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A Global BMP Framework Optimizes Fertilizer Management Practices for Water Quality

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Abstract Text:

A global framework describes how management practices contribute to society's sustainability. Fertilizer use can impact water quality. At the same time, it impacts several other facets of sustainability crucial to the future of humanity. This paper describes a framework designed to relate fertilizer best management practices (BMPs) to the goals of sustainable development. Sustainable development places equal emphasis on economic, social and ecological aspects. Such development is essential to provide for the needs of current and future generations. At the practical level, the three general aspects translate into four management objectives applicable to all cropping systems. These four inter-related objectives are productivity, profitability, system sustainability and environmental health (PPSE). Fertilizer BMPs comprise an interlinked subset of crop management BMPs. For a fertilizer management practice to be considered “best”, it must harmonize with the other agronomic practices in providing an optimum outcome in terms of the four management objectives, PPSE. Scientific principles apply to the development, evaluation, monitoring and refinement of BMPs at the farm level. This paper aims to outline those principles. It also discusses the value of attributes including yield, quality, nutrient use efficiency, water use efficiency, energy efficiency, net profit, return on investment, adoption, soil productivity, yield stability, water quality, air quality, nutrient loss, and nutrient balance as performance indicators, and reviews selected benchmarks appropriate to the North American context. A global framework provides a context for commitment of stakeholders including agricultural producers, agri-business, research and extension staff, rural residents and society at large, ensuring acceptance of common goals.

Impact Statement:

Experience indicates that combined efforts produce steady improvements in resource use efficiency in crop production. One example is the improvement in the partial factor productivity for nitrogen fertilizer use on corn. Practical management changes including hybrid selection, planting dates and rates, and site-specific fine-tuning of nutrient applications have resulted in a 50 percent improvement in the amount of corn grain produced per unit of nitrogen applied over the past 30 years. A global framework provides a mechanism for balanced efforts reducing nutrient leaks from cropping systems while maintaining productivity, profitability and system sustainability.