

USE OF DRAINAGE WATER FOR AMELIORATION OF A SALINE-SODIC SOIL UNDER RICE-WHEAT CROP ROTATION

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ABSTRACT

A saline-sodic sandy clay loam field ($EC_e = 24.3-32.3 \text{ dS m}^{-1}$, $SAR = 56.6-77.5$, $pH_e = 8.0-8.4$ for the upper 15 cm soil depth) under rice-wheat crop rotation was put to reclamation by applying drainage water ($EC=3.1 \text{ dS m}^{-1}$, $SAR=15.4$, $RSC=5.9 \text{ mmol L}^{-1}$) for irrigation. The treatments employed were: 1) agricultural drainage water without any amendment, 2) soil-applied spersal (an organic soil reclaimant) @ 15 L ha^{-1} once, 3) soil-applied gypsum @ 50% gypsum requirement of the 15 cm soil depth, 4) H_2SO_4 mixed in irrigation water equivalent to its RSC, 5) soil-applied gypsum @ 100% GR of the 0-15 cm soil depth, and 6) farm yard manure (FYM) addition to the soil annually @ 25 Mg ha^{-1} . After the rice harvest, all the treatments caused a marked decrease in pH_e , EC_e and SAR of soil compared to values before the experiment but the differences among treatments remained non-significant. These soil properties differed significantly with respect to soil depths having maximum decrease in the upper 15 cm depth. The paddy and wheat grain yields were not significantly affected, although the FYM treatment performed better.

INTRODUCTION

Pakistan has the largest continuous gravity flow irrigation system which is capable of handling about 130 billion cubic meters of water for irrigating about 14 million hectares of land. Due to intensity, this seemingly

SAR and RSC of water from sump S1B9 near Dijkot, ranges from 2.93 to 3.38 dS m^{-1} , 12.75 to 19.41 $(\text{mmol L}^{-1})^{1/2}$ and 4.20 to 10.70 mmol L^{-1} , respectively. This quality seems manageable for growing a variety of agricultural crops on nonsaline-nonsodic and salt-affected soils with chemical treatments (Ghafoor and Salam, 1993; Ghafoor *et al.*; 1988, 1989; Chaudhry, *et al.*, 1985, 1986; Chand *et al.*; 1977), conjunctive or cyclic use with canal water (Rhoades, 1988; Miyamoto, 1993).

The development of technology for using drainage water at or near the source will not only increase the horizontal as well as vertical agriculture but will also reduce the disposal problems of the effluent and thus will help reduce environment degradation. Hence field experiment at sump S1B9 in Fourth Drainage Project Area near Dijkot have been started since July 1993 with the following objectives:

1. To assess the feasibility of soil and water treatments for reclaiming a saline-sodic soil.
2. To evaluate the growth response of rice and wheat crops during reclamation.

MATERIALS AND METHODS

The experiment was started during July 1993