

Livestock production is a vital part of urban and peri-urban agriculture (UPA) in Kumasi, where many crop farmers benefit from cheap poultry manure available in large quantities. However, with increasing competition for this resource, the manure is seldom stored long enough to prevent the contamination of food and water with pathogens. While the actual incidence of disease related to this contamination has not yet been assessed, interventions to prevent the spread of infection should focus first of all on the consumer household. Farmers' access to clean irrigation water is another important step but only makes sense if farmers' own practices do not contribute to water pollution.



poultry manure. Rain washes the manure into the hand-dug well at the lowest point of the field.

Photo: IBSRAM

Increasing use of poultry manure in Ghana

Is farmers' race consumers' fate?

Kumasi, the capital of the Ashanti Region in Ghana, has a population of approximately one million. Due to its strategic location in the national road network Kumasi has gained a pivotal role in the vast and profitable distribution of goods within West Africa. Trading and the commuter transport business are significant economic sectors.

The most profitable form of livestock farming is poultry and egg production

There are also about 1,470 registered commercial farms in the city as well as some 30,000 backyard farms (MOFA, 1999; KNRMP, 1999). The most striking feature of a recent survey on urban farming systems was that on all plots surveyed there was some form of food crop cultivation taking place, even in areas with high housing density

(KNRMP, 1999). Nsiah-Gyabaah and Adam (2000) concluded that if "gardening" is synonymous with food crop production, then Kumasi is still the "garden city" it was once envisaged to be.

The survey by the Kumasi Natural Resources Management Project (KNRMP) also addressed urban livestock. This was no easy task, since it was difficult to obtain realistic figures on urban herd sizes and cattle owners especially from the farmers' side (KNRMP, 1999). This was mainly due to increasing pressure from the Kumasi Metropolitan Assembly (KMA) on cattle owners to move their animals outside the KMA perimeter

The study estimated that there are up to 500 regular cattle owners in the metropolis and up to 2000 speculators or short-term cattle owners. The Veterinary Department of the Ministry of Food and Agriculture, on the other hand, counted a total number of about 3000 cattle in the metropolitan area. In addition, the department recorded about 30,000 sheep and 26,000 goats in the city (MOFA, 1999). Most live-

stock are kept for cash income either on a full or supplementary basis, and provide meat for more than 13,000 "chop bars" (street restaurants) in the city. Thus the urban livestock sector provides a livelihood for many people in the metropolis, including migrants from northern Ghana specialized in cattle keeping. In only a minority of cases are livestock kept for subsistence (KNRMP, 1999).

The most profitable and attractive forms of livestock farming - especially in and around the city - is probably poultry and egg production. Between 1986 and 1995 Ghana's poultry population doubled from 6.4 m to 13.1 m. Poultry farming is practised by people from all social sectors. However, the establishment of larger poultry farms requires an initial investment. Data from different farmer associations indicate that there are nearly 100 registered poultry farms in the KMA area and its vicinity, and about 200 more which are not registered. The majority of the registered ones have 5000 - 10,000 birds, mostly layers. The bird numbers rise as high as 250,000 to 350,000

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Table 1. Disposal of animal manures by urban livestock keepers

Disposal method	Respondents reporting disposal method (%)			
	Cattle	Sheep & goats	Pigs ¹	Poultry ²
Thrown away/not collected	98	100	97.5	5-55
Used as soil ameliorant	2	0	45	45-95

¹ Some respondents mentioned that they used part of the pig manure for soil amelioration and part was thrown away. Also 5% said that they used it in fish ponds.

² About 45% of the farmers indicated that they give the manure regularly to vegetable farmers, and 50% do so occasionally on request (otherwise, the litter is dumped and often burnt).

Source: KNRMP 1999.

birds in Kumasi's two largest poultry farms at the city boundary. On the registered farms, poultry are mostly kept by men: 40% of them are specialized poultry farmers, 60% do it as a side job (businessmen, traders, teachers, accountants, etc.). Among the non-registered poultry farms bird numbers mostly vary between 50 and 1000 birds, not counting those thousands of households with some free-running chickens.

Urban pig production is still a comparatively small but growing sector in contrast to the number of "urban" cattle, which are suffering from the rapid decline of grazing land in the metropolis. Finally, there is a range of farmers specialising in small animals such as grass cutter (agouti), rabbit, or snails, as well as a certain number of fish farmers

(aquaculture). However, these are mostly located in the peri-urban area (KNRMP, 1999)

MANURE PRODUCTION AND USE

There are no data available on the quantity of manure produced in the metropolitan area, but estimations including peri-urban Kumasi indicate an annual (dry matter) production of about 34,000 t poultry manure, 54,000 t sheep and goat manure and about 12,000 t pig manure on the basis of livestock data from 1996 (Kindness, 1999). A large proportion of the manure produced in and around Kumasi is lost. This is the case not only for droppings of free grazing sheep and goats, but also for poultry litter, which is dumped (and burnt) along roadsides (Drechsel, 1996). This is a significant loss of a valuable resource as poultry litter analysed around Kumasi shows a high nitrogen content of 2.0-3.8% (Amoah, 2000). In terms of available plant nutrients (t yr⁻¹), the amount of poultry manure currently wasted is larger than the total quantity of inorganic fertiliser actually applied in urban and peri-urban Kumasi (Nsiah-Gyabaah and Adam, 2000).

There was little interest observed in manure marketing by the livestock keepers surveyed by KNRMP (1999). Many poultry farmers consider the litter as waste and give it away for free to crop farmers who do, however, have to pay for the transport or litter replacement. According to KNRMP (1999), 45% of the poultry farmers in Kumasi generally make the manure available, as do an additional 50% on request (otherwise they dump/burn it: see Table 1).

Poultry manure is mostly used by vegetable farmers, but also about 68% of the 94 fish farmers around Kumasi manure their ponds with the poultry litter (which "closes" a separate nutrient cycle as poultry are generally co-fed with fish meal). Different PRA studies showed that farm-

ers in and around Kumasi have a general awareness of the benefits of organic manures for soil improvement but lack detailed knowledge on their applicability and handling for different crops. This situation is peculiar to poultry manure, which, as a new source of nutrients, is insufficiently addressed by both traditional knowledge and extension material.

To improve the situation, NRI and IBSRAM have in recent years supported a range of on-farm trials around Kumasi which verified the fertiliser value and

Farm gate samples still contain high levels of total and faecal coliforms

profitability of poultry manure use not only on vegetables but also on the traditional cassava-maize inter-crop. Corresponding guidelines for extensionists and farmers are being produced and impact assessment studies showed an increasing interest and a high probability of technology adoption (Drechsel and Gyiele, 1998; KNRMP, 2000).

However, poultry manure has not only advantages but is also a carrier of pathogens¹ and appropriate handling of the manure and crops is necessary to reduce any potential health hazard.

FOOD CONTAMINATION

Urban livestock production can affect its environment in various ways. It can lead to noise, odour or uncontrolled grazing in neighbours' gardens. A more serious disadvantage, however, is the contamination of food and water with pathogens if fresh manure is applied, as it is the case with poultry manure.

With increasing demand for inputs, vegetable farmers are competing for poultry manure. They started to offer poultry-farmers fresh bedding material (usually wood shavings) in exchange for manure-enriched litter fresh from the coop. Thus, the majority of poultry farmers who give the litter to crop farmers do not store it before it leaves the farm. Also almost no crop farmers who asked for litter enquired about its maturity. After collection, about 60% apply the poultry litter directly without further composting while 40% heap the litter for some weeks or more depending on the date they need it on their fields (Mensah et al., 2000).

REFERENCES

- Amoah, p. 2000. Identification of suitability indices of poultry litter for cowpea and maize production. MSc thesis, Faculty of Science, Kwame Nkrumah university of science and technology (KNUST), Kumasi.
- Armar-Klemesu, M., Akpedonu, P., Egbi, G., and Maxwell, D. 1998. Vegetable contamination in Urban Agriculture: Vegetable production using wastewater. In: Armar-Klemesu, M. and Maxwell, D. (Eds). Urban Agriculture in the Greater Accra Metropolitan Area. Final Report to IDRC (project 003149). Legon University, Ghana.
- Drechsel, 1996. Applied research for peri-urban areas. *IBSRAM newsletter* 42: 5-7.
- Drechsel, P. and L. Gyiele 1998. On-farm research on sustainable land management in Sub Saharan Africa: Approaches, experiences, and lessons. *IBSRAM proceedings* No. 19. IBSRAM: Bangkok.
- Kindness, H. 1999. Supply and demand for soil ameliorants in peri-urban Kumasi. Kumasi Natural Resources Management Project, KNUST/NRI/DFID.
- KNRMP, 1999. Kumasi Urban Natural Resources Studies, June 1999. Kumasi Natural Resources Management Project, KNUST/NRI/DFID.
- KNRMP, 2000. Report on poultry manure facilitation and extension exercise, March 2000. Kumasi Natural Resources Management Project, KNUST/NRI/DFID.
- Mensah, E., Amoah, P., Drechsel, P. and R.C. Abiadoo. 2000. Environmental concerns of urban and peri-urban agriculture: Case studies from Accra and Kumasi. In: Drechsel, P. and D. Kunze (Eds.) *Waste Composting for Urban and Peri-urban Agriculture - Closing the rural-urban nutrient cycle in sub-Saharan Africa*. CABI-IBSRAM-FAO (in press).
- MOFA, 1999. Production of major crops in the Ashanti Region 1998. Ministry of Food and Agriculture, Regional Office Kumasi, Ghana.
- Nsiah-Gyabaah, K. and M. Adam. 2000. Farming systems and farming inputs in and around Kumasi. In: Drechsel, P. and D. Kunze (Eds.) *Waste Composting for Urban and Peri-urban Agriculture - Closing the rural-urban nutrient cycle in sub-Saharan Africa*. CABI-IBSRAM-FAO (in press).
- Westcot, D.W. 1997. Quality control of wastewater for irrigated crop production. FAO. Water Reports no. 10. Rome: FAO, 86p.

There is no conscious manure heaping for adequate composting (Amoah, 2000). The potential food contamination concerns leafy vegetables in particular, as every second farmer broadcasts the litter over the already established crops (see photo).

During irrigation, the litter is largely washed away. However, farm gate samples of lettuce, cabbage and onions from poultry manure treated fields still contained high levels of total and faecal coliforms (Table 2).

All vegetable samples not treated with poultry manure had lower coliform counts, but were still affected due to contaminated irrigation water. The farms studied used water from ponds, wells, streams or drains with up to 35×10^4 counts of faecal coliforms per 100 ml. The tolerated irrigation water level for crops likely to be eaten raw is 1×10^3 counts (Westcot, 1997). This source of contamination can be important but might be - at

least in part - homemade through excessive application of poultry manure.

Vegetables analysed at major markets in Kumasi did not show significantly different coliform counts than the farm gate samples, although there were significant differences between the various markets in Kumasi. The presence of coliforms from manure application depends on the frequency of manure application and the survival time of faecal coliforms on crops (<30 but usually <15 days; Westcot, 1997). While many lettuce farmers apply the manure only once, cabbage and onions receive their first treatment 1-2 weeks after planting and another treatment 3-4 weeks before harvest. In these cases a carry-over of coliforms is possible. The finding that the market samples did not show significantly different coliform counts than the farm gate samples indicates that although there was no additional contamination through market

Table 2 Faecal coliform counts of vegetable samples from various farms in Kumasi (MPN 100 ml⁻¹)

Sample	Average (x 10 ⁴)	Range (x 10 ⁴)
Lettuce	22.7	2.9 - 50.0
Cabbage	8.8	1.9 - 17.5
Onion	4.1	1.5 - 7.8

MPN=Most probable number

related handling, there was also no impact of on-market vegetable washing. In a comparable study carried out in Accra, Armar-Klemesu et al. (1998) found slightly higher coliform contamination of market samples than of farm gate samples. This indicated additional contamination through transport/handling but the major source of contamination remained the farm and irrigation water.

CONCLUSIONS

Livestock production is a vital part of Kumasi's UPA and contributes significantly to its agro-industrial sector. Farmers in and around Kumasi benefit from the large amounts of poultry manure generated, as this offers them access to a high quality fertiliser for little money. The potential of this resource is increasingly being realised. There are reports of trucks transporting the manure from Kumasi to the northern parts of the country and even to Burkina Faso.

With regard to the accompanying potential health hazard through the use of insufficiently composted manure and/or irrigation water, corresponding extension guidelines for vegetable farmers are needed. Many more epidemiological studies are also required to determine the actual incidence of disease occurring as a consequence of this transmission route. Prevention of the possible spread of gastro-intestinal infections should focus on the consumer household, its awareness of the problem of food contamination and access to piped water because a certain part of the population does not wash vegetables regularly and/or has no access to in-house piped water. In a further step, farmers' access to clean water has to be assured, also paying attention to the contribution of urban and peri-urban agriculture to water contamination through manure application or the hazardous disposal of animal waste.

¹) Poultry manure can also be a carrier of pesticides: 65% of the poultry farmers in urban and peri-urban Kumasi, confirmed that they spray their birds and the litter with pesticides or dip the birds in pesticides when pests are detected on them (Amoah, 2000).

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