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Economic Viability and Environmental Impact of Processing Arid Crops in the American Southwest

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Abstract: Drought represents a significant risk for agricultural producers in the American Southwest. One method for limiting this risk is planting high value crops that are drought resilient. Two such crops, Guayule and Guar, are native to arid climates and produce a broad range of valuable products including natural rubber, guar gum, and biofuels. This work outlines two process models used to evaluate the efficiency of converting raw Guayule and Guar biomass into final products. The process models are leveraged to develop life cycle (LCA) and techno-economic analyses (TEA) that will be used to evaluate the social, environmental and economic feasibility of integrating these crops into the American Southwest. From these models, output parameters optimize agricultural production and validate regional macroeconomics. Initial results have shown that the heat used to extract valuable components of biomass represents the single highest process energy demand. From this finding, we have modeled heat integration and diverted a portion of bagasse coproduct for on-site heat generation. For the remaining bagasse, processing pathways have been identified that will generate high value fuels while minimizing required processing energy and cost. Remaining objectives include determining a coproduct pathway for resins. This modeling has demonstrated the potential to optimize processing for arid crops such as Guayule and Guar while simultaneously outlining potential pathways for decreasing agricultural risk in the face of continuing drought

***Keywords**:* Sustainability, economics, life cycle analysis, agriculture, arid crops