



# NETL Life Cycle Inventory Data

## Process Documentation File

**Process Name:** Switchgrass Land Preparation Assembly, Construction  
**Reference Flow:** 1 pcs of Equipment Assembly per kg Biomass  
**Brief Description:** Assembly process that apportions the construction requirements of equipment used for land preparation for switchgrass. Equipment includes bulldozers and motor graders.

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### Section I: Meta Data

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**Geographical Coverage:** US **Region:** Midwest  
**Year Data Best Represents:** 2009  
**Process Type:** Basic Process (BP)  
**Process Scope:** Gate-to-Gate Process (GG)  
**Allocation Applied:** No  
**Completeness:** Individual Relevant Flows Captured  
**Flows Aggregated in Data Set:**  
 Process  Energy Use  Energy P&D  Material P&D

#### Relevant Output Flows Included in Data Set:

Releases to Air:  Greenhouse Gases  Criteria Air Pollutants  Other  
Releases to Water:  Inorganic Emissions  Organic Emissions  Other  
Water Usage:  Water Consumption  Water Demand (throughput)  
Releases to Soil:  Inorganic Releases  Organic Releases  Other

#### Adjustable Process Parameters:

Bulldozer Lifetime *The assumed lifetime of the bulldozer, in years*  
Grader Lifetime *The assumed lifetime of the motor grader, in years*  
Switchgrass Yield *The production rate of switchgrass biomass, in kg per year.*  
Study Period *The assumed lifetime of the switchgrass growing site, in years*  
Farm Size *The assumed size of the farm, in years*



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### Tracked Input Flows:

Diesel Track Bulldozer, 410 Horsepower [Installation] *Total number of bulldozers needed over the lifetime of the energy conversion facility (plant), normalized to the reference flow*

Diesel Motor Grader, 213 Horsepower [Installation] *Total number of motor graders needed over the lifetime of the energy conversion facility (plant), normalized to the reference flow*

### Tracked Output Flows:

Equipment Assembly per kg Biomass [Installation] *Reference Flow*

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## Section II: Process Description

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### Associated Documentation

This unit process is composed of this document and the data sheet (DS) DS\_Stage1\_C\_Assembly\_Switchgrass\_LandPrep\_2010.02.xls, which provides additional details regarding relevant calculations, data quality, and references.

### Goal and Scope

The scope of this unit process covers the elements required for the components used in the land preparation for switchgrass under Life Cycle (LC) Stage #1, as described below and in **Figure 1**. Bulldozers and motor graders are needed during the land preparation for switchgrass, to remove debris and create a suitable smooth surface for switchgrass cultivation. This unit process determines the fraction of each machine that should be allocated to each kilogram of switchgrass biomass produced.

Construction data, including the mass of raw materials required to construct each piece of equipment, are calculated in separate unit processes. Therefore, the following unit processes are considered to be embedded in this assembly unit process: DF\_Stage1\_C\_Diesel\_Track\_Bulldozer\_410\_HP\_2010.01.doc and DF\_Stage1\_C\_Motor\_Grader\_213\_HP\_2010.01.doc. For discussion of environmental emissions associated with the manufacture of raw materials used in the construction of switchgrass land preparation components, as well as other pertinent information, please refer to these separate unit processes.

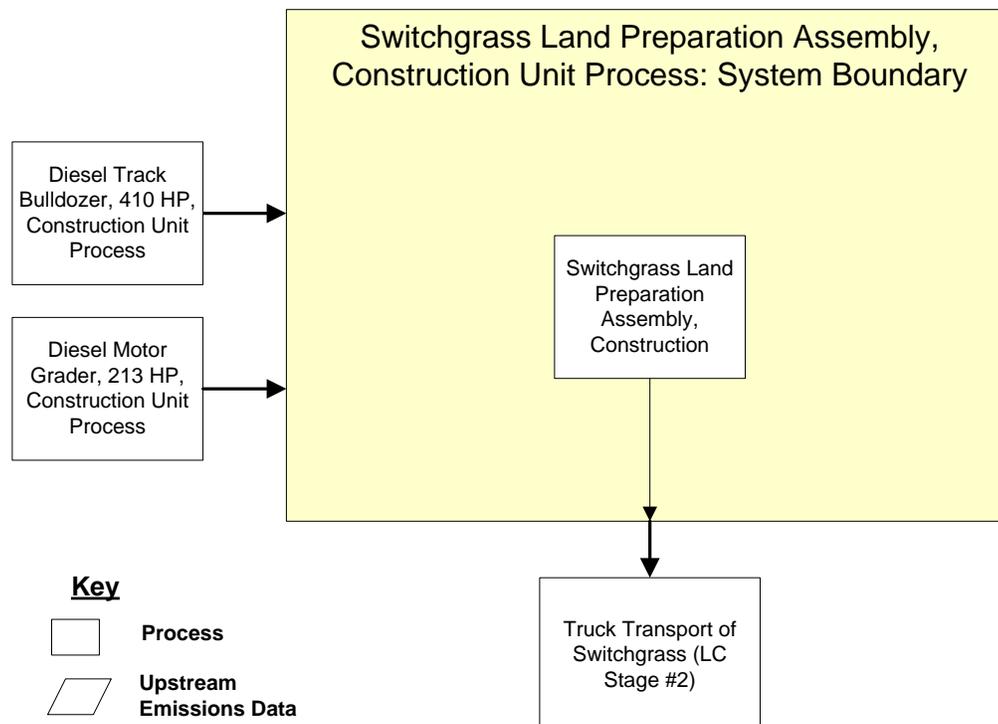
## Boundary and Description

Figure 1 provides an overview of the boundary of this unit process. As it shows, the bulldozer and motor grader are constructed in separate, embedded unit processes. All emissions and environmental effects are accounted for upstream of this unit process, as discussed in greater detail in the documentation for each embedded unit process.

This unit process has four variable parameters, which can be adjusted to match the scenarios being examined. The bulldozer and motor grader both have an assumed lifetime of 15 years. Depending upon the intensity of usage for these items, or based on additional data, the assumed lifetime may be increased or decreased. NETL currently suggests a yield of 3,569 kg/acre-year of switchgrass for this LCA; this value may be adjusted based on study assumptions and more recent or relevant biomass production data. The study period is the number of years that the switchgrass production site is in operation; the default value for this parameter is 30 years.

Relevant properties of the equipment used for the calculation of input and output flows for this unit process are shown in **Table 1**. **Table 2** provides a summary of modeled input and output flows. Additional details showing calculation methods for input and output flows, and other relevant information, are contained in the associated DS.

**Figure 1: Unit Process Scope and Boundary**



**Table 1: Properties of Assembly of Switchgrass Land Preparation Equipment**

Machine	Value	Unit	Source
Lifetime of Diesel Tractor, 165 Horsepower	15	years	NETL Engineering Judgment
Lifetime of Tiller, 5,015 lbs, Tractor Propelled	15	years	NETL Engineering Judgment
Study Period	30	years	NETL Engineering Judgment
Farm Size	500	acres	NETL Engineering Judgment
Switchgrass Yield	3,569 (7,867)	kg/acre-yr (lbs/acre-yr)	NETL Engineering Calculation

**Table 2: Unit Process Input and Output Flows**

Flow Name*	Value	Units (Per Reference Flow)
<b>Inputs</b>		
<b>Diesel Track Bulldozer, 410 Horsepower [Installation]</b>	<b>1.24529E-09</b>	<b>pcs</b>
<b>Diesel Motor Grader, 213 Horsepower [Installation]</b>	<b>1.24529E-09</b>	<b>pcs</b>
<b>Outputs</b>		
Equipment Assembly per kg Biomass [Installation]	1	pcs

\* **Bold face** clarifies that the value shown *does not* include upstream environmental flows. See also the documentation for embedded unit processes, as shown below.

### Embedded Unit Processes

DF\_Stage1\_C\_Diesel\_Track\_Bulldozer\_410\_HP\_2010.01.doc

DF\_Stage1\_C\_Motor\_Grader\_213\_HP\_2010.01.doc

### References

None.

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## Section III: Document Control Information

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**Date Created:** February 1, 2010

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### Revision History:

13JUNE2012 Updated to revised parameter values.

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**Section IV: Disclaimer**

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