td>
<td>Dermatomycosis</td>
</tr>
<tr>
<td>Brucellosis</td>
<td></td>
<td>Cysticercosis</td>
<td></td>
</tr>
<tr>
<td>Erysipelasis</td>
<td></td>
<td>Toxoplasmosis</td>
<td></td>
</tr>
<tr>
<td>Leptospyrosis</td>
<td></td>
<td>Sarcotic scab</td>
<td></td>
</tr>
<tr>
<td>Tuberculosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salmonellosis</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Staphillococcia</td>
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</table>

Ninety percent of the urban pig breeders use organic waste to feed their pigs: 83 percent of them do not treat the feed in any way. The percentage of sorters–breeders who store food (urban waste) is significant. The only form of treatment is cooking, using part of the waste that cannot be sold to fire the stove (e.g. plastic remains and wood) and causing high levels of environmental pollution. This form of cooking is not adequate to prevent Zoonosis.

## Conclusions

Pig farming in urban areas is a significant practice developed within the city of Montevideo. It is a family-type activity that involves children, youth and women continuously. The role of women is highly prominent, both in sorting household waste and in taking care of the pigs.

Although no cost-benefit studies have been undertaken, pig raising in squatter settlements allows households to generate supplementary family income and cope with unforeseen expenses. However, the activity poses serious food safety and health problems, as many sorters-breeders raise and slaughter the animals their compounds without any sanitary control.

In addition the activities of sorters-breeders generate significant adverse environmental impacts due to the sorting and disposal of inorganic and organic solid waste. Much of the waste is just dumped. These problems counteract the benefits arising from the re-use of household solid waste as pig feed and need proper attention.

## References


Rodríguez Palazzi, D. 1996. Project for the development of the Pig Production Unit of the Veterinary Faculty. University of the Republic, Uruguay.
Livestock keeping in urban areas, a review of traditional technologies.
The emphasis of this publication is, however, on practical aspects of animal production in urban conditions, such as breeding and animal species, husbandry techniques, product processing and waste management. The volume is well illustrated with pictures depicting the various aspects mentioned and can be downloaded from http://www.fao.org/DOCREP/004/Y0500E/Y0500E00.htm

This report reviews information from case studies on peri-urban livestock systems across the world – from Ho-Chi-Minh City, via Karachi to Dar-Es-Salaam and Quito and Mexico City. It also includes additional references and interviews with consultants.

Peri-Urban Livestock Production Systems in Sub-Saharan Africa
This paper presents statistics that demonstrate the importance of expanding the urban and peri-urban livestock production sector. It suggests that the observed growth of this sector is a response to market demands arising from rapid urbanisation.

People at the Centre of Urban livestock Projects.
Heifer International promotes a method of participatory development that enables low-income neighbourhood groups to reach beyond the goals of beautification and environmental improvement and become a vehicle for social and economic development in their communities.

Livestock and Wealth Creation, improving the husbandry of animals kept by resource-poor people in developing countries.
This textbook involves 105 contributors from 26 countries. It discusses the role of livestock and how improved practices can benefit keepers and consumers.

Living with Livestock in Town: urban animal husbandry and human welfare.
Waters-Bayer, Ann. 1995. ETC, Leusden
Small-scale raising of animals by families inside cities is often ignored or even forbidden. However, urban livestock keeping is more widespread than most city authorities admit. It consists mainly of low-input production of poultry, small ruminants, pigs, rabbits, guinea pigs or milk buffalo or cattle, usually indigenous breeds.

An Update on Zoonoses. Le point sur les zoonoses. Actualización en el campo de las zoonosis.
The most serious zoonoses are often viral in origin, and the viruses concerned evolve constantly. While such viruses are generally in a state of equilibrium with respect to their hosts (individual animals or animal populations), this does not hold true for humans, who as a rule are accidental hosts. This special issue of the Revue Scientifique et Technique de l’Office International des Epizooties is very interesting from an epidemiological point of view as it documents the risks related to zoonoses at the global level.
http://www.oie.int/fr/publicat/rt/copie%20de%20rt19_1.htm

Participatory Livestock Research, a Guide
This book offers an introduction to participatory research for livestock development, to both researchers and practitioners.

www.lpp.uk.com
This is the website of DFID’s Livestock Production Programme (LPP). The site is divided into sections: “About LPP” gives an overview of the programme; ‘Network Forum’ provides contacts to people who share an interest in livestock; ‘Virtual Library’ lists all the research outputs generated by LPP-funded projects, and “Projects Portfolio” is an easy-to-search database with detailed descriptions on LPP-funded projects.
On the Animal Production and Health Division pages of the FAO website, new developments on research and development issues are reported, with a state-of-the-art assessment of animal diseases. Hosted by the International Livestock Research Institute (ILRI) and the Food and Agriculture Organization of the United Nations (FAO), a group of 25 livestock and futures experts met to discuss the “Future of Livestock in Developing Countries to 2030” and constructed alternative scenarios of likely futures of livestock development in developing countries.

www.heifer.org
This idea of giving families a source of food rather than short-term relief lies at the base of Heifer International’s world-wide activities. Numerous families in 128 countries have received the gifts and in turn passed on the gifts of self-reliance and hope, emphasising long-term solutions of community involvement and livestock. “Passing on the gift” means that recipients agree to share the offspring of animals that are gifted to them with others in need, making them equal partners with Heifer in the fight to end world hunger.