Feasibility study for evaluating the potential of biochar as an economically viable agricultural component in Michigan's bioeconomy

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In the State of Michigan, 53% of land is covered in forests. The forest products industry is built upon 20 million acres of land with 150 registered foresters and more than 800 logging and trucking firms. However, in these forested lands, there is a significant proportion of non-merchantable and low-value biomass left on the forest floors. These residues are of no use, but they do increase the risk of fire hazards and diseases. Our study aims to procure this biomass to produce biochar, specifically using logging and pulpwood residues, and create a framework for the supply chain process using transportation network analysis. We intend to conduct a life cycle assessment subsequently to analyze the potential environmental and economic impacts biochar leaves behind for landowners, foresters, and farmers in the industry. Biochar is a charcoal like substance produced through the decomposition of biomass in the absence of oxygen, which has shown to have great carbon sequestration potential. Our preliminary results have indicated that hauling time and distance heavily influence costs incurred during the transportation of biomass to a centralized biochar producing facility. In addition, competition for feedstock with biomass power plants, social and economic demography of a region also influence the demand and price for biochar in the market. Our research plans to explore how these components affect different stakeholders in the potential biochar industry. We expect to support landowners, foresters, farmers, and policy makers better understand the role of biochar towards building a sustainable bioenergy based circular economy in Michigan.

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Nafisa Nowshin Ahmed is a first-year master's student at The Department of Forestry under The College of Agriculture & Natural Sciences, in Michigan State University. She is currently a graduate student at the Natural Resource Economics & Social Sciences Lab and is studying biochar from an economic and environmental sustainability perspective. Her research topic deals with identifying geographically and economically feasible locations in Michigan for supplying biomass to produce biochar followed by conducting a life cycle assessment (cradle-to-grave method) to analyze its environmental impacts and carbon sequestration potential. Nafisa has a background in Electrical & Electronic Engineering with a specialization in renewable energy and aspires to build a long-term career working with SDG7 (Affordable & Clean Energy) and SDG13 (Climate Action).