

Abstract Volume

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The Water Quality Challenge –

Prevention, Wise Use and Abatement

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## Quantitative Microbial Risk Assessment for Wastewater Reuse

in Irrigation and Survey Public Attitude towards Wastewater

Reuses in Saudi Arabia

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### Introduction/Problem Identification

Many parts of the world face shortage of fresh water. Saudi Arabia (SA) is no exception. Most of the SA is arid and freshwater resources are limited. The annual rainfall is less than 150 mm in most

parts of the country. The national water balance estimated for 2010 indicates that demand will be

approximately 18 billion m<sup>3</sup>. Only 4 billion m<sup>3</sup> will be available from natural and other renewable resources. More than 80% of water consumed is in the agricultural sector. Therefore, wastewater reuse

(WWR) for irrigated practices, contributes as a means of integrated water resources management and

also in order to cope with unforeseen future critical conditions that might affect food production. The

WWR in agriculture is receiving increased attention in SA due to the scarcity of fresh water. However,

wastewater generally contains high levels of microorganisms, which may have adverse health effects

on farmers and consumers in addition to public perception of risk associated with the WWR.

### Analysis/Results and Implications for Policy and/or Research

The construction of a QMRA model is an essential component of risk management for any recycled

water irrigation scheme. The study carried out in Al-Hassa, Saudi Arabia where is a projected wastewater reuse for unrestricted-irrigation to supply farms with irrigated water by opened canals. A decision

support tool, which is Recycled water Irrigation Risk Analysis (RIRA), was used to conduct QMRA for recycled water irrigation (Hamilton et al., 2007). The preliminary objective of this study was to

determine the concentration of Escherichia Coli and helminth eggs along part irrigation canals. E coli

water analysis results for samples that were collected from inlet flow point into the canal do meet the

Saudi Water Quality Standards (SWQS). The parameter for the E coli should not exceed 23 colony

forming units (CFU)/100 mL for unrestricted irrigation. However, E coli. concentration increased with distance and travel time along the main and sub-main canals, and exceed the SWQS. Although

the E coli concentrations exceeded the SWQS, The RIRA software indicated that E coli parameters

were in the range of acceptable risk according to 1 in 10,000 annual infections. Contrary to the E coli counts, helminth eggs decreased with travel distance in all investigated canals. Helminth eggs

results exceeded the SWQS for helminth eggs concentration at the flow discharge point. Helminth

eggs results were more than 1 egg/L, and exceeded the probability benchmark for annual infections

risk acceptance.

On the other hand, evaluate the perceived risk to farmers and consumers. Two communities have

been chosen to conduct questionnaires. One of these community experienced WWR and the other

one is not. 500 farmers and 400 consumers from both communities were participated in the questionnaires. Questionnaires revealed that they were not well informed regarding knowledge for nature

of wastewater. Although they were in general positive towards WWR, however, their attitude was

negative when food related applications were mentioned.