

Modeling Effects of Soil Fertility of Nutrients and Precipitation of 22 Years on Sustainable Productivity and Profitability of Pearlmillet and Sorghum Rotation in Semi-arid Vertisols

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Based on experiments conducted during 1988–2009 on rainfed pearl millet/sorghum with 9 treatments in Vertisols, an efficient treatment for sustainable productivity is identified. Twenty kg of nitrogen (N) from farmyard manure (FYM) + 20 kg N (urea) + 10 kg phosphorus (P) ha⁻¹ in pearl millet and 40 kg N (urea) + 20 kg P + 25 kg zinc sulfate (ZnSO₄) ha⁻¹ in sorghum gave maximum yield and rainwater-use efficiency, whereas 20 kg N (FYM) + 20 kg (urea) + 10 kg P ha⁻¹ in pearl millet and 40 kg (urea) + 20 kg P ha⁻¹ in sorghum and gave maximum soil N, P, and potassium (K) over years. The regression model of 20 kg N (crop residue) + 20 kg N (urea) + 10 kg P ha⁻¹ gave maximum R² for predicting sorghum equivalent yield separately through precipitation and soil variables, whereas 20 kg N (FYM) + 20 kg N (urea) + 10 kg P ha⁻¹ gave maximum R² under combined model of both variables. Treatment of 20 kg N (FYM) + 20 kg N (urea) + 10 kg P ha⁻¹ was superior for attaining maximum sorghum equivalent yield of 1062 kg ha⁻¹, net returns of Rs. 4805 ha⁻¹, benefit/cost (BC) ratio of 1.50, and 127 kg ha⁻¹ of soil N, 10.3 kg ha⁻¹ of soil P, and 386 kg ha⁻¹ of soil K over years.