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Evaluation of large-scale subsurface drainage system in the Indira Gandhi Nahar Pariyojana Command Area, Rajasthan, India

ROHITASHW KUMAR[1] and MUKESH KUMAR[2]

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ABSTRACT

The present paper describes a large scale field installed subsurface drainage system in the Indira Gandhi Nahar Pariyojana command area in Rajasthan. Utility of subsurface drainage as an intervention to reclaim waterlogged saline lands and to ensure sustainability of irrigated agriculture has been established through experiments and pilot research conducted in waterlogged area. The subsurface drainage systems were evaluated on the basis of hydraulic characteristics of envelop materials, different drainage properties of soil and evaluation of drain spacing equations for disposal of effluent. An attempt has been made to critically review the findings emerging out of such a large number of pilots and subsurface drainage systems projects with a view to identifying management strategies requirement at regional scale. Salient findings that could serve as design guidelines or to operationalize the systems in an effective and eco-friendly manner have been put together for their application in future. The knowledge generated in this paper would help to design and plan subsurface drainage activities on which rests the food and nutritional security of India and many other developing nations.

Key words: Subsurface drainage, design guidelines, pilot research, salinity, waterlogging

INTRODUCTION

The introduction of irrigated agriculture in arid and semi-arid regions of the country has resulted in the development of the twin problem of waterlogging and soil salinization, with considerable areas either going out of production or experiencing reduced yield (Kumar *et al.*, 2009). It is estimated that an area of nearly 8.5 million ha is affected by soil salinity and alkalinity, of which about 5.5 million ha in the irrigation canal commands and 2.5 million ha in the coastal areas (Gupta, 2002). The problem of increasing salinity caused by the rise of the water table and the lack of drainage is considered as a major environmental problem that threatens the capital investment in irrigated agriculture and its sustainability (Kumar *et al.*, 2012).

Agricultural land drainage is a useful intervention in the overall water management activities (Kumar *et al.*, 2012). Effective design of subsurface drainage system requires that soil water movement during drainage be characterized in terms of soil properties, drainage system parameters and boundary conditions (Kumar *et al.*, 2009, 2012, 2013). There are numerous mathematical solutions, which have been proposed for the design of subsurface drainage system under steady and non steady state conditions. These solutions are arrived at by applying analytical or integration or analog techniques. Utility of subsurface drainage as an intervention to reclaim waterlogged saline lands and to ensure sustainability of irrigated agriculture in India has been established through experiments and pilot research conducted for over a century (Gupta, 2002). It is felt that large scale drainage projects would be increasingly implemented in India and many other developing countries (Kumar and Gupta, 2010). The knowledge generated in this century would help to design and plan subsurface drainage activities on which rests the food and nutritional security of India and many other developing nations.

[1]Associate Professor and Head, Division of Agricultural Engineering, SKUAST- Kashmir, Srinagar (J&K);
E-mail: rohituhf@rediffmail.com
[2]Assistant Professor, School of Agriculture, IGNOU, Maidan Garhi, New Delhi