NETL Life Cycle Inventory Data
Process Documentation File

Process Name: Corn Stover Harvest 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 corn and corn stover harvesting. Equipment includes a harvester and a baler.

Section I: Meta Data

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: All Relevant Flows Recorded

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:

Harvester Lifetime	*The assumed lifetime of the harvester in years*
Baler Lifetime	*The assumed lifetime of the baler in years*
Corn Stover Production Yield	*The production rate of corn stover, in kg per year*
Corn Grain Production Yield	*The production rate of corn, in kg per year*
Farm Size	*The assumed size of the farm, in acres*

Tracked Input Flows:

Harvester, 300-Bushel Capacity, 6 Cylinder [Installation]	*Total number of harvesters needed over the lifetime of the energy conversion facility (plant), normalized to the reference flow*
Baler, 3,110 lbs, Tractor-Propelled [Installation]	*Total number of balers 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*

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_Stage1_C_Assembly_Corn_Stover_Harvesting_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 needed for the harvesting of corn and corn stover under Life Cycle (LC) Stage #1 as described below and in **Figure 1**. Harvesters and balers are needed during harvesting to collect corn stover and prepare it for storage before shipment by truck (LC Stage #2) to the energy conversion facility (LC Stage #3). This unit process determines the fraction of each machine that should be allocated to each combined kilogram of corn and corn stover produced.

Construction data, including the mass of raw material 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_Baler_3110_lbs_TractorPropelled_2009.01.doc* and *DF_Stage1_C_Harvester_300_Bushel_Capacity_2009.01.doc.* For discussion of environmental emissions associated with the manufacture of raw materials used in the construction of corn and corn stover harvesting 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. It shows the harvester and the baler 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 harvester and baler both have an assumed lifetime of 15 years, based on the assumptions presented in the DS. Depending upon the intensity of usage for these items, or based on additional data, the assumed lifetime may be increased or decreased as relevant. NETL currently suggests a yield of 3,829 kg/acre-year for corn grain and 1,001 kg/acre-year for corn stover, for this life cycle analysis. These values may be updated based on study assumptions from more recent or relevant biomass production data.

For this unit process, corn stover is the feedstock of interest, but the yield rate of corn grain is included to ensure that equipment construction requirements for the harvester are assigned to both corn grain and corn stover; if only the yield rate of corn stover was included in this unit process for the harvester, the environmental burdens for harvester construction would be overstated. As the baler is only applicable to the corn stover, it is allocated according to only the yield rate of corn stover.

Table 1 provides some general information for the process. **Table 2** provides a summary of the modeled input and output flows.

Figure 1: Unit Process Scope and Boundary

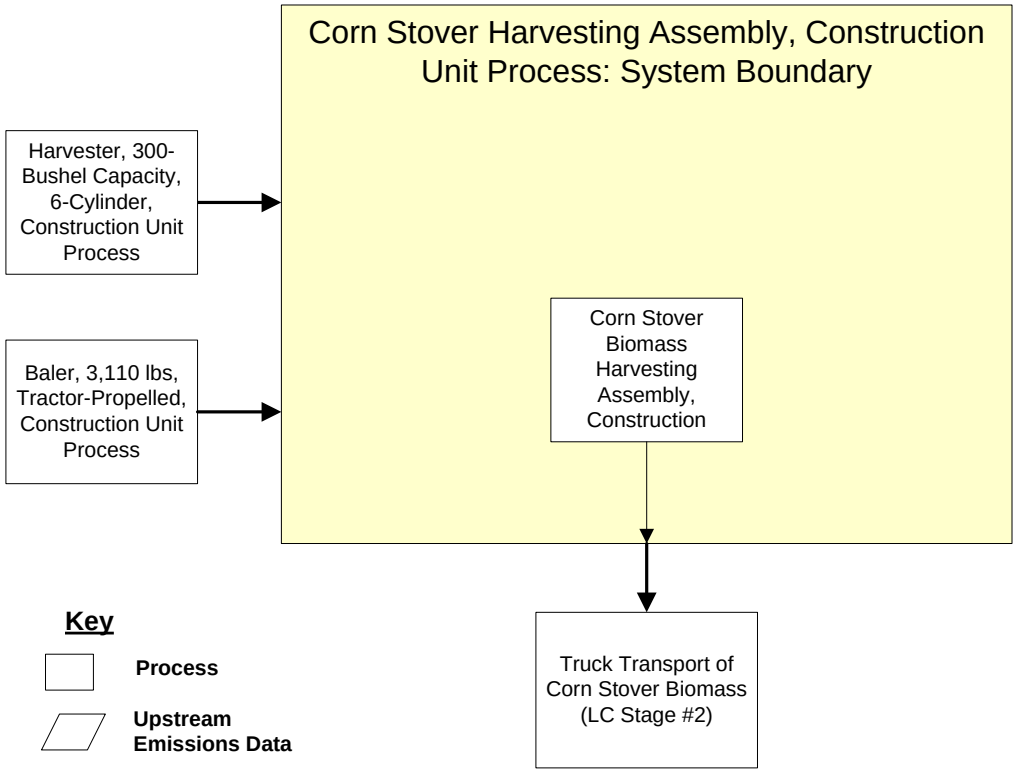

Table 1: Properties for Assembly of Corn Grain and Corn Stover Harvesting Equipment

Machine	Value	Unit	Source
Lifetime of Harvester, 300 Bushel Capacity, 6 Cylinder	15	years	NETL Engineering Judgment
Lifetime of Baler, 3,110 lbs, Tractor-Propelled	15	years	NETL Engineering Judgment
Farm Size	500	acres	NETL Engineering Judgment
Corn Yield	3,829 (8,442)	kg/acre-yr (lb/acre-yr)	NETL Engineering Calculation
Corn Stover Yield	1,001 (2,206)	kg/acre-yr (lbs/acre-yr)	NETL Engineering Calculation

Table 2: Unit Process Input and Output Flows

Flow Name*	Value	Units (Per Reference Flow)
Inputs		
Harvester, 300 Bushel Capacity, 6 Cylinder [Installation]	**2.7607E-08**	**pcs**
Baler, 3110 lbs, Tractor-Propelled [Installation]	**1.3324E-07**	**pcs**
Outputs		
Equipment Assembly per kg of 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_Baler_3110_lbs_TractorPropelled_2009.01.doc

DF_Stage1_C_Harvester_300_Bushel_Capacity_2009.01.doc.

References

None.

Section III: Document Control Information

Date Created: January 19, 2010

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13JUNE2012 Updated to revised parameter values.

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