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Water quality index modelling for an administrative block in New Delhi using M-FIS technique

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The problem of ground water quality is more acute in densely populated and industrial areas and on areas where ground water is withdrawn from shallow aquifers in Delhi. Soft computing technique as Mamdani-Fuzzy Inference System (M-FIS) is being used to study the ground water quality for Alipur block. Data for eight different physico-chemical water quality parameters (pH, TDS, Chloride (Cl), Sulphate (SO4), Nitrate (NO3), Calcium (Ca), Fluoride (F) and Magnesium (Mg)) have been used with 39 samples. Mamdani Fuzzy Water Quality Index (WQI), Guidelines given by Canadian Council of Ministry of Environment for Water Quality Index (CCME_WQIG) and Empirical method are applied in order to assess the degree of drinking water resources. The problem of water quality classification can be approached using combination of Degree of Match and the Fuzzy Rule-based System. In M-FIS, input data are categorised into three linguistic terms ("Desirable", "Acceptable", & "Not-Acceptable") based on water quality standards for drinking water, whereas the output data are categorized into six classes (excellent, very good, good, fair, marginal, & poor) based on WQI. Total three models have been developed using three methods/ techniques. Results calculated by Empirical method, is being used as an alternative to the expert knowledge in M-FIS technique. Comparative results have been shown by different graphs with all three methods. Through Performance indices table, CCME _WQI is better than FWQI but still the use of FWQI is recommended for future use because once the model is developed, its FIS file can be used to calculate WQI just be giving the observed values of the input parameters without considering the environmental changes of study area.

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Conserving rainfall runoff and soil to improve productivity of citrus orchards on vertisol

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The higher runoff in monsoon period and soil moisture shortage in post monsoon during critical growth stages induces the poor yield and fruit quality of citrus plants in central India. It is utmost essential to conserve the rainwater in orchards. Rain water harvesting and its efficient use for citrus production is need of the hour for sustainable citriculture in water scarce region. Keeping this in view, the study was conducted to explore the feasibility of rainwater harvesting and recycling the harvested water with drip irrigation at best irrigation regime and mulch for enhancing the productivity of citrus. Various in-situ rainwater conservation treatments viz., continuous trenching, continuous bunding, staggered trenching between the rows across the slope (4.2%) and control (without any soil and water conservation treatment) were evaluated in 1 year-old Nagpur mandarin at Nagpur during 2003-2009. The continuous trenching produced the best response conserving 38% runoff, 32.28% soil, 32.44% N, 27.67% P, and 28.95% K over control, besides 15.7% higher fruit yield with better fruit quality. Moreover, rainfall runoff from 3.2 hectare of land with continuous trenches was harvested in a tank of size 35m×35m×3m and recycled at the best level of irrigation (60% of pan evaporation) through drip with black plastic mulch of 100 micron thickness in 1 ha of Nagpur mandarin. The harvested water also recharged the groundwater in the nearby wells and water from wells was used for irrigation purpose after drying of water in harvesting tanks during May and June. Over all, the fruit yield was enhanced up to 110% with better quality fruits under rainwater conservation practices and groundwater use over rain-fed trees. These studies suggested the combine adoption of continuous trenches, rainwater harvesting in tanks and groundwater recharging through harvested water and use of the water under drip irrigation with black plastic mulch to reduce the water scarcity along with inducing better growth, yield and health of the plants in Nagpur mandarin orchards of central India.

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