Feedstocks Logistics
Sustainability, Input Requirements, etc.
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Feedstocks Logistics and Sustainability – General Perspectives

Kevin J. Shinners – Professor – Department of Biological Systems Engineering – University of Wisconsin

Feedstock logistics is the supply chain between feedstock production and conversion. Logistics involves feedstock harvest, processing, storage, and transport. Processing can include, but not be limited to, size-reduction, densification, and on-farm biochemical pretreatment. Typically feedstock logistics is considered to begin at harvest and not include crop establishment or maintenance prior to harvest. The costs associated with feedstock logistics can be a significant fraction of the supply chain for many feedstocks, so research and development to improve logistics systems adopted from other agricultural systems is critical. Feedstock logistics systems could have a profound impact on sustainability, so an important component of research to improve the economics of feedstock logistics must also address environmental sustainability.

Define sustainability for feedstock logistics and how does this connect with the general issue of feedstock sustainability?

Feedstock harvest, processing, storage, and transport must be conducted so that the entire feedstock chain can be sustained over time. Any feedstock logistic system must have a manageable impact on the environment while also being economically viable to all participants throughout the value chain. Producer participation in feedstock production is highly dependent upon it being a profitable enterprise across many years. The production system also cannot have negative impact on the long-term health on the land which is the enterprises most important asset. Capital for conversion infrastructure, including transport and refining systems, will not be made available unless there is reasonable confidence that the feedstock supply system will be sustainable through the life of the facilities. An important balance must be struck between the desire to drive feedstock costs as low as possible, which often involve practices that are unsustainable, and the adoption of logistics practices that are highly sustainable but challenge the economic viability of biomass as an energy source.

How does feedstock logistics impact sustainability?

One of the most important aspects of feedstock logistics is the amount of mass removed per unit area. Generally, the cost of feedstock is reduced when high yield per unit area is achieved. High yields help dilute fixed costs of land, equipment and structures over more tonnage; it dramatically reduces the transport distance and cost; and it makes larger conversion facilities more cost effective, helping to promote economies of scale. High

biomass yields also reduce the agricultural land area diverted from food production. However, high yields also may have negative impacts on soil fertility, organic matter and erosion. High yields are also generally associated with high levels of inputs from fertilizer and chemicals. Many proposed feedstock logistics systems currently being proposed will be challenged to meet sustainability goals by the number of operations involved. Successful and sustainable biomass feedstock logistics systems of the future will evolve into those with the fewest number of operations. No matter the yield obtained, logistic systems for biomass crops must contribute to an overall positive energy balance for the derived fuel, they must have less environmental impact than the fossil fuels they replace, and they must be economically viable and competitive with alternative energy sources.

How do feedstock logistics vary between oilseeds, starch, and sugar products and forest products?

Feedstock logistics systems for oilseeds and starch products are well established and mature. Improvements can always be made to these systems, but these will be incremental. Currently, logistic system adopted from current hay and forage systems are being proposed for cellulosic feedstocks. However, the sustainability of these systems is challenged because they involve equipment with insufficient capacity, they involve too many operations, and they often produce undesirable physical and chemical properties in the delivered feedstocks. Research to develop improved variations of existing systems is needed to produce sustainable cellulosic feedstock systems. It is unlikely that a single national standard for cellulosic feedstocks will be viable because of regional agronomic and climatic differences. However, feedstock logistics systems that cut across many crops and regions but leverage a common core of equipment, storage practices and transportation schemes will likely be the most economically sustainable.