

Woody Biomass for Energy in Michigan

TOPICS FOR DISCUSSION AND INQUIRY

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What is Woody Biomass?

Stated most simply, biomass is tissue produced by living organisms. In an ecological sense, it is usually measured in dry weight per unit area, such as tons per acre. In a forest, trees produce huge amounts of biomass. Wood is one form of that biomass, along with leaves, bark, flowers, fruit, etc. Woody biomass has been used by humans for millennia for a variety of purposes. Wood is one of the most common (and ecologically friendly) raw materials that society uses. In current markets, and with growing concerns about carbon and fossil fuel consumption, biomass has come to mean a potential alternative fuel source for energy. Of course, woody biomass has been used as an industrial and residential fuel for a long time. Yet, emerging technologies are changing the face of that market.



*Northern hardwood forest,
the most common forest type in Michigan.*

Within this energy context, biomass can mean corn for ethanol, manure for methane gas, agricultural residues (such as corn stover or leftover sugar cane called bagasse), purpose-grown plants such as switchgrass or *Miscanthus*, municipal solid waste, and a wide variety of materials from trees. Cellulosic biomass refers to the parts of plants that contain cellulose, a complex sugar and the **main component of wood** and many other plant tissues. The quantity of biomass from each of these pools varies with geography, and all may be important in the quest to reduce our collective consumption of fossil fuels.

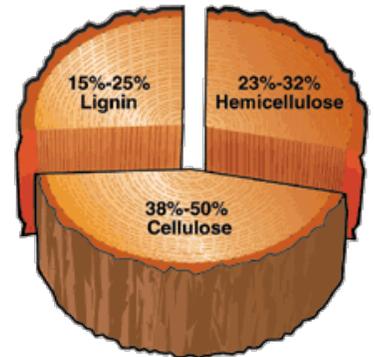
Woody biomass, or forest biomass, also comes in a variety of forms as forest products. Wood chips may be the most common. Chips may contain bark and leaves, or they may be wood only. Large grinders process harvested trees, or portions of trees, into a finer material. Shredders make another size and shape of forest-processed product. Logging slash, the leftover tops after higher value pulpwood and sawlogs are removed, can also be bundled to concentrate the volume for more economical transport.

Sometimes slash is the main source of woody biomass. In other operations, the whole tree or just the main stem might be the main source.

The biomass that supplies a particular mill or plant is called **feedstock**.

The kind of product manufactured in the woods is important to mills that produce the next value-added product, such as pellets, heat, power, ethanol, or chemicals. In addition to various kinds of chips, grindings, shreddings, bundles, etc., the species mix can make a difference. For example, broad-leaved trees

(hardwoods) have characteristics different from needle-bearing trees (softwoods). Like a pulp mill, a pellet mill or ethanol plant may require bark-free material. A District Energy plant or Combined Heat and Power (CHP) plant may accept a wide range of forest products mix, such as that used by the current forest industry to feed its boilers.



What is wood made of?



Harvesting processor at work.



Piles of shredded wood at a large pellet manufacturing facility.

geographical distribution of forests and forest types, ownership patterns, procurement systems, and other variables.

In current forest industry operations, supply chains have considerable variability. With emerging markets for woody biomass, these more traditional supply chains will need to be better understood and modified.

Much of the wood harvested in the Great Lakes States is done using a cut-to-length system. High-tech **harvest processors** manufacture pulpwood and sawlogs in the forest. Forwarders then pick up the logs and move them to a landing, where the logs are loaded onto trucks and then delivered to area pulp mills or sawmills.

Technologies to harvest, process and transport logging slash or whole trees have yet to be fully developed and made economical, especially in northern hardwood (maple, beech, yellow birch, basswood) stands, where thinning and selection harvest maintain high-value residual trees. Certain biomass-processing systems have been around for decades, such as chippers and grinders. Europe, especially the Scandinavian countries, has woody biomass harvesting systems that work well in forest types in those regions. However, the applicability to North American forests is not always direct, and changing the way business is done normally takes

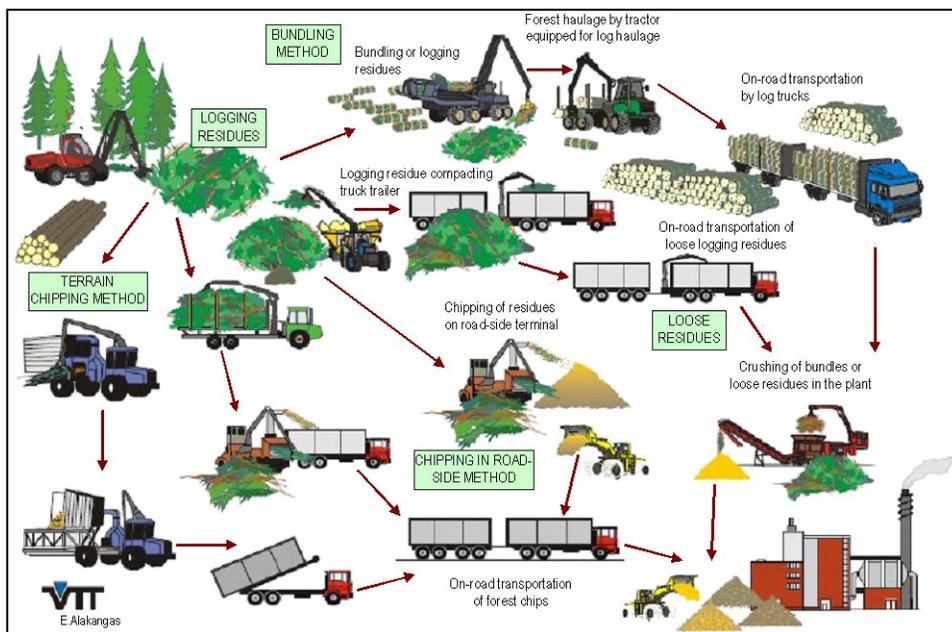
Many methods exist to process woody biomass into some sort of feedstock. Much of the **handling and processing** can occur in the forest. In other cases, processing may occur at a mill site to better control feedstock specifications. The movement of woody biomass from the forest to the mill is called a supply chain. Supply chains can be complicated or simple, depending on what form of feedstock is needed and what sort of demands a particular mill might have. Other factors include the condition of the logging infrastructure, the transportation network, the

time.

Feedstock supply chains serving the emerging woody biomass energy industry, in many situations, will likely be structured differently than those the current forest industry employs. The manner in which woody biomass is purchased, processed, and transported will change.

Research and experience will determine which ways will work best in the emerging market for woody biomass.

¹ Alakangas, E., 2005. VTT (Technical Research Center of Finland). Madlener, R. and M. Parikka (eds.) In "Energy Wood Production Chains in Europe". Madlener, R. and M. Parikka. 2005. (Echaine Consortium.) page 23. 93 p. [graphic on p. 23].



Wood biomass supply chains, Source: E. Alakangas, VTT Finland.¹



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