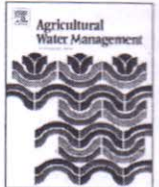




ELSEVIER

Contents lists available at ScienceDirect

Agricultural Water Management

journal homepage: www.elsevier.com/locate/agwat

Long term impact of waste water irrigation and nutrient rates: I. Performance, sustainability and produce quality of peri urban cropping systems



P.S. Minhas^{a,*},¹, Khajanchi-Lal^{a,2}, R.K. Yadav^a, S.K. Dubey^b, R.K. Chaturvedi^a

^a Central Soil Salinity Research Institute, Karnal 132001, Haryana, India

^b Central Soil and Water Conservation Research & Training Institute, RRS, Agra 282 002, India

ARTICLE INFO

Article history:

Received 31 August 2014

Accepted 15 March 2015

Available online 23 April 2015

Keywords:

Wastewater irrigation

Cropping systems

Sustainability

Fertilizer saving

Produce quality

Peri-urban agriculture

ABSTRACT

Farmers in peri-urban areas of developing countries depend on wastewaters for their livelihood but with grave health and environmental risks. An 8-year field experiment compared food grain (FGPS), agroforestry (AFS), fodder (FPS) and vegetable (VPS) production systems and quantified responses to fertilizers (NP 25–100%) when irrigated with sewage (SW; EC 1.3 ± 0.3 dS m⁻¹ BOD 82 ± 11 , NO₃-N 3.2 ± 0.4 , NH₄-N 9.6 ± 0.5 , P 1.8 ± 0.3 , K 6.4 ± 0.4 mg L⁻¹) vis-à-vis groundwater (GW). Productivity improved with SW by 14–28% while trends were negative with sub-optimal NP under GW. Partial factor productivity (PFP) averaged 18.0, 11.1, 157 and 149 kg kg⁻¹ NP with GW in FGPS, AFS, FPS and VPS, respectively. Counter figures were 13.8, 8.8, 96 and 56 kg kg⁻¹ NP with SW. Paddy-wheat equivalent yields were 5.5, 1.8 and 19.9 fold under AFS, FPS and VPS with SW. About 40, 33, 75 and 20% of fertilizer NP with SW was sufficient for similar production as with recommended NP and GW in FGPS, AFS, FPS and VPS, respectively. Quality of produce improved in terms of crude protein and the micronutrients in edible parts with SW while toxic metals were within the permissible limits. However, the keeping quality of vegetables was lowered due to faster decay with pathogens contamination (Aerobic bacterial plate counts 5×10^5 – 4.2×10^8 cfu g⁻¹ and *Escherichia coli* $<2 \times 10^2$ – 7×10^5). Thus, the sewage proved as a vital resource in improving productivity, sustainability and saving fertiliser costs but this may pose health risks because of pathogenic infestation that need to be regulated.