**Table 1**: Inputs to AD Bio-CH4 pathway (basis of 1 day): Case 1 and Case 2

|  |  |  |  |
| --- | --- | --- | --- |
| AD pathway (Bio-CH4) | Process | **Amount** | **Unit** |
| 1.Manure transportation from local farm to facility | Inbound trip | 4.69x103 | t\*km |
| Return trip | 3.75 x103 | t\*km |
| 2.Food waste transportation from Denver to facility | Inbound trip | 5.76 x104 | t\*km |
| Return trip | 4.61 x104 | t\*km |
| 3.AD process  | Electricity | 132 | MWh |
|  | Natural gas | 3.2 x108 | btu |
| 4. Bio-CH4 Combustion emissions (Bio-CH4 combustion) | 99151.2 | kg CH4 combusted |
| 5. CO2 Fugitive emissions from AD (CO2 emissions from AD) | 99151.2 | kg CO2 emitted |
| 6. Transportation of compost from AD to Denver market  | Inbound trip | 9.71 x103 | t\*km |
| Return trip | 7.77 x103 | t\*km |
| 7. AD digestate N field application(Liquid digestate N2O emissions on field application)  | 2.34x103 | kg of N |
| 8. AD compost field application(CO2 emissions from AD compost soil application) | 1.22 x105 | kg |

**Table 2**: Inputs to compost pathway (basis of 1 day): Case 1 BAU

|  |  |  |  |
| --- | --- | --- | --- |
| Compost pathway  (BAU) | Process | **Amount** | **Unit** |
| 1.Manure transportation from local farms to compost facility  | Inbound trip | 4.66 x103 | t\*km |
| Return trip | 3.73 x103 | t\*km |
| 2.Wood pallets transportation from nearby  | Inbound trip | 221.3 | t\*km |
| Return trip | 177 | t\*km |
| 3.Food waste transportation from Denver to compost  | Inbound trip | 8.11 x104 | t\*km |
| Return trip | 6.49 x104 | t\*km |
| 4.Diesel used in tractor for composting  | Tractor | 4.92 x103 | Kg |
| Turner | 16.8 | kg |
| Grinder | 594 | kg |
| 5.Composting decomposition emissions (CO2)(Composting Decomposition Emissions (CO2)) | 322.94 | tons dry compost |
| 6.Composting decomposition emissions (CH4&N2O)(Composting Decomposition Emissions (CH4 and N2O)) | 1.18 x103 | tons (wet) compost |
| 7.Compost land application (at 50% moisture)(CO2 Emissions from Compost Land Application) | 395.3 | tons wet compost |
| 8. Compost (wet) transportation from compost facility to Denver market  | Inbound trip | 44550.31 | t\*km |
| Return trip | 35640.24 | t\*km |

**Table 3**: Inputs to natural gas pathway: Case 1 BAU

|  |  |  |  |
| --- | --- | --- | --- |
| Natural gas pathway (BAU) | **Process** | **Amount** | **Unit** |
| 1.Emissions from natural gas transport, extraction processing, distribution and usage | 3.97 x106 | MJ of heat |

**Table 4**: Inputs to synthetic fertilizer pathway: Case 1 BAU

|  |  |  |  |
| --- | --- | --- | --- |
| Synthetic fertilizer pathway(BAU) | **Process** | **Amount** | **Unit** |
| 1.Emissions from synthetic fertilizers manufacturing process and market | Nitrogen | 2.34x103 | kg |
| Phosphate | 0.75x103 | kg |
| Potassium | 2.91x103 | kg |
| 2. Synthetic fertilizer transport from Denver market to farmInbound tripReturn trip | 44.9 | t\*km |
| 35.9 | t\*km |
| 3. Fertilizer N field application (Emissions of N2O from synthetic N fertilizer applied to Field)  | 2.34x103 | kg of N |

**Table 5**: Inputs to peat pathway: Case 1 Bio-CH4

|  |  |  |  |
| --- | --- | --- | --- |
| Peat pathway (Bio-CH4) | **Process** | **Amount** | **Unit** |
| 1.Emissions from peat moss manufacturing, transport and use (Peat moss Manufacturing, Transport and Use (CO2 Emissions)) | 546 | m3 make up peat |
| 2. Transportation of Peat moss from Canada(Saskatchewan) to Denver  | Inbound trip | 1.42 x105 | t\*km |
| Return trip | 1.14 x105 | t\*km |

**Table 6**: Inputs to avoided landfill without gas collection pathway: Case 2 Scenario-1

|  |  |  |  |
| --- | --- | --- | --- |
| Avoided landfill pathway uncontrolled emissions | **Process** | **Amount** | **Unit** |
| 1.Transportation of food waste from Denver to landfill  | Inbound trip | 8.42 x103 | t\*km |
| Return trip | 6.74 x103 | t\*km |
| 2. Emissions from landfill without gas collectionCH4 and CO2 (Steady state) Uncontrolled | 216.6 | tons (dry) food waste input to landfill |

**Table 7**: Inputs to avoided landfill with gas collection and flaring: Case 2 Scenario-2

|  |  |  |  |
| --- | --- | --- | --- |
| Avoided landfill pathway with gas collection and flaring | **Process**  | **Amount** | **Unit** |
| 1.Transportation of food waste from Denver to landfill  | Inbound trip | 8.42 x103 | t\*km |
| Return trip | 6.74 x103 | t\*km |
| 2. Emissions from landfill with gas collection and flare CH4 and CO2 (Steady state) (Landfill Emissions GCS steady state) | 216.6 | tons (dry) food waste input to landfill |

**Table 8**: Inputs to avoided landfill with gas collection & electricity pathway: Case 2 Scenario-3

|  |  |  |  |
| --- | --- | --- | --- |
| Avoided landfill pathway with gas collection and electricity generation | **Process** | **Amount** | **Unit** |
| 1.Transportation of food waste from Denver to landfill  | Inbound trip | 8.42 x103 | t\*km |
| Return trip | 6.74 x103 | t\*km |
| 2. Emissions from LFGE (landfill with gas collection and electricity generation)CH4 and CO2 (steady state) | 216.6 | tons (dry) food waste input to landfill |
| 3. Electricity generation from Natural gas | 287 | MWh |

**Table 9**: Inputs to avoided synthetic fertilizer pathway: Case 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Avoided Synthetic fertilizer pathway | **Process** |  | **Amount**  | **Unit** |
| 1.Emissions from synthetic fertilizers manufacturing process and market  | Nitrogen | 2.34x103 | kg |
| Phosphate | 0.75x103 | kg |
| Potassium | 2.91x103 | kg |
| 2. Transportation of synthetic fertilizers from LaSalle market to fields  | Onward trip | 44.9 | t\*km |
| Return trip | 35.9 | t\*km |
| 3. Fertilizer N field application (Emissions of N2O from synthetic N fertilizer applied to Field) | 2.34x103 | kg of N |

**Table 10**: Inputs to avoided peat moss pathway: Case 2

|  |  |  |  |
| --- | --- | --- | --- |
| Avoided peat pathway | **Process** | **Amount** | **Unit** |
| 1.Emissions from peat moss manufacturing, transport and use (Solid digestate compost from AD) (Peat moss Manufacturing, Transport and Use (CO2 Emissions)) | 245 | m3 |
| 2. Transportation of Peat moss from Canada(Saskatchewan) to Denver | Inbound trip | 6.4 x104 | t\*km |
| Return trip | 5.12 x104 | t\*km |

**Table 11**: Inputs to avoided manure pathway: Case 2

|  |  |  |  |
| --- | --- | --- | --- |
| Avoided manure pathway | **Process** | **Amount** | **Unit** |
| 1.Anaerobic lagoon emissions | 40.49 | tons (dry basis) |
| 2. Slurry storage tanks | 6.23 | tons (dry basis) |
| 3. Solid manure piles | 15.58 | tons (dry basis) |

**Table 12**: GHG emissions for peat manufacturing, packaging transport and use

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Category  | Unit | Harvest | Package | Transport | Soil application | In situ decomposition | Total |
| GHG Emissions | Kg CO2 equivalent | 4.03 | 2.53 | 15.63 | 183 | 60.79 | 269.7 |

**Table 13** Case 1: Business As Usual composting system (Basis of 1 day)

|  |  |  |
| --- | --- | --- |
| Process  | **kg CO2 eq.** | **% Contribution** |
| **Composting Pathway** |
| 1. Feedstock transport | 29,592.63 | 3.06 |
| 2. Composting process equipment fuel use | 20,796.49 | 2.14 |
| 3. Decomposition of feedstock in composting process | 367,988.1 | 37.92 |
| 4.Transportation from compost facility to market | 15,313.93 | 1.58 |
| 5. Land application of compost | 173,939.4 | 17.93 |
| **Fossil Natural Gas Pathway** |
| 6. Natural gas production and combustion | 317,870.7 | 32.76 |
| **Synthetic Fertilizer Pathway** |
| 7. Synthetic fertilizer production and market | 18,904.28 | 1.95 |
| 8. Synthetic fertilizer transport from market to farm | 13.92 | 0.0014 |
| 9. Synthetic N fertilizer soil application | 25,786.51 | 2.66 |
| **Total** | **970,206** | **100** |

**Table** **14**: Case 1: Bio-CH4 system (Basis of 1 day)

|  |  |  |
| --- | --- | --- |
| Process | **kg CO2 eq.** | **% Contribution** |
| **AD Bio-CH4 Pathway** |
| 1. Manure transportation from dairy farm to AD | 1,453.99 | 0.17 |
| 2. Food waste transport from Denver to AD facility | 17,856.1 | 2.17 |
| 3. Anaerobic digestion Process | 134,499.6 | 16.39 |
| 4. CO2 separation from AD biogas and venting  | 121,956 | 14.86 |
| 5. Biogas CH4 combustion | 272,665.8 | 33.23 |
| 6. AD digestate soil application | 25,786.5 | 3.14 |
| 7. AD compost transport to Denver | 3,010.29 | 0.36 |
| 8. AD compost applied to land | 53,824.3 | 6.56 |
| **Peat Pathway** |
| 9. Peat manufacturing, transport, use | 145,217.1 | 17.69 |
| 10. Peat transport from Saskatchewan to Denver | 44,278.6 | 5.39 |
| **Total** | **820,548.3** | **100** |