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

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In October 2008, the interagency Biomass R&D Board published the National Biofuels Action Plan[1] to facilitate Federal cooperation to help evolve bio-based fuel production technologies from promising ideas to competitive solutions. It was by no accident that one of the action areas chosen was Feedstock Logistics. Furthermore, Sustainability was an action area and because of it's importance, was also integrated into the other areas including logistics.

Feedstock logistics is usually defined as the supply chain between feedstock production and conversion. It involves harvesting and/or collecting, often some type of preprocessing and sometimes densification, transportation, and sometimes storage either at production site, at an intermediate area, or at the conversion facility. Feedstock logistics can be the highest cost component of the supply chain for certain feedstocks, and in many cases, an area of environmental and social concerns with long-term impacts and sustainability connotations.

There are both challenges and opportunities for using cellulosic feedstocks for aviation fuels. Feedstock logistics is an area of importance because of its key economic and environmental implications. Additional science and new technologies are needed to ensure that aviation biofuels and all other biofuels can be harvested and transported both economically and sustainably.

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

Sustainability usually has environmental, social, and economic aspects which in effect mandates that the harvest, preprocessing, transport, and storage be done in such a manner that these supply systems can be sustained over time. In effect, such supply systems have to be economically viable, accepted by the public, and have minimal, acceptable negative impacts to the environment. However, as in all supply chains, the interactions and dynamics among ecological, biological, mechanical, and social systems are very complex. The feedstock logistics component is a critical component in feedstock sustainability, but not one to be taken out of context of the entire supply/conversion chain. When defining, understanding, and managing sustainability, feedstock logistics

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[1] National Biofuels Action Plan, 2008. http://www1.eere.energy.gov/biomass/pdfs/nbap.pdf

has to be addressed as an integral part of the entire production, conversion, and use components. However, there are specific functions and activities in the logistics supply chain that can be and should be addressed to improve the supply system and ensure sustainability.

How does feedstock logistics impact sustainability?

There are a myriad of aspects as to the sustainability of feedstock logistics for the production of biofuels. For discussion purposes, the following are highlighted:

- Positive energy ratio – the supply system provides more renewable energy from the feedstocks than fossil energy it uses.
- Reduces greenhouse gases – the supply system contributes fewer emissions so than the LCA of the production, conversion, and use cycle has less emissions than comparable fossil fuels.
- Reduces or mitigates environmental impacts – the supply system does not do irreparable damage to the ecosystems or long-term accumulative land degradation.
- Viable economics – the supply system can be financially self-sustained while delivering feedstocks at a competitive price.

Feedstock logistics has two major interfaces that are often scrutinized for sustainability. One is the land interface – the integration of the mechanical systems with the ecological systems. The other is the raw material transportation interface – the delivery of feedstocks has emissions, fossil fuel usage, air quality, and social aspects such as safety and health that can be significant.

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

Both the agricultural and forestry operations and logistics components of the supply chain have matured and advanced considerably in the past 50 years – reaching unheralded technological achievements in production and cost efficiency. In both sectors, where biofuels feedstocks are or are similar enough to conventional feedstocks for other commodities, there are capable systems already in place. This does not mean that they cannot be improved or even tweaked for additional attributes such as emissions reductions, especially as related to biofuels feedstocks.

There are needed improvements in "new" feedstocks operations in both areas, especially for agricultural residues and forestry residues and small-diameter trees. Systems have not been optimized for these feedstocks. An example is the **Uniform-Format Solid Feedstock Supply System**[2] where agricultural system efficiencies can be gained by comminuting the feedstocks to small size for improved bulk handling.

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[2] DOE, https://inlportal.inl.gov/portal/server.pt/gateway/PTARGS_0_1829_37189_0_0_18/Executive_Summary_Final_w_cover.pdf