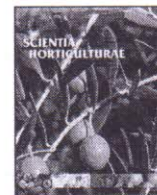




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## Influence of farmyard manure application and mineral fertilization on yield sustainability, carbon sequestration potential and soil property of gardenpea–french bean cropping system in the Indian Himalayas



Dibakar Mahanta<sup>a,\*</sup>, R. Bhattacharyya<sup>b</sup>, K.A. Gopinath<sup>c</sup>, M.D. Tuti<sup>a</sup>, Jeevanandan K<sup>a</sup>, Chandrashekara C<sup>a</sup>, Arunkumar R<sup>a</sup>, B.L. Mina<sup>a</sup>, B.M. Pandey<sup>a</sup>, P.K. Mishra<sup>a</sup>, J.K. Bisht<sup>a</sup>, A.K. Srivastva<sup>a</sup>, J.C. Bhatt<sup>a</sup>

<sup>a</sup> Vivekananda Institute of Hill Agriculture (Indian Council of Agricultural Research), Almora 263 601, Uttarakhand, India

<sup>b</sup> Indian Agricultural Research Institute, New Delhi 110 012, India

<sup>c</sup> Central Research Institute for Dryland Agriculture, Santoshnagar, Saidabad, Hyderabad 500 059, India

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### ABSTRACT

Sustainability of agricultural systems has become an important issue all over the world. Hence, sustainability and climate resilience of gardenpea–french bean cropping system was evaluated by yield trends, C sequestration and emission reduction and soil properties as affected by four application rates of farmyard manure (FYM) (5–20 t ha<sup>-1</sup>) vis-à-vis mineral fertilization, integrated nutrient management (INM) practices as 50% recommended NPK + FYM at 5 t ha<sup>-1</sup> and un-amended control after six years of cropping in the Indian Himalayas. The highest sustainable yield index of 0.606 was achieved with the application of 20 t FYM ha<sup>-1</sup> (FYM<sub>20</sub>). The carbon sequestration potential of FYM<sub>20</sub> plots was about 459 and 193% more than NPK and INM plots, respectively. The same plots reduced 53 and 24% carbon equivalent emission with comparison to NPK and INM application, respectively. The soil cation exchange capacity (CEC) under FYM<sub>20</sub> plots was 22 and 11% higher than NPK and INM plots. The soil cracking volume under FYM<sub>20</sub> plots (57 cm<sup>3</sup> m<sup>-2</sup> area) was very less compared to NPK (324 cm<sup>3</sup> m<sup>-2</sup> area) and INM (154 cm<sup>3</sup> m<sup>-2</sup> area) plots. The morning soil temperature (0–15 cm depth) in coldest week of last year experimentation under FYM<sub>20</sub> plots was moderated by 0.60 and 0.47 °C than NPK and INM plots, respectively. Successive increase of FYM level improved soil organic C, microbial colony formation unit, dehydrogenase activity, bulk density and soil cracking surface area and the best values for all soil properties were recorded under FYM<sub>20</sub> plots. Application of 20 t FYM ha<sup>-1</sup> produced 54 and 29% higher gardenpea equivalent pod yield of the system than mineral fertilization and INM, respectively. The principal component analysis revealed that soil CEC was the most important property (among the selected soil parameters) contributing to the pod yield. Soil organic carbon markedly improved other soil properties as evident from correlations. Organic production system with FYM 20 t ha<sup>-1</sup> could be recommended for climate resilient sustainable yield and better soil property of gardenpea–french bean cropping system than mineral fertilization and INM in the Indian Himalayan regions.