Title: A Conceptual Ecosystem Services Framework Applied to Emerging Biofuel Production Systems

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Abstract:

Ecosystem services have been widely implemented for a few decades, yet the adopted definitions, classification schemes, and frameworks are not consistent. In particular, soil ecosystem services have high potential of provision of ecosystem services from soil natural capital. The emergence of growing renewable energy markets derived from biofuel feedstocks are expected to alter soil natural capital, land use patterns, terrestrial carbon stocks, and energy patterns resulting in complex responses of environmental and economic systems. Our objectives were to (i) develop a geospatial conceptual model and novel metrics aiming to assess the benefits derived from soil ecosystem services and (ii) apply the model and identify metrics relevant to bioenergy production systems in context of carbon and energy fluxes in the Florida Panhandle. The conceptual framework consists of five inter-related components: (1) soil natural capital, characterized by mass, energy, and organization; (2) ecosystem processes which degrade, preserve or, form a soil-ecosystem; (3) soil ecosystem services divided by four categories; (4) natural and anthropogenic external drivers which influence soil natural capital and related services; (5) benefits from soil ecosystem services to human well-being. The frameworks for the provision of ecosystem services from soils natural capital as well as the framework applied to bioenergy are presented. Preliminary findings suggest that there are positive effects for carbon accumulation in soil ecosystems which may only materialize if sustainable conservation management is employed. The competition between marginal land and prime production land uses to implement biofuel systems will need to be given more attention in future research.

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