

Integrated Land and Water Resources Management Framework for Hirakud Canal Subcommand (India) Using Gray Systems Analysis

Uday Mandal¹; Anirban Dhar²; and Sudhindra Nath Panda, M.ASCE³

Abstract: An integrated land and water management model incorporating inexact framework is developed for sectorwise and seasonwise planning in the canal subcommand area. The gray systems theory is utilized for defining system parameters and decision variables within the inexact framework. The model considers the objective of maximizing the net annual return subject to optimal allocation of land and water resources for given imprecise information on net return of crop, available resources (land, surface water, and groundwater), and water demand in the cultivable subcommand area. Gray linear programming (GLP) is utilized for solving the optimization problem. The developed model is applied to the Hirakud canal subcommand area of western Odisha, India. The model is evaluated for different scenarios with inexact bounds on available natural resources (land and water) for different crops. The model results show its usefulness in evolving crop-specific land utilization levels and quantities of surface water and groundwater resources for deriving maximum benefit. The model also provides season-specific crop-scheduling information. The evaluation results show potential applicability of the developed methodology. DOI: 10.1061/(ASCE)WR.1943-5452.0000300. © 2013 American Society of Civil Engineers.

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