

Indicators to support environmental sustainability of agricultural production and bioenergy crops

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Purpose: Indicators that can be used to assess the condition of the environment and to monitor trends over time are needed to characterize conditions under which agricultural land management and uses of resources are sustainable. Relevance: Environmental sustainability can be defined as the capacity of an activity to continue while maintaining options for future generations and considering the environmental systems that support the activity. While decades of research have been applied to environmental indicators, only recently has attention focused on reaching agreement on standard indicators for sustainable productive systems related to agriculture and bioenergy crops. Effective indicators help in the quantification of benefits and costs of management options and resource uses. We identify 19 indicators for soil quality, water quality and quantity, greenhouse gases, biodiversity, air quality, and productivity, building on existing knowledge and on national and international programs that are seeking ways to assess sustainable bioenergy. Together, this suite of indicators is hypothesized to reflect major environmental effects of diverse agricultural and bioenergy production processes. The importance of each indicator is identified and contextual issues that may determine indicator selection and prioritization are discussed. Future research relating to the indicator suite is recommended, including field testing, target establishment, and application to particular productive systems and locations.

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