

**Environmental and economic analysis of switchgrass production
for water quality improvement and alternative energy use in northeast Kansas**

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The major goals of this project were to: 1) determine reductions in sediment yield, surface runoff, nitrogen in surface runoff, and edge-of-field erosion (USLE) associated with producing switchgrass on conventional agricultural acreage in northeast Kansas; and 2) evaluate the break-even cost of producing switchgrass in the Delaware Basin versus conventional commodity crops. In addition, from information gained in the environmental analysis, the magnitude of a potential “switchgrass water quality” payment required to cost-effectively produce switchgrass and utilize it as an alternative energy source for space heating purposes was determined.

Switchgrass production (tons/acre/year) was modeled as a function of varying nitrogen fertilizer input (0, 50, 100, 150, and 200 pounds of nitrogen per acre); between 580,000 and 1.4 million tons of switchgrass could be produced annually across the basin. In all nitrogen input cases modeled, the reduction in sediment yield, edge-of-field erosion, and surface runoff in the basin as a result of switchgrass plantings was 99%, 98%, and 55%, respectively. Average reductions as a result of switchgrass plantings for nitrogen in surface runoff ranged from 65% to 16% (0 to 200 pounds nitrogen).

The environmental savings in the basin would cost between \$20 million and nearly \$36 million dollars per year, and the average annual cost per acre for switchgrass ranged from about \$77 with no nitrogen applied to around \$140 with 200 pounds of nitrogen applied. The edge-of-field cost per ton ranged from around \$33 with no nitrogen applied to a slightly over \$23 at 200 pounds of nitrogen applied. A majority of the switchgrass produced had an edge-of-field cost of \$25 per ton or less. Savings of at least 50% in each of the four environmental variables could be attained for an edge-of-field cost of \$20 - \$24.99 per ton or less.

The magnitude of switchgrass water quality payments needed to achieve delivered energy costs of \$6.00 per MMBtu ranged from a low of \$10.06 per ton (\$61.59 per acre) to a high of \$24.71 per ton (\$52.35 per acre) depending upon the switchgrass yield level.