

# USE OF MARGINAL LAND AND WATER TO MAXIMIZE BIOFUEL PRODUCTION

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The development of sustainable, renewable energy sources has become an issue of increasing importance due to both the recent increase in gasoline prices in the United States and the international scientific consensus to reduce greenhouse gas emissions to mitigate climate change. Advanced biofuels are a primary component of the emerging energy portfolio. To strengthen the nation's energy security, mitigate greenhouse gas emission, and revitalize the rural economy, the Energy Independence Security Act of 2007 mandated the production of 36 billion gallons of biofuels by 2022, of which 21 billion gallons must be advanced biofuels. This mandate would result in an increase in biomass production of approximately seven times the current amount—from 190 million dry tons to 1.36 billion dry tons of biomass. Biomass is a land-based renewable resource and such a significant increase is likely to result in large-scale conversion of land, from current uses to energy feedstock generation, potentially causing increases in the prices of food, land, and agricultural commodities as well as disruption of ecosystems. Further, while a majority of current bioenergy crops are not irrigated, their yield is usually dependent on water availability. This study evaluates sustainable production of bioenergy crops through the use of marginal land and impaired water and discusses the potential for growing cellulosic biofuel crops such as poplar and switchgrass in optimized systems such that (1) marginal land is brought into productive use; (2) impaired water is used to boost yields; (3) clean freshwater is left for other uses that require higher water quality; and (4) feedstock diversification is achieved that helps ecological sustainability, biodiversity, and economic opportunities for farmers.

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**KEY WORDS:** cellulosic biomass, biofuels, marginal land, poplar, sustainability, water

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