

Surface Water Quality and Periurban Food Production in Kano, Nigeria

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Kano, the largest city in northern Nigeria, has long served as an important market for resources produced in its periurban zone. In particular, urban farming is widespread in Kano and is tolerated as an important response to the economic and social conditions faced by many poor individuals. Previous studies in the region have concluded that urban farms make very significant contributions to city nutrition, household food security, employment and the environment (1).

However, recent research also suggests that there is much cause for concern as industrial and domestic toxins are reaching dangerously high levels in periurban areas. This article examines some of the environmental and health consequences associated with urban farming in Kano, as irrigation sources become increasingly polluted.

Water availability and quality

Kano is growing quickly. Statistics from the most recent census undertaken in 2007, which are yet to be released, suggest that Kano currently boasts a population of just under four million. The region also faces low and unreliable rainfall, with most rain falling predominantly in the five-month 'wet season' between May and September. Each year, there is a serious water deficiency in the Kano vicinity, which can last for up to seven months. Dry season production is only possible in low-lying depressions where the water table is close to the surface (referred to as fadamas in Hausa). There is intense competition for periurban plots where such irrigated cultivation is possible.



Levels of pollution in water sources vary both temporally and spatially Photo: Roy Maconachie

The combination of Kano's low and unreliable rainfall, its growing population, and industrial pollution from nearby factories seriously threatens the quantity and quality of local water resources. The tannery and textile industries, using the largest quantities of water and producing the greatest amounts of wastewater, constitute the main sources of pollution. The waste by-products from these tanneries have high concentrations of the heavy metals chromium and cadmium. Further compounding the problem is the city's inadequate sewerage provision, leading to the discharge of effluents into rivers and drains. This contamination of water sources poses a major risk to human health.

Due to recent water scarcity, domestic water use and residential runoff had been reduced

Water quality measurement

During field research carried out in 2002 at three agricultural sites in urban and peri urban Kano, water samples were taken at various points from the Getsi Stream and Jakara River. An attempt was made to examine water quality both temporally and spatially. The Kofar Ruwa site and Jakara site off Airport Road were chosen because they are situated close to the city centre in areas of high population density, while the Kwarin-Dankukuru site is located at the urban periphery. At Kwarin-Dankukuru, water was sampled from both an irrigation channel and a washbore (6-8 metres deep), so that comparisons could be made between the two sources. Water samples were also taken from the Getsi Stream in the nearby Bompai Industrial Estate, since this was the main source of industrial pollution at Kwarin-Dankukuru. Both of the waterways sampled were major sources of irrigation water for periurban farmers. For each sample, standard procedures were followed for the analysis of the selected elements cobalt, copper, iron, manganese, nickel, lead, chromium, mercury, cadmium, magnesium, and calcium - some of the trace elements which are typically associated with discharges from tanneries and textile mills, two of the major polluters in the Kano industrial estates. The investigation did not examine levels of pathogens associated with faecal contamination (for information on this see Tanko, 1997). The majority of sampling was carried out during the month of April, at the end of the long dry season, since this was the critical period when farmers were irrigating on a daily basis and there were no natural water flows to dilute toxins in the channels. However, a set of samples was also taken during August, the

wettest month, in order to compare water quality in the wet and dry seasons. Water specimens were taken both in the early morning and in the afternoon, as it was noted that local factories release pollutants into water courses at different times during the day, causing daily temporal variations in water quality. The results of the analysis are presented and discussed in detail in Maconachie (2007). In addition to the quantitative data collected, interviews were conducted with producers at each site, and their concerns for water quality further suggest that there is an urgent need to ameliorate the considerable health and environmental hazards associated with agriculture in urban and periurban Kano.

The Kwarin-Dankukuru site

At the Kwarin-Dankukuru site, where the Jankara River and Getsi Stream meet, high levels of toxins were revealed in the analysis. Farmers commented that in previous years, large volumes of water from residential areas would dilute industrial pollution, even in the dry season, but due to recent water scarcity, domestic water use and hence residential runoff had been reduced. It was also noted that wastewater from the Bompai industrial estate is released, without any form of treatment, into the Getsi Stream. All the farmers interviewed at Kwarin-Dankukuru expressed great concern about the current environmental state of the site, and the implications that this may have on their health. Farmers could distinguish water toxicity levels by colour and provided detailed descriptions of the temporal variations in water quality.

There are three bad colours [of water] that come at different times. The oily red one and the green one will kill the crops, and when we see these colours in the channel, we turn off our pumps immediately. The bluish water is corrosive and causes a red rash when it comes in contact with the skin. We always wash our hands after we come in contact with the blue water (personal communication, April 2002).

Farmers' observations suggest that there is a clear need for the regulation of industrial contamination by authorities. Whilst some contaminants were found to be present in water sampled from the washbore at Kwarin-Dankukuru, the water was free of heavy metals. Although previous research has revealed traces of these metals in shallow hand-dug wells around the Bompai settlement (Tanko, 1997), no evidence of such contamination was found in the current study, suggesting that deep ground water sources may be a good alternative for farmers in urban and periurban Kano, for the irrigation of their crops. However, longitudinal studies are urgently needed to clarify the health risks for farmers and consumers.

Jakara site

Unlike the water in the Getsi Stream, the Jakara River showed no evidence of pollution by heavy metals. In fact, the Jakara joins the



Urban agriculture around a factory
Photo: Roy Maconachie

Getsi, and thus helps to dilute toxins originating from the tanneries and textile mills in the downstream portion of the Getsi system. However, chemical analysis of water samples from the Jakara revealed that other pollutants, including cobalt, manganese, and iron, were present in high concentrations. Substantial vegetable production takes place with water from the Jakara channel, and farmers report observing colour differences in effluents at different times during the day. The analysis of water samples also reflected these temporal variations in water quality.

Kofar Ruwa site

The Kofar Ruwa production site is situated in the floodplain of a small tributary of the Jakara River, which serves as a drain for urban wastewater from the built-up area. The construction of a sewage treatment scheme in the area has long been abandoned, and the sources that supply irrigation water for vegetable production are heavily polluted and have been flagged as a major environmental and health concern. Interviews with farmers at Kofar Ruwa suggest that concern for the quality of available water was also a significant issue for many farmers. According to one cultivator, both the odour and colour of water sources change periodically at Kofar Ruwa, especially during the dry season, and sometimes the poor quality of irrigation water will "burn" the lettuce and cause it to "dry up". Although no traces of heavy metals were detected in the samples taken at the Kofar Ruwa site, toxicities of some of the domestic contaminants, especially manganese, were detected. In addition, a number of respondents at Kofar Ruwa mentioned that there was a general lack of water in the dry season, and that farmers were frequently forced to use poor-quality water on their plots.

Conclusion

There is currently much cause for concern for periurban farmers in Kano, as industrial and domestic toxins are reaching dangerously high levels and the environmental resources required for farming are becoming increasingly polluted. Water treatment and water supply facilities are virtually non-existent, and the scarcity and prohibitive cost of irrigation water and chemical fertilisers are such that those who engage in urban agriculture are left with no choice but to use contaminated water sources. Local surface water is of vital importance and the shallow ground water supplies found in fadama depressions, where much agricultural production takes place, are highly polluted with urban and industrial contaminants.

Farmers report colour differences in effluents at different times during the day

However, evidence suggests that levels of pollution in urban and periurban water sources vary both temporally and spatially and there may be safer times and locations where agriculture can be encouraged by authorities. There is an urgent need, therefore, for urban agriculture to be carefully monitored, and for improvements in management to be sought. If local authorities were able to harness the beneficial characteristics of domestic wastewater, surface water pollution problems would not only be mitigated, but valuable water resources would be conserved and dependence on commercial fertilisers might be lessened (see Pescod, 1992). However, since the health implications of long-term exposure to toxins are unclear, coordinated longitudinal research involving urban planners, agricultural scientists and health specialists is urgently needed.

Although zoning by-laws in the industrial areas supposedly do exist, they are poorly enforced, penalties for violating industrial standards are very lax, and in some cases they are non-existent. Industrial pollution management capabilities are severely constrained at institutional levels, both financially and technically, and there is a lack of effective implementation of environmental management laws. Market-based incentives to reduce pollution, such as the “polluter pays” principle, or grants, subsidies and tax credits for environmentally friendly behaviour, either do not exist or are ineffective. Responsibility for pollution control enforcement is not clearly defined, and both state and federal governments seem to disagree on who should be liable.

Farmers report colour differences in effluents at different times during the day



Interventions include improved irrigation practices
Photo: IWMI-Ghana



There is an urgent need to monitor urban agriculture and improvements in management.

Substantial investment and community action are needed in urban and periurban waste management.

In short, coordination among environmental agencies is weak and a new concerted programme of action is urgently needed to stimulate effective strategies for the management of the urban and periurban environment. It thus remains crucial that government and institutional actors effectively monitor and enforce both environmental and zoning by-laws, if the health and environmental constraints of urban agriculture are to be overcome, and the future sustainability of production is to be assured.

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Notes

1) See Binns and Fereday, 1996; Binns and Lynch, 1998; Olofin et al, 1997

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