

# LONG-TERM MANURING AND FERTILIZER EFFECTS ON DEPLETION OF SOIL ORGANIC CARBON STOCKS UNDER PEARL MILLET-CLUSTER BEAN-CASTOR ROTATION IN

WESTERN INDIA. CH. SRINIVASARAO<sup>1\*</sup>, B. VENKATESWARLU<sup>1</sup>, R. LAL<sup>2</sup>, A. K. SINGH<sup>3</sup>, S. KUNDU<sup>1</sup>, K. P. R. VITTAL<sup>4</sup>, J. J. PATEL<sup>5</sup> AND M. M. PATEL<sup>5</sup> Central Research

## ABSTRACT:

Soil organic carbon (SOC) pools are important for maintaining soil productivity and reducing the net CO<sub>2</sub> loading of the atmosphere. An 18-year old long-term field experiment involving pearl millet-cluster bean-castor sequence was conducted on an Entisol in western India to examine the effects of chemical fertilizers and manuring on carbon pools in relation to crop productivity and C sequestration. The data showed that even the addition of 33.5 Mg C ha<sup>-1</sup> inputs through crop residues as well as farm yard manure could not compensate the SOC depletion by oxidation and resulted in the net loss of 4.4 Mg C ha<sup>-1</sup> in 18 years. The loss of SOC stock in the control was 12 Mg C ha<sup>-1</sup>. Conjunctive use of chemical fertilizers along with farm yard manure produced higher agronomic yields and reduced the rate of SOC depletion. The higher average seed yields of pearl millet (809 kg ha<sup>-1</sup>), cluster bean (576), and castor (827) over six cropping seasons were obtained through integrated use of fertilizers and manure. For every Mg increase in profile SOC stock, there was an overall increase of 0.46 Mg of crop yield, comprising increase in individual yield of pearl millet (0.17 Mg ha<sup>-1</sup> y<sup>-1</sup> Mg<sup>-1</sup> SOC), cluster bean (0.14) and castor (0.15). The magnitude of SOC build up was proportional to the C inputs. Carbon pools were significantly correlated with SOC, which increased with application of organic amendments. Threshold C input of 3.3 Mg C ha<sup>-1</sup> y<sup>-1</sup> was needed to maintain the SOC stock even at the low antecedent level. Copyright © 2011 John Wiley & Sons, Ltd

.keywords: soil amendments; carbon sequestration; carbon pools; FYM; sustainable yield index; semi-arid tropics; India; soil organic carbon