Ag quick CAST

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Reducing the Impacts of Agricultural Nutrients on Water Quality across a Changing Landscape

Supplying external inputs of nutrients such as nitrogen (N) and phosphorus (P) to cropland in order to maximize crop production was first recognized nearly 200 years ago, and today 40 to 60% of [U.S.] crop yield is attributable to fertilizer.

- Although many sources contribute nutrients to water bodies, agriculture remains a significant source in many areas of the United States.
- U.S. agriculture faces an unprecedented challenge—support growing domestic and global agricultural product demands while minimizing environmental impacts on local and regional water resources.

Nutrient loss from agricultural fields and watersheds is determined by the complex interaction among numerous physical, chemical, and biological variables.

- Fertilizers and manures have the potential to elevate nutrient concentrations in surface runoff and subsurface leachate, particularly if applied beyond crop need.
- Research across diverse agricultural landscapes in the United States has shown that hydrological processes are an important component driving nutrient loss.

Nutrient management not only has direct implications for crop productivity, but it can also strongly influence nutrient losses to groundwater and surface water bodies.

- The right source of nutrient is dependent on the nutrient content, its solubility, and whether it is regionally available.
- Nutrient application rates are determined differently for P and N.
- Nutrient placement can have significant implications for both crop uptake and nutrient loss.
- The right timing of nutrient application aims to ensure there is adequate nutrient supply during peak crop uptake and critical crop growth stages.

Conservation practices can be used in combination with nutrient management to decrease nutrient loss from cropped fields.

- Vegetated filter strips, buffers, or riparian zones are often implemented between the edge of an agricultural field and a stream or drainage ditch.
- Integrating single or multispecies cover crops with the primary commodity crop system will decrease the amount of time that fields are left with bare soil.
- Sediment detention basins capture agricultural surface and subsurface drainage water and allow sediment and particulate nutrients to settle out prior to the water entering a stream or ditch.
- Constructed wetlands have the potential to remove nutrients from agricultural drainage water.
- For fields with subsurface tile drainage, drainage water management or controlled drainage can be used to artificially adjust the outlet elevation of the drainage network to a specified depth by restricting flow.
- Both bioreactors and P removal structures have been implemented using various designs and can be installed separately or in series.
- Two-stage ditch systems incorporate benches that function as flood plains in an attempt to restore or create natural alluvial channel processes.

The combined demands of increased agricultural production with reduced environmental impact require management strategies that can be sustained over the long term.

- Current knowledge of N and P rates is imprecise.
- Legacy nutrients may mask water quality impacts of current conservation efforts.
- Most implemented conservation practices do not address dissolved nutrients.
- Few conservation practices provide in-stream nutrient removal.
- Nutrient reductions for both nutrient management practices and conservation practices are field specific.
- Conservation program success requires collaboration and cost-effective implementation.

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- ***GMO Free—The Impact on Consumers, Retailers, Farmers, and the Environment*** (Summer 2019 rollout)
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- ***The Microbiome's Positive Impacts on Crops*** (Fall 2019 rollout)
- ***Ground and Aerial Robots for Agricultural Production: Opportunities and Challenges*** (Fall 2019 rollout)

BORLAUG CAST COMMUNICATION AWARD ANNOUNCEMENT
The 10th Borlaug CAST Communication Award nominee will be announced April 16 at the CAST Spring Board of Directors Meeting. The announcement will take place at the USDA Whitten Building. Dr. Marty Matlock, the BCCA 2018 winner, will deliver the keynote address prior to the announcement of this year's winner. The event will take place at 3:00 p.m.

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