Dedicated Energy Crops (DECs) are expected to play a significant role in the large-scale deployment of biofuels and biopower. Ceres, Inc. has become a world leader in the development of energy crops that can serve as both biofuel and biopower feedstocks, including *Panicum virgatum* (switchgrass), Miscanthus, sweet sorghum and high biomass sorghum. Economic success will likely dictate that these crops will be grown on low-rent land where food crops or other high-value uses are limited. Fitting with this demand, these C4 grass crops possess many desired traits for this nascent industry, including low water use, high nitrogen use efficiency, and robust growth on marginal lands compared to the 1st generation biofuel crops like corn and sugarcane. Still, the use of transgenes to improve performance, yield, and sustainability in order to meet the demands placed upon biomass sources is already under development in DECs, and transgenic improvements are likely to be essential to accelerate the economic viability of their adoption. Each of these genetically modified crops brings a unique set of opportunities and challenges associated with commercial deployment, including governmental regulations, farmer adoption, and environmental stewardship. These issues will be discussed for each species.