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## REVIEW ARTICLE

# Domestic Livestock in African Cities: Production, Problems and Prospects

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**Abstract:** A large number of African cities are characterized by the constant presence of livestock. Khartoum (Sudan), Addis Ababa (Ethiopia), Dar es Salaam (Tanzania), Dakar (Senegal), Banjul (The Gambia) and Accra (Ghana) can be considered as examples of the variety of species of livestock contributions to urban economies and to livelihoods. Cattle, sheep and goats provide meat and milk, pigs provide meat and poultry provide meat and eggs. Donkeys import firewood and food is horses pull taxis. Food producing animals, in addition to their output used for home consumption, make considerable cash contributions to household income when their products are sold. Animals in urban areas are, however, a source of conflict and of pollution and may be reservoirs of diseases including zoonoses. This paper provides a series of illustrated case studies relating to many aspects of urban livestock and lists some activities that could be undertaken by municipalities to improve urban production systems.

**Keywords:** Livelihoods, Food security, Employment generation, Income, Gender, Livestock products, Transport.

## 1. INTRODUCTION

Food insecurity has been a problem and a fact of life in African urban areas, especially for low-income groups, for very many years [1]. The problem was, indeed, exacerbated with the introduction of structural adjustment in the 1980s [2]. Yet, the potential of urban agriculture, which comprises many subsystems and can be very flexible in operation, to provide food to households and contribute to alleviating hunger could be a huge step towards meeting one of the main Millennium Development Goals.

Rapid urban population growth and demand for animal protein is provided a boost to urban and peri-urban farming [3, 4]. Urban livestock keeping, although often only a part-time enterprise, benefits the poor and provides a way of diversifying livelihood activities that are accessible to vulnerable groups. Livestock also provide locally produced food products for people living near the livestock keepers. Informal food markets can, however, increase the risk of the spread of zoonotic diseases in densely populated cities [5]. There are many other issues such as access to clean drinking water, product safety, environmental contamination and the risk of disease transmission that need to be addressed [6].

Urban livestock production is frequently associated with crop farming and is often a multi-species business. Association of both enterprises in one unit allows livestock-keeping households to recycle animal wastes, usually as crop fertilizer [7]. In some parts of Africa, for example in Morogoro in Tanzania, more than 90% of urban livestock keepers use animal manure as a fertilizer [8]. Elsewhere, however, especially in Ethiopia, dung is used as a domestic fuel [9]. Use of livestock manure as crop fertilizer carries risks of contamination by microorganisms not only of crops but also of people and some of these microbes (*e.g. Salmonella* spp. and *Escherichia coli*) may be responsible for zoonotic diseases. In small urban crop plots there may also be excess nutrient accumulations in the soil [10]. Inappropriate disposal or storage of livestock waste such as uncovered manure heaps and slurry pits and dumping in streets are further risks.

Urban livestock farmers usually keep more than one type of animal although a “secondary” species may be poultry

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as they are well able to scavenge for their feed, especially if they are of the local indigenous type [11]. Cattle (overwhelmingly for milk production), sheep and goats are common urban animals throughout Africa. The dominant species in terms of numbers depends to a large extent on the (rural) background of the owners and the market potential. Pigs are important in many cities but their distribution is governed by cultural and religious factors. Dar e Salaam, for example has both Muslim and Christian populations and there are many pigs [12]. In Khartoum, whose people are almost entirely of the Muslim faith there are no pigs, nor are there very many in Addis Ababa where the population is mainly Ethiopian Orthodox Christians (for whom pig meat is proscribed) or Muslim. Equines, mainly donkeys but also horses - and mules in Ethiopia - provide a variety of transport services to urban dwellers including as pack animals, riding animals, working in 2- and 4-wheel carts and providing taxi services in vehicles known as *ghari* in Ethiopia and *calèche* in Senegal.

All these animals place great pressure on feed resources. Feed is obtained from a wide variety of sources but often is a major constraint to "intensification". Thus, roughage is obtained from peri-urban and nearby rural areas by direct cutting of wild grasses and shrubs by the owners' families or by hired labour or roughage feed is bought from "professional" feed suppliers who bring feed into towns and cities from the countryside usually with the aid of equine transport. Crop residues are obtained in a similar manner or derived from the owners' plots if cereals are grown. "Concentrate" feeds are expensive and often of doubtful quality. Household waste and crop residues such as citrus peel, cassava and yam peels, maize cobs and stalks, cowpea vines and husks, groundnut haulm, cocoa pods, colanut pods and rice milling by-products [13] are recycled mainly through pigs and poultry. Various communities have evolved strategies to make maximum use of feed resources [14].

This study is based on two sources: (i) A thorough review of the literature relevant to the cities included; and (ii) the personal objective observations of the author living and working in these places over a period of 57 years. Livestock production in a selection of African capital cities is described mainly through a series of case studies. These examples can contribute to solving the problems of urban livestock production as well as to providing a basis for the development of policies and strategies.

## 2. RESULTS

### 2.1. Khartoum, Sudan

Household waste is an important source of feed for Khartoum's urban livestock and particularly goats but also sheep, cattle and equines used for transport. Livestock contribute economic benefits, especially to the urban poor but they also contribute to a large proportion of affluent residents. Waste collection is increasingly being undertaken by the urban authorities but this could result in financial hardship if the supply of urban waste as animal feed was reduced or eliminated by an organized waste collection and disposal strategy [15]. Goats are by far the most numerous livestock species in Khartoum and of these the indigenous Nubian goat is overwhelmingly the most common. The Nubian has long been reputed as a precocious and prolific breed and produces a reasonable amount of milk. Owners prevent kids from suckling by the use of a bag covering the udder (Fig. 1). Some progressive owners are now using Saanen goats or crossing Saanen on to the Nubian to increase milk output. Owners of Saanen goats provide more health care than traditional owners and provide their stock with more feed in the form of dried forage. Housing is generally of a primitive nature; 33.0% of owners had housing of untreated wood, 32.0% used plastic sheets and scrap iron, 19.0% used corrugated iron sheets and 11.0% used mud together with some sun-dried bricks and concrete for construction. Few owners have a clear business plan and decisions are mostly made on an *ad hoc* basis [16].

Equines (horses and donkeys) are used for a variety of tasks. Donkeys are usually harnessed to 2-wheeled carts for delivering both milk and water to urban households although water may also be carried in canvas or metal containers slung on each side of the back. Horses are more common in 4-wheel carts. These are often overloaded and inappropriate harness is universally in use (Fig. 2). The Khartoum State Police Force has mounted units. It is said that these units are important in combatting crime and catching criminals and ensure security at markets, in residential areas and at national and sporting occasions. It could be expected that they would be well cared for and provided with good living conditions, veterinary care and food. Such is not, however, the case. Hygiene was very poor, housing (if provided) was inadequate, horses were grossly underfed, internal and external parasites were rife and veterinary care was very limited [17]. The Sudan Equestrian Federation is very active, imports Thoroughbred stallions from Kenya and Saudi Arabia and holds regular race meetings in the winter months.



Fig. (1). Sudanese goat fitted with udder bag to prevent suckling by kids (4 March 2011).



Fig. (2). A cart horse in central Khartoum showing unsuitable harness and one type of load (26 March 2014).

## 2.2. Addis Ababa, Ethiopia

Urban livestock production is a major subsector of agricultural production in Ethiopia. Urban livestock systems are complex and involve diverse activities and technologies throughout the value chain in production, processing and

marketing. Urban livestock contribute to overall development. They produce food, generate employment and provide income. As such they have substantial roles in reducing poverty, contributing to food security and improving human health. Cattle and poultry are the major species but goats, sheep and equines also contribute significantly to the urban economy and to people's diets. The capital, Addis Ababa, has about 5200 dairy farms holding some 58,500 cattle of which almost 50% are crossbreds of exotics with local types. It follows that about 30,000 persons depend directly on income from the dairy subsector. Total annual milk output is estimated at 44 million litres of which 83% is marketed and 17% is consumed by the household [9]

In Addis Ababa, about 33% of households with livestock are headed by women and 45% of livestock owners are women with an average age of 55 years (men livestock owners average 57 years). Education levels range from illiterate to secondary school (slightly more men than women). Ownership patterns vary but many urban male livestock keepers are active or retired civil servants. Women own about 43% of dairy cattle, 81% of poultry, 47% of sheep and 33% of goats. The average cattle number per owning household is about seven animals. Women are usually responsible, with assistance from other family members, for feeding the stock, cleaning stables, milking dairy cattle, processing milk and marketing livestock products. Women are also the principal agents in the management of animal dung, its removal and its conversion through sun-drying to cakes for use as household fuel or as an additional "cash crop" (Fig. 3). Younger children, especially girls aged 7 to 15, are mainly responsible for managing calves, poultry and small ruminants whereas men and older boys take care of sick animals, construct shelters and cut grass. Major constraints in urban livestock production are poor access to credit, limited technical advice, the high cost and limited availability of feed (both forage and concentrates), veterinary services and medicines and the low prices of liquid milk and its products [18]. The poor reproductive performance of dairy cows is exacerbated by the inadequacies of the public artificial insemination services (technicians and semen). Disease in general is seen as an important constraint with mastitis in cattle and Newcastle disease in poultry topping the list of problems [9].



**Fig. (3).** Dung cakes prepared for use as domestic fuel in Addis Ababa (15 March 2006).

Ethiopia depends heavily on natural biomass for its fuel supplies. In 1995/1996 total energy consumption in Ethiopia was estimated at 723 petajoules ( $723 \times 10^{15}$ ) or about 50 million tonnes of wood equivalent. The contribution of wood fuel was about 77% of the total with agricultural residues and dung accounting for about 16%. The share of traditional fuels in the national energy consumption was thus above 90% and in the period 1980-2000 increased at an average annual rate 2.5% [19, 20]. In Addis Ababa a survey of 862 households showed that 395 (46%) used wood as a fuel, 541 (63% used charcoal, 20% used other wood products such as twigs and branches: 10% of households used dung. A large proportion of households used kerosene whereas less than 2% used electricity to supply energy, mostly for lighting.

Donkeys and women were used to import biomass fuels and grain into Addis Ababa (Fig. 4). In particular, the Former Women Fuel Wood Carriers Association (FWFWCA) is an organization devoted to bettering the lives of Ethiopian women who previously worked as “fuel wood carriers” - women who manually cut down eucalyptus wood (often illegally) outside Addis Ababa, carried it into the city and sold each day’s load for less than USD 1.00. Donkeys are also extensively used within the city for transporting building materials and supplying water to the poorer quarters of the conurbation without piped supplies. More than half of dairy farmers in Addis Ababa used donkeys to bring feed to their farms [21] and it has been reported that donkey transport is an important occupation and primary income source for urban households [22]. Horse taxis (*ghari*) have been banned from Addis for many years but still provide an essential transport service in other urban areas of Ethiopia)



**Fig. (4).** Donkeys and women assure much of the supply of combustible material to Addis Ababa (2 April 2006 and 30 January 1990).

### 2.3. Dar es Salaam, Tanzania

Dar es Salaam has been the subject of a great many studies of urban livestock [23 - 28]. In 1984 urban Dar es Salaam had 1,763 crossbred dairy cattle [29]. Some 10 years later at the end of 1993 cattle numbers in the urban wards of the city had increased to 14,721 [25]. In the 1980s, pig numbers increased 4.5 times, there was a 15-fold increase in goat numbers and poultry numbers more than tripled [30]. Small scale intensive (broilers/layers) and extensive (indigenous scavenging fowl) poultry production is widespread [28] but is insufficient to supply the urban demand. Poultry (mainly domestic fowl but also Guinea fowl, pigeon and Muscovy ducks) are brought into the city by itinerant traders who scour the neighbouring rural areas to collect birds (Fig. 5).

Dairy cattle in Dar es Salaam are kept almost exclusively by medium and high income people in periurban and low density settlement areas [31]. Selling of milk is mostly informal and over 90% is raw milk. In Tanga (a town to the north of Dar es Salaam but where the situation is likely to be similar) 83% of samples had higher coliform counts than the recommended values of less than 50,000 cfu/ml and 56% were positive to the Brucella milk ring test [32]. Producers depended mainly on poor quality forage as feed, either collected by themselves and mostly brought to the homestead by bicycle or as a head load or bought from youths who make a business of cutting grass and selling it by the roadside. Breeding is mainly by natural service as artificial insemination services were unreliable and expensive. Animals were generally confined in poorly designed sheds at high stocking densities which are against animal rights stipulated in the Tanzania Animal Welfare Act. There were indications that some producers were reducing the size of their herds due to the difficulties of obtaining feed but also because of prohibitive urban by-laws [33].



**Fig. (5).** Poultry collected from rural areas being transported in local baskets to Dar es Salaam (17 September 2012).

The large demand for pigs in Dar es Salaam is partially filled by lorry shipments from the Mbeya Region (author: pers. obs.). The very active urban market is mainly served, however, by individual owners and small dealers trading informally and moving animals to point of sale or slaughter by a variety of means. These include herding on foot and transport in handcarts and on the backs of bicycles. Within Dar es Salaam pigs are kept in small units although several units may be in close proximity to each other (Fig. 6). Housing is mainly rudimentary, built of recovered materials of all kinds and invariably extremely unsanitary. Some feed is obtained from tourist hotel culinary waste, from garden trimmings and from various other sources. Some manufactured concentrate feed is used by some producers [12]. All of the 24 privately owned slaughter slabs in Dar es Salaam were “substandard, wrongly located, poorly designed and constructed and lacked most basic requirements for a slaughter house” and “because of inadequate slaughtering, disposal and cleaning facilities, the slaughter slabs were under unhygienic condition with questionable safety, soundness and wholesomeness of the pork produced” [34]. Slaughter, dressing and meat handling at slabs in Morogoro “are done on the ground under unhygienic conditions and all slabs are dirty and have neither tap water nor drainage systems” [34]. Slabs in Dar es Salaam are approved by the municipality and assigned a government employee to oversee operations and perform meat inspection but the efficiency of the inspection was doubtful as there are insufficient inspectors for the number of slabs (E. Mkupasi, pers. comm.).

The number of donkeys in Tanzania in the 2000s was estimated at under 300,000 and a thorough exercise to determine the number of horses in the country arrived at a total of 493 [35]. There are very few equines in Dar es Salaam probably because of the risk of trypanosomosis. The number of donkeys is unknown but there were only 80 horses in Dar es Salaam and its environs in 2013. These belonged to the Tanzania Police Service (13 animals) and were used for ceremonial purposes and crowd control, the Dar es Salaam zoo (23) where they were used for display, education and leisure purposes, the Horse Club (29) for leisure rides and four other owners (15) of whom one was a hobby farmer [35].



Fig. (6). Collective piggery at Tanzania Police Service barracks area, Dar es Salaam (20 November 2012).

Livestock are kept in the urban area mainly to generate income rather than to supplement the household food supply (39% of 71 respondents to a questionnaire) although the contribution to total income was “moderate” (78%). More than 90% of persons in charge of livestock were women and 48% of women were the main decision-makers [36].

#### 2.4. Dakar, Senegal

Urban food insecurity is stimulating the development of agriculture in the Niayes Zone of Senegal (in which more than 50% of the Senegalese population lives) where Dakar, is the major conurbation. In this zone the human population density is more than 1,000 per square/km. Livestock keeping and the functions of waste recycling and animal traction are well integrated into the production systems. Livestock make an important contribution to key elements in the diets of women and children such as milk, meat and eggs. Livestock product marketing also contributes to women’s welfare by generating income. Urban production networks are predominantly family based [37]. Most Senegalese families keep some domestic animals such as traditional poultry - urban poultry production involved some 70,000 entrepreneurs in the late 1990s - or a few small ruminants - about 47% of households - but economic objectives do not necessarily prevail. Animals mainly receive domestic waste as feed but this may be supplemented with concentrates and some crop by-products such as groundnut or bean haulms. These feed resources are generally inadequate, however, and animals scavenge freely in town. In addition to the family-based system there are a few sheep fattening and intensive poultry farms which produce livestock and products for sale and which are specifically targeted at both Christian and Islamic religious festivals. Poultry farming generates waste that is then used as a fertilizer on leafy vegetable crops. Some 65% of national demand for poultry meat and eggs derives from local production in the greater Dakar area [38, 39] Urban dairying uses mainly local types of cattle and goat. Intensive dairying is expanding in Dakar but is vulnerable to space and feed constraints. Small ruminants used for milk production also produce surplus males which are fattened to supply meat for the religious festivals, mainly the Muslim feast of *tabaski* (The Feast of the Sacrifice) (Fig. 7). There is also a lively trade in the supply of goats and sheep to street restaurants, known as *dibiterie* (Fig. 7).

A study of the main agricultural systems showed great diversity in farm products (fruit/vegetables and livestock) and the potential for further development. Semi-extensive animal rearing, however, faces difficulties linked to rapid urbanization. The main constraints to the development of urban livestock are the land tenure system and land availability (as housing and welfare are given priority in land allocation), deterioration of natural resources, poor farmer organisation and minimal access to credit [37, 40].



**Fig. (7).** Male sheep being fattened for slaughter at the Feast of the Sacrifice and a street restaurant (*dibiterie*) in Dakar using local small ruminants and providing roast meat (6 August 2014 and 20 August 2014).

Donkeys are little used in Dakar but many horse carts - in Dakar these are mostly 2-wheeled vehicles as opposed to the more general 4-wheeled ones mostly usually used for horses elsewhere - ply the streets transporting a variety of building materials, food stuffs and miscellaneous other items. Groups of horses are gathered at night and in non-working hours in walled compounds (Fig. 8). Horse taxis (*calèche*) are banned from central Dakar, presumably because of the traffic chaos they would otherwise cause but are still extremely common in the outlying suburbs (Fig. 8). The welfare of horses is a problem: they are inadequately fed for the work they do, leading to emaciation and inappropriate harness results in many chronic saddle sores.



**Fig. (8).** Horse “park” at the compound of the Senegalese Agricultural Research Institute in central Dakar and horse taxis in an outlying suburb (5 August 2014 and 20 August 2014).

## 2.5. Banjul, The Gambia

The Gambia is the smallest country on the African mainland and is one of the continent’s poorest. In 2003 more than 51% of its population lived in the Greater Banjul area. A recent report by a United Nations agency provided a profile of the national urban situation with sections on the economy and on the informal sector. There is no mention of livestock in the report [41]. Yet, both crop and livestock production are a common feature as a response to inadequate and costly food supplies [42]. Livestock production is characterized by the keeping of several species. Cattle (50% of households with livestock) are the commonest species with sheep (30%) next and then goats (29.8%). Poultry are owned by 56.6% of households. Cattle and goats are the commonest combination (20% of livestock owners). All species are managed extensively except for poultry which are sometimes kept under semi-intensive management. Income was obtained from milk and small ruminant sales and less commonly from the sale of cattle [43]. Most cattle are of the trypanotolerant N’dama type. As these trade off tolerance for production the research and development services are attempting to encourage crossing to “more productive” exotic types but these are more susceptible to trypanosomiasis and need constant and expensive prophylaxis against the disease. Sheep are mainly of the Djallonké type (Fig. 9) which is also trypanotolerant to some extent. Small scale backyard poultry use the local scavenging genotype which may have a bare neck and frizzle feathers (Fig. 10) as adaptations to reduced heat stress. In addition to domestic fowl, pigeons are kept by many families and Muscovy ducks by a few. Some non-Muslim families breed and



rear pigs. Attempts at further diversification of livestock activities in Banjul have been made by the Department of Livestock Services through the introduction of “microlivestock” (rabbits and grasscutters *Thryonomys swinderianus*) especially to women’s groups. Most of the feed for these small animals derives from the residues and by-products of the mixed crop-livestock urban system [44].

In addition to field and farm work, both horses and donkeys are widely used in general urban transport operations. In this role, as in neighbouring Senegal, they usually pull a 2-wheel cart and carry a variety of goods. They also act as taxis in the transport of people. As elsewhere in Africa the harness is less than satisfactory although it does include a breeching strap which is unusual in the African context. A new and albeit limited use of horses is to provide rides for tourists on the beaches south of the capital of Banjul. The saddle and bridle in this context are of the standard English type [45].



**Fig. (9).** Local sheep of the Djallonké type in a Banjul market (11 August 2014).



**Fig. (10).** An indigenous cockerel showing frizzle feathering as an adaptation to heat stress (20 July 2014).

## 2.6. Accra, Ghana

The Metropolitan Agricultural Development Unit of the Accra Metropolitan Assembly coordinates and facilitates an Accra Working Group on Urban and Peri-urban Agriculture. This body comprises about 20 institutions committed to alleviating poverty in Accra and beyond. It aims to promote livestock through a Livestock Development Project that will provide quality and affordable meat products to contribute to protein needs. The project will support non-traditional activities such as grasscutter (Fig. 11) and rabbit production as well as crop production that require small areas. All activities aim at the improvement of the livelihoods of the most vulnerable group such as women and youths and the physically challenged [46].



**Fig. (11).** A grasscutter *Thryonomys swinderianus* being reared as microlivestock diversification by a small holder in Accra (13 February 2001).

Small livestock production is fairly evenly spread across income groups. Poultry are the most commonly kept livestock with over 70% of keepers rearing chickens or ducks. Sheep and/or goats are kept by about 20% of families with livestock. A small proportion of subsistence producers keep pigs or micro-livestock and other minor species such as Guinea fowl (Fig. 12). Only a few animals are kept per household, the greatest number of poultry being 40 and over 90% of people kept less than 10 animals [47]. Commercial production for sale, mainly small scale, is usually of poultry and pigs. Poultry are more common in the middle and high-income communities who can afford start-up costs. Much of this activity is on the city outskirts but there is some production within Accra despite bylaws controlling the practice. Livestock waste is generally disposed of at the refuse dump but some producers sell it to crop farmers for fertiliser. In lower-income neighbourhoods pigs and small ruminants are raised commercially. Keeping animals in the house is a common feature in almost all communities in the city but more so in low-income migrant areas. Only 8-9% of low-income migrant households do not keep such livestock. Both men and women are involved in keeping small livestock but most households have other forms of employment. The majority of those keeping small livestock and poultry are women who are assisted by their children and husbands do not usually contribute to the upkeep and care of the animals. When men are the owners, however, they have access to their wives' and children's labour although the reverse does not apply. In high-density, low-income communities, poultry are left to scavenge and share the limited compound space with other household activities. Goats and sheep are confined to protect them from theft. Plantain and cassava peels and leftovers from "chop bars" (street restaurants) are collected and fed to these animals. In high- or middle-income low-density neighbourhoods, where fewer households keep animals, they are penned and fed bought or home-mixed compound feeds and provided with some veterinary services. Most work is performed by household members and hired labour is rarely used. In some commercial operations livestock may provide a regular source of income or a source of supplementary food but small livestock mainly represent a reserve asset. Negative environmental issues include solid waste being deposited along watercourses, wastewater channelled into lagoons or streams, unhygienic and unsanitary

butchering practices, air pollution from the burning of tyres used in flaying, noxious smells from discarded feed, accidents with vehicles and general nuisance [47, 48].



**Fig. (12).** Guinea fowl, a minor but important species in urban livestock in a traditional scavenging system in Accra (8 August 2014).

Neither horses nor donkeys are common in Accra. The Accra Polo Club, founded in 1902, is managed by a British expatriate and holds regular matches against visiting international teams. The Club has 220 stables and three horses for private hire. It provides livery services for privately owned horses. The Burma Camp Saddle Club is owned and managed by Ghana's armed forces. Horses can be rented for leisure riding and private and group lessons are also available. In the late 1980s the Waste Management Department of the Accra Metropolitan Authority bought two donkeys, carts and harness from an animal traction development project. The donkeys and carts were used in collecting refuse from parts of the city where it was uneconomical to run big refuse trucks from house to house. When refuse collection was privatised in the early 1990s donkeys continued to be used by entrepreneurs for the removal and transport of garbage to a central dump [49].

### 3. DISCUSSION AND CONCLUSION

The positives of keeping livestock in urban situations are manifest and manifold, as are the negatives. Urban livestock keepers are beset by problems of policy and institutional and technical support. In many capital cities, indeed, legal impediments to urban agriculture and perhaps especially to livestock remain. Opportunities for harassment by and corruption of the authorities continue to exist and producers are confronted by insecurity - of access to land, of fluctuating prices and of the demand for products. Many stakeholders do not favour the development of urban livestock production as the business competes with "regular" urban spaces.

Urban livestock include cattle, goats and sheep that provide milk and meat, poultry that provide meat and eggs and horses and donkeys that support the citizenry with transport of commodities and people. Encouragement of urban livestock farming, with appropriate regulation where required, will contribute benefits not only to the livestock owners themselves but also to the general population in greater employment opportunities and food security. Adequate safeguards need to be in place to mitigate negative effects such as increased production of waste and pollution of water and the atmosphere.

Women are intimately involved in urban livestock production. Gender concerns need to be addressed at all stages of the urban food and development cycle and in any development projects. This applies to design, planning, implementation, monitoring and evaluation. There must be adequate provision for the benefits of development to reach women and for the recognition of their physical, intellectual and financial inputs. Women have a major role in minimising environmental pollution and public health problems.

The literature has identified actions that could be taken by municipal authorities to provide a more secure basis for the poor to engage in food production and to provide scope and flexibility for such considerations as different gender demand patterns for land access for cultivation [50 - 52] Some examples are:

- Revocation of land use by-laws that are impossible to enforce but result in uneven attempts to do so which almost always assail the poor rather than the better off;
- Concomitant termination of sporadic bouts of crop destruction and eviction by officials and once again biased against the poor rather than middle-class families;
- Replacement of previous by-laws by simple broad-scale zoning;
- Identification of public land that could be converted to leasehold plots for cultivation together with criteria for access to that land and regulations granting secure tenure for an agreed period;
- Setting land aside for plots in future expansion areas together with access and security of tenure;
- Creating a legal framework that protects tenants' rights on private land within city boundaries; and
- Encouragement of NGO activities and facilitation of coordination among NGOs.

A general vision for urban livestock would be to create healthy people, healthy livestock and a healthy environment. Similarly, a generalized mission would be to ensure a systematic sustainable urban livestock production system for better nutrition, improved health and higher incomes for the urban population [42, 53 - 56]

#### CONSENT FOR PUBLICATION

Not applicable.

#### CONFLICT OF INTEREST

There are no conflicts of interest to report.

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