

Environmental Assessment of the Kassena-Nankana Irrigation Scheme Vis a Vis Microbial Contamination of Tomatoes Produced From Irrigated Farms in the Kassena- Nankana East Municipality

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ABSTRACT

This aim of the study was to conduct an environmental assessment of three irrigation systems in the Kassena-Nankana East Municipality and determine microbiological-quality of tomato crops grown on farms irrigated from study schemes and water used for irrigation. A structured questionnaire and direct observation was used to gather background information from a total of 120 farmers from the study area in order to identify environmental conditions that may be contributing to the contamination of the irrigation water source and tomatoes. A total of 192 samples (96 samples each of water and tomatoes) from the three study sites were collected. Standard methods (Hach Company) were used for the determination of physico-chemical parameters of water samples. The bacteria load/burden (heterotrophic bacteria and coliform count) were determined by the pour plate method while identification of specific pathogens was done using biochemical assay. The study showed that organic fertilizer (poultry manure and cow dung) and pesticides are used by farmers for the cultivation of tomatoes in the study area. High illiteracy rate, lack of training in irrigation, open defecation among the inhabitants, free range system of animal husbandry and poor agronomic practices in the study area were factors for contamination of the irrigation water and tomatoes in the study area.

The measured values of pH for canal water samples ranged from 6.70 - 7.9, while that of the Dam and river water samples ranged from 6.50 - 7.0 and 6.5 - 7.3 respectively. Temperature of the water samples ranges from 26.5⁰C - 29⁰C for canal, 26.7⁰C - 27.9⁰C and 27.13⁰C - 27.7 °c for river water. The mean nitrate levels in the dam water sources were highest with a mean value of (23.35mg/l) and a ranged from 21mg/l - 24.9mg/l. The mean value of nitrate levels in the river water source was 11.77 mg/l with a range of 9.4mg/l-14.3mg/l. Canal water had the least mean nitrate level of 1.62mg/l and a range of 1.10mg/l - 2.8mg/l. The mean fecal coliform count in water samples from Yigwania (River) was highest (1.28×10^7 cfu/100ml) followed by water samples from Doba (dam) 6.14×10^6 cfu/100ml whilst samples from canal were having the least mean faecal coliform levels (3.3×10^5 cfu/100ml). The mean faecal coliform count (cfu/100ml) in irrigation water sampled from the study area was higher than the world health organization (WHO, 2006) recommended level (1×10^3 cfu/100 ml) for unrestricted irrigation of crops. The highest mean fecal coliform count in external

tomatoes parts was in samples from Yigwania (4.48×10^5 cfu/g) followed by samples from Doba (3.535×10^5 cfu/g). Samples from Bonia (canal irrigation) had the least mean fecal coliform count (2.91×10^3 cfu/g). Tomatoes samples from the study area were faecally contaminated with mean faecal coliform levels exceeding the international commission on microbiological specifications for foods (ICSMF, 1974) recommended level of 10^3 fecal coliform per gram fresh weight.

The dominant bacterial species isolated from the water and tomato samples were *Klebsiella pneumonia*, *Staphylococcus aureus*, *Xantomnas maltophilia*, *Escherichia coli* and *Pseudomonas aeruginosa*.

Contaminated irrigation water and insanitary practices In and around irrigation schemes in the Kassena-Nankana East is a major source of microbial contamination of tomatoes with pathogenic bacteria. Public health authorities and other regulatory agencies should intensify their efforts in educating farmers on proper agronomic and sanitation practices as well as monitoring the conditions of sanitation and hygiene round these farms.

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