



A CASE STUDY FOR A BIOMASS LOGGING OPERATION

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With the recent prices of oil and gas having increased substantially, biomass from forests has generated substantial interest as an energy source. Several potential bio-energy projects in different, preliminary stages of planning in East Texas could need substantial supplies of woody biomass. Logging contractors may ask 1) what does it take to start a logging business for woody biomass, 2) how much does it cost to produce, and 3) is it profitable? Potential customers may want to know what the delivered price may be. To answer these questions, Texas Forest Service presents the following case study and attached spreadsheet of itemized costs of a logging business for woody biomass.

Woody biomass is broadly defined as any part of a tree or a shrub that can be used for fuel or chemical production. A more narrowly defined and practical definition is all fiber excluding wood that would be traditionally used for commercial production such as pulpwood and sawlogs. Within this definition, there are three types of woody biomass: mill residue, logging residue, and small diameter trees. Mill residue collectively refers to chips, sawdust, and bark that are generated in the process of producing primary wood products such as lumber, veneer, and pulp chips. However, mill residue is largely already marketed and many see its availability as uncertain. Logging residue includes tree tops, limbs, stumps, and unused rough or rotten trees from logging operations for pulpwood or sawlogs. Small diameter trees are trees that are not big enough to meet a minimum pulpwood standard.

This case study is focused on a logging business for whole-tree chipping of small diameter trees. In East Texas, there is an abundance of pine stands that are between 6-12 years old, many of which need thinning. In the absence of a biomass market, thinning of these small diameter trees for stand improvement would normally be done at a financial loss, since there is no commercial value for the thinned material. The need for woody biomass may provide an opportunity to make pre-commercial thinning financially feasible.

Basic assumptions of this case study include:

- Five year length of project
- All machinery purchased new
- Residual values of the machines are about 25% of the initial purchase costs after five years
- The interest rate for project capital is 10%

To start a biomass logging business from scratch, approximately \$755,000 of initial capital investment is necessary. The machines needed for this project include a feller buncher, grapple skidder, whole tree chipper, bulldozer, and two service trucks. Taking into account the residual value of the machines, the average annual cost of the machines, including initial purchase costs and loan interest, is \$128,601. The typical models of the machines with the power adequate for the job and their costs are listed in the following table.

Table 1. Fixed Costs for Biomass Logging

Item	Model	Horse Power	Cost
Feller Buncher	Hydro Ax 470 (Blount)	123	\$150,000
Grapple Skidder	Caterpillar 525B	175	\$175,000
Whole Tree Chipper	Mobark 30/36	440	\$220,000

Bulldozer	John Deere 650J	100	\$110,000
Service Truck	Ford F550 4x4	300	\$70,000
Service Truck	Ford F250 4x4	362	\$30,000
Total Capital Investment			\$755,000

Assuming 240 working days per year with an average of 10 hours per working day, the total working hours per year is 2,400 hours. The machines are capable of producing 20 green tons of biomass per hour on average. The total annual production of biomass would be about 48,000 green tons.

A crew of 4 people, including a crew foreman and three operators, is needed. The wage and benefit cost for each crewmember is \$150/day, and the foreman cost is \$250/day.

Other operating costs include fuel, lube, repair and maintenance, major parts, insurance, and others. The annual total operating cost is \$506,905. About \$250,000 operating capital should be sufficient to cover the project operation. This means that the owner of the business may need to obtain approximately \$1 million in the beginning of the project to cover the need of capital investment and operating funds.

The annual operating costs by item are listed in Table 2.

Table 2. Operating Costs for Biomass Logging

Item	Explanation	Annual Cost
Repair & Maintenance	100% of the depreciation	\$113,250
Diesel Fuel	0.03g/hp-hr, \$2.20/g off-highway diesel	\$141,039
Lube	40% diesel costs	\$56,416
	mainly tires for FB, skidder, and chipper	
Large Parts (Tires, etc.)	\$9,000 per set, 3 sets every 2 years	\$16,200
Insurance Premium	4.5% of the machine costs	\$33,975
Crewman Wages and Benefits	\$150/day x 3 persons x 240 days	\$108,000
Manager Wages and Benefits	\$250/day x 1 person x 240 days	\$60,000
Other costs		\$12,000
Total Operating Costs		\$540,880

Note: some of the parameters are taken from MRCalculator.xls, <http://www.srs.fs.usda.gov/forestops/download.htm>

The annual total cost, obtained by adding annual capital cost and annual operating cost, is \$669,481. Dividing the annual total cost by the annual biomass production, per ton biomass logging cost is \$13.95. Dividing the annual total cost by the total number of hours per year, the average hourly cost is \$278.95.

Transportation cost is also included. Hauling biomass has its own complications and can be contracted or run as a separate business. This case study uses a prevailing cost of biomass hauling of \$0.15 per ton per mile. For a truck hauling 25 tons of biomass for 50 miles to the mill, it would cost \$187.50, or \$7.50 per ton.

For a biomass logging business, the break-even price for biomass under this case study would be the total logging plus hauling costs, or \$21.45 per ton delivered. This price does not include any payment to the landowner, and assumes landowners provide the stumpage for free in exchange for the stand improvement benefit from thinning. For some premium that covers unaccounted cost in the production process, for some reasonable profit, or if payment to the landowner is required, the delivered biomass chip price could be \$25/ton or higher.

The costs of woody biomass production presented in this case study are likely at the high end of biomass operations in East Texas. Mill residues, if available, should be the lowest cost woody biomass as there is no harvesting cost involved. The cost for collecting logging residues such as tree tops and limbs should be lower than whole tree biomass harvesting because only skidding, chipping, and transportation costs are needed.

One limiting factor could be landowner willingness or availability for pre-commercial thinning operations. Combining biomass operations with conventional operations can reduce the cost of biomass harvest, and is a likely and practical scenario. Purchasing used equipment may also reduce the total capital requirement in the beginning of the project, but may not necessarily save money overall. With the current lack of a biomass market in Texas, a biomass logging business may need certain long-term commitments from the biomass buyer in order to start the business.

Additional information on biomass in East Texas, including *Biomass from Mill Residue and Logging Residue in East Texas, 2003*, as well as data on tons of small-diameter trees available by county in East Texas, may be obtained by contacting Texas Forest Service.