

Supplemental Information

Life Cycle Inventory used in Simapro

Table 1. Inventories of forest residues collection

	Amount	Unit	comment
Output	1	hr	
Forwarding of forest residues			
Input (material and fuel)			
Forwarder	6.849315E ⁻⁵	P	Assuming service life is 14600PMH [1]
Lubricating oil	0.5146	Kg	[2]
Diesel, low sulfur	10.5876	Kg	Density of diesel 0.84kg/l (SimaPro database).

Table 2. Inventories of forest residues transport

	Amount	Unit	Comment
Output (Transport, long-haul truck)	1	tkm	Road transport
Input (material & fuel) Diesel at refinery, l/U.S.	0.0268	kg	Density of diesel 0.84kg/l

Table 3. Inventories of biomass chipping

	Amount	Unit	Comment
Output			
Chipping of biomass by Biber 92			
Input (material and fuel)			
Diesel ,low sulfur	60.6816	Kg	Density of diesel 0.84kg/l.
Lubricating oil	0.9245	Kg	Source (Ecoinvent database)

Table 4. Inventories for coal mining (Data source: SimaPro US LCI database)

	Amount	Unit	Comment
Output			
Coal, at mine	1	kg	
Input (from nature)			
Coal	1.1602	kg	In ground
Inputs from technosphere (material/fuels)			
Coal combusted in industrial boiler/US	4.31E-04	kg	
Diesel, combusted in industrial boiler/US	8.80E-03	l	
Electricity, at grid, US/US	3.87E-02	kWh	
Gasoline, combusted in equipment/US	8.36E-04	l	
Natural gas, combusted in industrial boiler/US	1.62E-04	m ³	
Residual fuel oil, combusted in industrial boiler/US	8.70E-04	l	
Emissions to air			
Methane	3.99E-03	kg	
Particulates	1.63E-03	kg	
Volatile organic compounds	2.57E-05	kg	

Table 5. Logging and mill residues in southeast Texas, 2008 [3]

County name	Produced logging residue (green ton)	Produced mill residue (ton)	Distance from WA PARISH (mile)
Angelina	235157	634150	159.2
Chambers	16141	6703	84.2
Grimes	7970	215	92.4
Hardin	108678	102774	128.9
Harris	16393	711	38.1
Houston	84306	10349	143.5
Jasper	158481	405188	168.4
Jefferson	2774	192	110.9
Leon	12452	429	149.4
Liberty	120159	194116	85.6
Madison	3389	1230	136
Montgomery	44230	71589	74.4
Newton	169244	125052	198.7
Orange	6222	14797	137.3
Polk	189728	739228	116.1
Sabine	60828	665755	202.8
San Augustine	65364	27150	193.4
San Jacinto	65395	89652	91.6
Trinity	75588	66000	139.4
Tyler	168533	110331	147.9
Walker	70005	90167	108.5
Waller	1429	52	56.2
Southeast Total	1682467	3355831	Average:125.57

Table 6. Logging and mill residues in northeast Texas, 2008 [3]

County name	Produced logging residue (green ton)	Produced mill residue (ton)	Distance from WA Parish (mile)
Anderson	48353	23004	187.7
Bowie	39827	378418	324.5
Camp	11791	4214	279.1
Cass	126136	239423	296.6
Cherokee	158425	116503	194.6
Franklin	4369	774	299.7
Gregg	38752	744	243.8
Harrison	102787	137145	254.8
Henderson	13364	2224	214.1
Marion	58291	98381	268.4
Morris	12561	4547	292.9
Nacogdoches	120268	380088	179.5
Panola	101027	100053	228.1
Red River	66090	43240	338.1
Rusk	102518	394137	218.1
Shelby	58699	87699	211.3
Smith	80915	14106	230.2
Titus	17707	31588	300.5
Upshur	37573	11693	260.07
Van Zandt	2438	764	257.5
Wood	22004	12200	271.2
Northeast Total	1223894	2080946	Average:254.79

Table 7. Crop residues in Texas at 2007

Biomass source	Acres	Dry Tons/acre	% of Acreage collected	Total dry ton/crop
Wheat	3800000	1	10%	380000
Corn	847200	2	10%	169440
Grain Sorghum	469000	1	10%	46900
Rice	145000	1	40%	58000
Cotton	4724000	0.26	25%	307060
Total dry tons				961,400

Table 8. Top ten counties in Texas for corn production at 2009 [4]

County	Acres	Distance from WA PARISH (mile)
Dallam	133500	712
Castro	129500	613.3
Hartley	122000	694.6
Williamson	100000	200.3
Parmer	93300	619.5
Jackson	89000	84.3
Sherman	85100	695.4
Lamb	77300	587.4
Falls	72700	171.4
Hill	71000	228.6

Table 9. Top ten counties in Texas for cotton production at 2009 [4]

County	Acres	Distance from WA PARISH (mile)
Hale	312200	570
Lubbock	297500	538.8
Hockley	249000	561.3
Floyd	246500	558.2
Crosby	244500	522.7
Lynn	239900	516.7
Gaines	203200	542.7
Lamb	201800	587.3
Terry	163500	539.4
Dawson	154500	500.4

Table 10. Top ten counties in Texas for grain sorghum production at 2009 [4]

County	Acres	Distance from WA PARISH (mile)
Nueces	168000	199.5
Willacy	151000	290.9
Hidalgo	137000	312.7
Cameron	115000	324.4
Lynn	78100	516.7
Terry	70800	539.4
Lamb	60000	587.3
Deaf Smith	58000	668.3
Swisher	55500	603.9
Hockley	55000	561.3

Table 11. Top ten counties in Texas for wheat production at 2009 [4]

County	Acres	Distance from WA PARISH (mile)
Deaf Smith	217000	668.3
Hansford	216000	671
Jones	183500	393.6
Parmer	183000	619.5
Knox	181200	456.1
Haskell	176400	423.7
Ochiltree	168200	646.1
Castro	160000	613.3
Wilbarger	154300	445.7
Swisher	153600	603.9

Table 12. Top ten counties in Texas for rice production at 2009 [4]

County	Acres	Distance from WA PARISH (mile)
Wharton	38000	40.4
Colorado	31800	61.5
Matagorda	19700	64.3
Jefferson	17500	111.4
Brazoria	15200	37.8
Chambers	13100	84.7
Jackson	9900	84.3
Liberty	7600	85.4
Waller	6300	57.6
Fort Bend	5700	16

References

1. Thakur, A., C.E. Canter, and A. Kumar, *Life-cycle energy and emission analysis of power generation from forest biomass*. Applied Energy, 2014. **128**: p. 246-253.
2. Klvac, R., S. Ward, P.M.O. Owende, and J. Lyons, *Energy Audit of Wood Harvesting Systems*. Scandinavian Journal of Forest Research, 2003. **18**(2): p. 176-183.
3. VanderSchaaf, C.L., *Biomass from Logging Residue and Mill Residue in East Texas, 2008*. 2009, Texas Forest Service: Austin, TX.
4. Agriculture, T.D.o., *Texas Bioenergy 2010 Status Report*. 2010, Texas Department of Agriculture: Austin, TX.