

APPLICATION OF OPTIMIZATION MODELING IN SUSTAINABLE AGRICULTURAL AND WATER RESOURCES PLANNING: A CASE STUDY

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ABSTRACT

In this study optimization model has been formulated for optimal utilization of water and land resources and maximizing benefits, and solved using MATLAB and applied to Nuh, region of Mewat district, Haryana, India. Four case scenarios, each consists of four criterias, being analyzed and optimal cropping patterns and corresponding optimal operational policies proposed. Net canal water availability, seepage losses, other losses and ground water draft of the study area are 23,595.01, 1367.02, 5898.75, and 2961.767 ha. m respectively. Emission of greenhouse gas N₂O due to the use of fertilizer computed for all the 16 cases and varied between 36738 to 124, 937 kg per year. CO₂ emission due to groundwater pumping varied between 4065 to 176995 tons per year and 2714 to 118, 174 tons per year for diesel pump with 20 and 30% efficiency respectively for different optimal cropping patterns. Different optimal cropping patterns with 87 to 200% irrigation intensity are proposed. Proposed agricultural planning provides various alternatives to planners based on food requirements and storage limitations and emission of greenhouse gases.

KEYWORDS: Optimization, MATLAB, Emission, Cropping Pattern, Operational Policies, Scenario, Criteria