



## A 12-Month Study of Food Crops Contaminated by Heavy Metals, Lusaka, Zambia

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We investigate heavy-metal contamination of irrigation water used for urban agriculture and subsequent contamination of food crops in Chunga, NW Lusaka, the capital of Zambia. Inhabitants of the Chunga area rely on urban agriculture as both a major source of income and food. From August 2004 to July 2005, monthly samples of irrigation water used and edible portions of food crops were taken from a farmer's plot at Chunga. The food crops (cabbage, Chinese cabbage, pumpkin leaves, rape, sweet potato leaves and tomatoes) are grown using irrigation throughout the year. Irrigation water samples and digested food crop samples were analysed using ICP-MS at the Department of Geology, Colgate University, USA for Al, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Cd, Ba, Hg, Tl, Pb, and U. We find heavy-metal concentrations present in both irrigation water and food crop samples. Zambian sample concentrations were compared to Zambian and international legislative and guideline limits for concentrations of heavy metals in industrial effluent, heavy metals in irrigation water and heavy metals in foods. In irrigation water samples recommended national and/or international legislative limits for Al, Cr, Mn, Fe, Cu, Hg, Pb and U were exceeded. Limits for Hg were exceeded by up to 130 times. There were heavy-metal concentrations above recommended limits in food crops for Cr, Fe, Ni, Cu, Zn, Cd, Hg and Pb throughout the different food crops grown and throughout the year. In all 14 samples recommended limits for Cr, Fe and Hg were exceeded. Zambian legislated limits for food crops were exceeded by up to 16 times for Pb and 58 times for Hg. The results of this study show that heavy metal contamination is present in irrigation water used and food crops grown in urban agriculture in Chunga, Lusaka, Zambia. Recommended maximum limits for heavy metals in irrigation water and food are exceeded in some samples indicating there may be a risk to health.