Advantages of bioreactors

- Based on proven technology
- Little or no land needs to be taken out of production
- Do not require a change in drainage practices
- Can be retrofitted to existing drainage systems
- No reduction in drainage effectiveness
- Require little maintenance (changing control structure levels a few times a year)
How much do bioreactors cost?
The average cost of field scale bioreactors installed by the Iowa Soybean Association for 40 to 80 acre drainage areas have averaged $8,000. Although there is currently no financial incentive for producers to install bioreactors, it is hoped that as more is learned about these systems, they will be considered worthy of public funding. In Iowa, the EQIP program currently offers a 50% cost-share for bioreactor installations.

How long do bioreactors last?
The wood chips in the bioreactor should last for 10 to 20 years. At that time the wood chips can be replaced to restore the bioreactor function, or if the producer chooses not to replace the chips, the stop logs can be removed from the control structures and drainage will continue normally.

Bioreactor design criteria
The USDA NRCS in Iowa has an interim conservation practice standard for denitrifying bioreactors (Interim IA-747) that provides some design criteria. The interim standard calls for a design capacity to treat a flow equivalent to a drainage coefficient of 1/8" per day or 20% of the calculated peak flow from the drainage system. Bioreactors should be designed to meet the capacity requirements with a hydraulic retention time (the time it takes for water to pass through the bioreactor) sufficient to achieve the desired nitrate reduction. Current recommendations are for a retention time of 4 to 8 hours. Iowa State University has developed a spreadsheet calculator to assist with bioreactor design (see example spreadsheet).

Why is nitrate in drainage water an issue?
- Although subsurface drainage generally reduces sediment and phosphorous pollution, it often increases losses of dissolved pollutants such as nitrate-nitrogen
- Nitrate is both a human health concern (drinking water) and a cause of surface water impairments
- Excess nitrogen from agricultural land in the Mississippi River basin, particularly from more heavily drained states in the Midwest, is a leading contributor to the hypoxic (dead) zone in the Gulf of Mexico
- EPA has a goal for a 45% reduction in annual nitrogen deliveries to the Gulf by 2015