Energy and carbon footprint of cover cropping in a semi-arid irrigated agriculture

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Abstract

The Paris Climate Agreement in 2015 set the goal of limiting global warming below 2 °C by 2100 compared to pre-industrial levels, yet the energy and carbon footprint of individual management practices are not understood very well. This study aimed to evaluate the energy and carbon footprint of cover cropping in a semi-arid irrigated cropping system. The field study was conducted in a randomized complete block design of four treatments and four replications within each phase of a corn-sorghum two-year crop rotation. The size of an individual plot was 12.2 m × 9.1 m. Cover cropping treatments include a combination of grasses, brassicas, and legumes (GBL), grasses and brassicas (GB), grasses and legumes (GL), and no cover cropping (NCC or fallow). The energy inputs and outputs were calculated using energy coefficients and the carbon footprint was estimated using C-equivalent conversion factors in published literature. The energy input was about 24.5 % more in both corn and sorghum with cover cropping than NCC, while the energy output was 13-17% greater in corn and 15-24% greater in sorghum with cover crops than NCC. Similarly, the carbon footprint of cover cropping was two times higher for corn and 1.5 times higher for sorghum compared to NCC. The economic analysis indicated a positive and greater than one benefit to cost ratio making the system feasible economically. Considering the carbon credit program, cover cropping is a feasible and beneficial approach to improve the economic and environmental sustainability of production systems. Cover cropping in semi-arid irrigated regions is economically feasible and more advantageous to crop-fallow in terms of energy efficiency and carbon footprints.

Keywords: Energy efficiency, Carbon footprint, Cover cropping, Benefit-cost ratio, Carbon credit