Using Agri-Environmental Indicators to Communicate Risks to Water Quality from Horticulture Production in Ontario

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Improved environmental quality in the agricultural landscape is directly tied to how farmers manage their land. Farmers make management decisions within the context of the constraints in their production systems. Farm constraints include: soil type, variability, and slopes; micro-climate; the crops grown, their rotation, nutrient demand, tillage regime and equipment required; and the economics of viability. Farms with similar constraints can be grouped into defined production systems. Understanding the capacity for environmental improvements at a production system scale allows farmers, farm organizations and policy makers to prioritize and benchmark investment in programs, practice change, research and technology transfer to affect improved environmental performance.

This project developed a practical, systematic and science-based “production system framework” model to evaluate the hypothesis that different production systems have differing capacities to affect environmental improvements. A typology, or rule set, was applied to individual Canadian Census of Agriculture 2011 records to group farms into defined production systems. Census output values for each system were combined with grower practice survey data, the most relevant research literature values, and local climate data to calculate the following water quality and quantity-related agri-environmental indicators: nitrogen balances, phosphorus balances, soil erosion, crop water demand, irrigation water demand and point source wastewater impacts.

Indicator results are presented using three contexts: impact per area, impact per unit yield, and impact per dollar of economic contribution. Fifteen different Ontario based horticulture (fruit, vegetable, ornamental and specialty crops) production systems were evaluated. Ontario horticulture organizations were consulted to ensure the input data are reflective of Ontario production realities and to facilitate the transfer of resulting knowledge to the sectors.

Results demonstrate that different production systems have different priority environmental issues and that the range of impact for one environmental metric can be very broad. For example nitrogen and phosphorus balances were found to vary from below 0 kg/ha to over 3000 kg/ha depending on the production system.