

[Home](#) > [Journal](#) > [Earth & Environmental Sciences](#) > [JEP](#)
[Indexing](#) | [View Papers](#) | [Aims & Scope](#) | [Editorial Board](#) | [Guideline](#) | [Article Processing Charges](#)
[JEP](#) > Vol. 3 No. 11, November 2012



The Quality and Health Implications of Urban Irrigation Water Used for Vegetable Production in the Accra Metropolis

PDF (Size: 1049KB) PP. 1509-1518 DOI: 10.4236/jep.2012.311167

Author(s)

Mark O. Akrong, Seth K. A. Danso, Joseph A. Ampofo

ABSTRACT

The quality of irrigation water from different sources used by urban farmers in the Accra Metropolis was investigated. These were, tap water stored in dugout, surface water (from stream) and wastewater in drains. The samples were analysed for their bacteriological, physical and chemical qualities using standard methods. Analytical Profile Index (API) identification system was used to characterize and identify the bacterial species isolated in the samples. The results showed that heavy metal concentrations in the samples were within the FAO/WHO recommended limits for irrigation. The concentrations of highly toxic Lead and Cadmium were even below detection limit. Total and faecal coliform bacteria loads in all three potential irrigation water sources were above the WHO recommended limit for irrigation. Different bacteria species belonging to seven genera were identified in the three irrigation water sources. These included *Citrobacter*, *Chryseomonas*, *Enterobacter*, *Klebsella*, *Proteus*, *Providencia*, *Pseudomonas*. Generally, the most dominant bacterial species were *Pseudomonas aeruginosa* and *Chryseomonas luteola*. Some of these bacteria spp. can pose a health threat to farmers especially those who have challenges with their health and immune system. For example, infection with some of the bacteria species such as *Pseudomonas aeruginosa* in patients with cystic fibrosis is known to be deadly over periods of time.

KEYWORDS

Irrigation Water; Coliform Bacteria; Enterobacteriaceae Heavy Metal

Cite this paper

M. Akrong, S. Danso and J. Ampofo, "The Quality and Health Implications of Urban Irrigation Water Used for Vegetable Production in the Accra Metropolis," *Journal of Environmental Protection*, Vol. 3 No. 11, 2012, pp. 1509-1518. doi: 10.4236/jep.2012.311167.

References

- [1] P. Drechsel, S. Graefe, M. Sonou and O. Cofie, " Informal Irrigation in Urban West Africa: An overview," Research Report 102, International Water Management Institute, Colombo, Sri Lanka, 2006.
- [2] B. Keraita, P. Dreschsel, and P. Amoah, " Influence of Urban Wastewater on Stream Water Quality and Agriculture in and around Kumasi, Ghana," *Environment & Urbanization*, Vol. 15, No. 2, 2003, pp. 171-178. doi:10.1177/095624780301500207
- [3] T. Asano and A. D. Levine, " Wastewater Reclamation, Recycling and Reuse: Past, Present, and Future," *Water Science and Technology*, Vol. 33, No. 10-11, 1996, pp. 1-16.
- [4] R. G. Feachem, D. J. Bradley, H. Garelick and D. D. Mara, " Sanitation and Disease: Health Aspects of Excreta and Wastewater Management," John Wiley & Sons, Chinchester, 1983.
- [5] WHO, " Guidelines for the Safe Use of Wastewater, Excreta and Grey Water: Wastewater Use in Agriculture," Vol. 2, WHO, Geneva, 2006, p. 219.
- [6] N. Khouri, J. M. Kalbermatten and C. R. Bartone, " The Reuse of Wastewater in Agriculture: A Guide for Planners," 1994.

- [Open Special Issues](#)
- [Published Special Issues](#)
- [Special Issues Guideline](#)

[JEP Subscription](#)
[Most popular papers in JEP](#)
[About JEP News](#)
[Frequently Asked Questions](#)
[Recommend to Peers](#)
[Recommend to Library](#)
[Contact Us](#)

| | |
|------------|---------|
| Downloads: | 301,517 |
| Visits: | 673,910 |

Sponsors, Associates, and Links >>

- [The International Conference on Pollution and Treatment Technology \(PTT 2013\)](#)

- [7] P. H. Gleick, " The Worlds Water 2000-2001: The Biennial Report on Freshwater Resources," Island Press, Washington DC, 2000, p. 315.
- [8] I. Hussain, L. Raschid, M. Hanjra, F. Marikar and W. van der Hoek, " Framework for Analyzing Socioeconomic, Health and Environmental Impacts of Wastewater Use in Agriculture in Developing Countries," Working Paper 26. International Water Management Institute (IWMI), Colombo, Sri Lanka, 2001, 31 p.
- [9] J. Smit and J. Nasr, " Urban Agriculture for Sustainable Cities: Using Waste and Idle Land and Water Bodies as Resources," Environmental and Urbanization, Vol. 4, No. 2, 1992, pp. 141-152.
- [10] R. V. Veenhuizen, " Cities Farming for the Future: Urban Agriculture for Green and Productive Cities," 2006, 2 p.
- [11] G. B. Shende, " Status of Wastewater Treatment and Agricultural Reuse with Special Reference to India and Research and Development Needs," In: M. B. Pescod and A. Arar, Eds., Treatment and Use of Sewage Effluent for Irrigation, Butterworths, London, 1985, pp. 185-209.
- [12] Ghana Statistical Services, " Population and Housing Census: Summary Report of Final Results," Accra, Ghana, 2002, p. 62.
- [13] E. Obuobie, B. Keraita, G. Danso, P. Amoah, O. O. Cofie, L. Raschid-Sally and P. Drechsel, " Irrigation Urban Vegetable Production in Ghana: Characteristics, Benefits and Risks," IWMI-RUAF-CPWF, IWMI, Accra, Ghana, 2006, p. 150.
- [14] www.ghana.govgh/index.php
- [15] K. B. Dickson and G. Benneh, " A New Geography of Ghana," Revised Edition, Longman Group Ltd., Essex, 1995, pp. 17-40.
- [16] P. Amoah, " Wastewater Irrigated Vegetable Production: Contamination Pathway for Health Risk Reduction in Accra, Kumasi and Temale-Ghana," Ph.D. Dissertation, Kwame Nkrumah University of Science and Technology, Kumasi, 2008, pp. 74-75.
- [17] APHA, AWWA, WEF, " Standard Methods for Examination of Water and Wastewater," 22nd Edition, Washington DC, 2001.
- [18] APHA, AWWA, WEF, " Standard Methods for the Examination of Water and Wastewater," 20th Edition, Washington DC, 1995, pp. 3-15.
- [19] APHA, AWWA, WEF, " Standard Methods for the Examination of Water and Wastewater," 20th Edition, Washington DC, 1998, pp. 4-146.
- [20] J. G. Holt, " Bergey' s Manual of Systematic Bacteriology," The Williams and Wilkins Co., Baltimore, 1986.
- [21] BioMerieux sa, " API 20 100/20 160. Identification System for Enterobactriaceae and other Gram-Negative Rods," France, 1998, pp. 1-5.
- [22] R. S. Ayers and D. W. Westcot, " Water Quality for Agriculture," FAO Irrigation and Drainage Paper 29, FAO, Rome, 1985, 174 p.
- [23] M. D. Pescod, " Wastewater Treatment and Use in Agriculture," FAO Irrigation and Drainage Paper 47, Food and Agriculture Organization of the United Nations, Rome, 1992, pp. 125-156.
- [24] P. Ghesquiere, " Indirect Wastewater Reuse for Peri-Urban Irrigation in Kumasi, Ghana. Assessment of Surface Water Quality for Irrigation and Its Implications for Human Health," Thesis Submitted in Partial Fulfillment of a Diploma in Water & Environment, ENGEES, Strasbourg, 1999.
- [25] <http://www.excelwater.com/eng/b2c/impurities.php>
- [26] G. A. Cornish, E. Mensah and P. Ghesquiere, " Water Quality and Peri-Urban Irrigation: An Assessment of Surface Water Quality for Irrigation and Its Implications for Human Health in the Peri-Urban Zone of Kumasi, Ghana," Report OD/TN 95, September 1999, HR Wallingford Ltd., Wallingford, 44 p.
- [27] WHO, " Health Guidelines for the Use of Wastewater in Agriculture and Aquaculture," Report of WHO Scientific Group, WHO Technical Report Series No. 778, World Health Organization, Geneva, 1989, p. 74.
- [28] R. C. Abaidoo, B. Keraita, P. Amoah, P. Drechsel, J. Bakang, G. Kranjec-Berisavljevic, F. Konradsen, W.

Agyekum and A. Klutse, " Safeguarding Public Health Concerns, Livelihoods and Productivity in Wastewater Irrigated Urban and Peri urban Vegetable Farming," CPWF PN 38 Project Report, Kumasi, 2011.

- [29] P. Amoah, P. Drechsel and R. C. Abaidoo, " Irrigated Urban Vegetable Producyion in Ghana: Sources of Pathogen Contamination and Health Risk Elimination," Irrigation and Drainage, Vol. 54, No. S1, 2005, pp. S49 S61. doi:10.1002/ird.185
- [30] P. Drechsel, R. C. Abaidoo, P. Amoah and O. O. Cofie, " Increasing Use of Poultry Manure in and around Kumasi, Ghana: Is Farmers' Race Consumers' Fate?" Urban Agriculture Magazine, Vol. 2,