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Table S1. Inputs per kg of mushroom product

Inputs	Unit per kg mushroom	Weighted Average	Unweighted Average	Input Category
AMS ammonium sulfate	kg	3.56×10^{-3}	2.27×10^{-3}	Compost Materials
Brewer/distiller's grain	kg	6.27×10^{-3}	1.76×10^{-2}	Compost Materials
Casing inoculum	kg	5.62×10^{-3}	5.72×10^{-3}	Growing Materials
Cocoa bean hulls	kg	9.34×10^{-2}	5.96×10^{-2}	Compost Materials
Compost - finished	kg	3.47	3.63	Growing Materials
Compost - phase 1	kg	5.13	5.45	Compost Materials
Compressed natural gas	kg	4.40×10^{-4}	1.14×10^{-2}	Natural Gas
Corn stover	kg	1.60×10^{-1}	1.07×10^{-1}	Compost Materials
Corncobs	kg	1.33×10^{-1}	8.49×10^{-2}	Compost Materials
Cotton seed burrs	kg	2.51×10^{-3}	7.05×10^{-3}	Compost Materials
Cotton seed hulls	kg	2.24×10^{-2}	2.14×10^{-2}	Compost Materials
Cotton seed meal	kg	3.34×10^{-2}	5.17×10^{-2}	Compost Materials
Diesel	Gal	6.01×10^{-3}	8.81×10^{-3}	Diesel
Dried poultry waste	kg	5.25×10^{-2}	5.01×10^{-2}	Compost Materials
Electricity	kWh	6.90×10^{-1}	7.70×10^{-1}	Electricity
Electricity generation fuel - walnut shells	kg	1.64×10^{-2}	7.84×10^{-3}	-
Fungicides (aqueous)	Gal	7.07×10^{-6}	6.95×10^{-6}	Pesticides
Fungicides (solid)	kg	3.18×10^{-5}	2.68×10^{-5}	Pesticides
Grape pomace	kg	7.86×10^{-3}	7.50×10^{-3}	Compost Materials
Gypsum - mined	kg	7.79×10^{-2}	3.17×10^{-1}	Compost Materials
Gypsum - recycled	kg	3.85×10^{-2}	3.11×10^{-2}	Compost Materials
Hardwood tree leaves	kg	1.11×10^{-2}	7.06×10^{-3}	Compost Materials
Hay	kg	6.17×10^{-1}	3.94×10^{-1}	Compost Materials
Heating oil	Gal	7.17×10^{-3}	7.32×10^{-3}	Heating Oil
Herbicides	Gal	1.38×10^{-7}	9.63×10^{-8}	Pesticides
Insect growth regulators	Gal	1.52×10^{-4}	1.28×10^{-4}	Pesticides
Insecticides	Gal	5.44×10^{-6}	9.53×10^{-6}	Pesticides
Lime - hydrated	kg	4.25×10^{-3}	4.25×10^{-3}	Growing Materials
Lime - sugar beet	kg	3.10×10^{-2}	5.87×10^{-2}	Growing Materials
Limestone	kg	5.15×10^{-2}	5.16×10^{-2}	Growing Materials
Liquefied petroleum gas (LPG)	Gal	1.58×10^{-3}	1.55×10^{-3}	LPG
Natural gas	kg	2.02×10^{-2}	2.07×10^{-2}	Natural Gas
Nitrogen sources	kg	2.20×10^{-2}	1.68×10^{-2}	Compost Materials
Peat moss - black/reed sedge	kg	7.94×10^{-2}	6.31×10^{-2}	Peat
Peat moss - sphagnum	kg	5.40×10^{-1}	5.35×10^{-1}	Peat
PIMA	kg	6.79×10^{-3}	6.48×10^{-3}	Compost Materials
Poultry litter/manure	kg	4.53×10^{-1}	5.39×10^{-1}	Compost Materials
Refrigerant - Propylene Glycol 2	kg	1.55×10^{-7}	1.49×10^{-7}	Refrigerants
Refrigerant - R-11 (CFC-11)	kg	7.24×10^{-9}	1.40×10^{-8}	Refrigerants
Refrigerant - R-12 (CFC-12)	kg	1.18×10^{-7}	2.27×10^{-7}	Refrigerants
Refrigerant - R-22 (HFC-22)	kg	2.77×10^{-5}	2.27×10^{-5}	Refrigerants
Refrigerant - R-123	kg	2.41×10^{-8}	4.66×10^{-8}	Refrigerants
Refrigerant - R-410a (HCFC-410a)	kg	4.84×10^{-6}	3.17×10^{-6}	Refrigerants
Refrigerant - unspecified	kg	5.24×10^{-6}	4.60×10^{-6}	Refrigerants
Sanitizers (aqueous)	Gal	1.31×10^{-4}	1.87×10^{-4}	Sanitizers
Sanitizers (solid)	kg	9.72×10^{-5}	8.71×10^{-5}	Sanitizers
Spawn	kg	2.64×10^{-2}	2.60×10^{-2}	Spawn & Supplements
Straw-bedded horse manure	kg	8.37×10^{-1}	5.34×10^{-1}	Compost Materials
Straw - wheat	kg	5.02×10^{-1}	9.77×10^{-1}	Compost Materials
Supplements	kg	3.10×10^{-2}	3.04×10^{-2}	Spawn & Supplements
Water - freshwater	Gal	1.16	1.01	On-Site Water Use
Water - precipitation	Gal	6.66×10^{-1}	6.48×10^{-1}	Compost Materials
Urea 45	kg	1.34×10^{-3}	3.10×10^{-3}	Compost Materials
Urea 46	kg	1.04×10^{-4}	2.92×10^{-4}	Compost Materials

Table S2 – Life cycle inventory data – documentation

Source[a]	Region	Years Valid	LCI Name	Inputs	Formula/Notes
E	RER	2015	ammonium sulfate production	AMS ammonium sulfate (nitrogen source)	Used as is
E	GLO	2015	Distiller's Dried Grains with Solubles to generic market for protein feed	Brewer/distiller's grain	Used as is
E	Canada-QC	2015	peat moss production, horticultural use	Casing Inoculum	LCI*(1121kg/m3)*(0.9898190332) for 1 kg casing inoculum
E/G	RNA	2015-2018	Spawn (developed)	Casing Inoculum	LCI*(1/3)*(0.0101809668) for 1 kg casing inoculum
-	-	-	-	Cocoa bean hulls	Waste Product (no LCI needed / only transportation accounted for)
-	-	-	-	Compost - Finished	Accounted for in Model
-	-	-	-	Compost - Phase 1	Accounted for in Model
G	US	2012 - 2018	Natural gas mix	Compressed Natural Gas (CNG) - Production	Used as is
G	RNA	2009 - 2016	Natural gas, combusted in industrial equipment	Compressed Natural Gas (CNG) - Combustion	Used as is
G	US	2015 - 2018	Corn straw, at field (30% H2O content) (economic allocation)	Corn stover	Used as is
G	US	2009 - 2013	Grinding (developed)	Corncobs	Used as is
-	-	-	-	Cotton seed burrs	Waste Product (no LCI needed / only transportation accounted for)
G	US	2015 - 2018	Cottonseed hulls (economic allocation)	Cotton seed hulls	Used as is
G	US	2015 - 2018	Cottonseed meal (economic allocation)	Cotton seed meal	Used as is
G	US	2012 - 2018	Diesel mix at filling station	Diesel - Production	Used as is
G	US	2009 - 2016	Diesel, combusted in industrial equipment	Diesel - Combustion	Used as is
E	Switzerland	2015	treatment of poultry manure, drying, pelleting	Dried poultry waste (DPW)	Used as is
G	US-CAMX	2010 - 2018	Electricity grid mix - CAMX	Electricity - CA	Used as is
G	Canada	2012 - 2018	Electricity grid mix - CAN	Electricity - CAN	Used as is
G	US-PJM	2010 - 2018	Electricity grid mix - PJM	Electricity - MD	Used as is
G	US-SPSO	2010 - 2018	Electricity grid mix - SPSO	Electricity - OK	Used as is
G	US-PJM	2010 - 2018	Electricity grid mix - PJM	Electricity - PA	Used as is
G	US-ERCT	2010 - 2018	Electricity grid mix - ERCT	Electricity - TX	Used as is
-	-	-	-	Electricity Generation Fuel - Walnut Shells	Waste Product (no LCI needed / only transportation accounted for)

[a]G refers to GaBi database and E refers to Ecoinvent database

[Table S2 continued

E	RER	2015	chlorothalonil production	Fungicide - Bravo	LCI*(54%); [1.34 g/mL*.54 = 2.7391 kg LCI/Gal]
G	EU-27	2015 - 2018	Yeast	Fungicide - Jazz	LCI*(14.6%)
E	RER	2015	benzimidazole-compound production	Fungicide - Mecuria/Mertect	[4.0 lbs AI/gal = 1.8144 kg LCI/Gal]
E	RER	2015	pesticide production, unspecified	Fungicide, Insecticide, Miticide - Phor-Ex	Used as is because piperonyl butoxide is missing
G	RNA	2009 - 2016	Palm kernel oil, processed, at plant	Fungicide, Insecticide, Miticide - Trilogy	LCI*(70%); [5.46 lbs/gal*.7 = 1.7336 kg LCI/Gal]
-	-	-	-	Grape pomace	Waste Product (no LCI needed / only transportation accounted for)
G	Germany	2015 - 2018	Gypsum stone (CaSO4-Dihydrate) (EN15804 A1-A3) [grinded and purified]	Gypsum - mined	Used as is
E	Switzerland	2015	treatment of waste gypsum plasterboard, recycling	Gypsum - recycled	Used as is
-	-	-	-	Hardwood tree leaves	Waste Product (no LCI needed / only transportation accounted for)
E	Switzerland	2015	hay production, Swiss integrated production, intensive	Hay	LCI*($65/$165) = LCI*0.394
G	US	2012 - 2018	Diesel mix at filling station	Heating Oil - Production	Used as is
G	US	2009 - 2016	Diesel, combusted in industrial boiler	Heating Oil - Combustion	Used as is
E	RER	2015	diphenylether-compound production	Herbicide - Goal	[240 g AI/L = 0.9085 kg LCI/Gal]
E	RER	2015	glyphosate production	Herbicide - Roundup	LCI*(49%); [1.3522 g/cm3*.49 = 2.5081 kg LCI/Gal]
E	RER	2015	triazine-compound production, unspecified [x 0.05 AI; 0.42lbs AI per gal]	Insect Growth Regulator - Aegis/Armor	LCI*(5.0%); [0.42 lbs/gal*.05 = 0.009525 kg LCI/Gal]
G	RNA	2009 - 2016	Palm kernel oil, processed, at plant	Insect Growth Regulator - NEEMIX 4.5	[0.39 lbs AI/gal = 0.1769 kg LCI/Gal]
E	RER	2015	pyrethroid-compound production	Insecticide - Permethrin/Perm-Up	LCI*(36.8%); [3.2 lbs/gal*.368 = 0.5342 kg LCI/Gal]
E	RER	2015	pesticide production, unspecified	Insecticide - Prentox/Pyronyl Fogging PF	Used as is because piperonyl butoxide is missing
G	RNA	2009 - 2016	White mineral oil, at plant	Insecticide, Miticide - Stylet Oil (organic)	LCI*(97.1%); [0.86 g/cm3*.971 = 3.1610 kg LCI/Gal]
G	DE	2015 - 2018	Calcium hydroxide (Ca(OH)2; dry; slaked lime) (EN15804 A1-A3)	Lime - hydrated	Used as is
-	-	-	-	Lime - sugar beet	Waste Product (no LCI needed / only transportation accounted for)
G	US	2015 - 2018	Limestone (CaCO3; washed)	Limestone	Used as is

[Table S2 continued]

G	US	2012 - 2018	Liquefied Petroleum Gas (LPG) (70% propane; 30% butane)	Liquefied Petroleum Gas (LPG) - Production	Used as is
G	US	2009 - 2016	Liquefied petroleum gas, combusted in industrial boiler	Liquefied Petroleum Gas (LPG) - Combustion	Used as is
G	US	2012 - 2018	Natural gas mix	Natural Gas - Production	Used as is
G	RNA	2009 - 2016	Natural gas, combusted in industrial equipment	Natural Gas - Combustion	Used as is
G	US	2009 - 2016	Nitrogen fertilizer, production mix, at plant	Nitrogen Source - Good N Green	Used as is
E	Canada-QC	2015	peat moss production, horticultural use	Peat moss - black/reed sedge	LCI*(801kg/m3)
E	Canada-QC	2015	peat moss production, horticultural use	Peat moss - sphagnum	LCI*(801kg/m3)
-	-	-	-	PIMA	Waste Product (no LCI needed / only transportation accounted for)
-	-	-	-	Poultry litter/manure	Waste Product (no LCI needed / only transportation accounted for)
G	US	2015 - 2018	Propylene glycol (via PO-hydrogenation)	Refrigerant - Propylene Glycol 2	Used as is; no on-site emissions assigned
G	US	2015 - 2018	Chlorodifluoromethane (R22, HCFC-22) (estimation)	Refrigerant - R-11 (CFC-11)	Used as is because R-22 replaced R-11
G	US	2015 - 2018	Chlorodifluoromethane (R22, HCFC-22) (estimation)	Refrigerant - R-12 (CFC-12)	Used as is because R-22 replaced R-12
G	US	2015 - 2018	Chlorodifluoromethane (R22, HCFC-22) (estimation)	Refrigerant - R-22 (HFC-22)	Used as is
G	US	2015 - 2018	Chlorodifluoromethane (R22, HCFC-22) (estimation)	Refrigerant - R-123 (HCFC-123)	Used as is because R-123 is an HCFC
G	US	2015 - 2018	Pentafluoroethane, HFC 125, R125 (estimated from HCF 152a)	Refrigerant - R-410a (HFC-410a)	Used as is because R-410a is an HFC (and half R-125 already)
G	US	2015 - 2018	Pentafluoroethane, HFC 125, R125 (estimated from HCF 152a)	Refrigerant - Unspecified	Used as is
E/G	RER/US	2015 - 2018	Peroxyacetic Acid (developed)	Sanitizer - Bio-15	LCI*(15%); [1.0375 g/mL*.15 = 0.5891 kg LCI/Gal]
E	RER	2015	esterquat production, from coconut oil and palm kernel oil	Sanitizer - Boost 3200 (quaternary ammonium compounds)	LCI*(6.0%); [1.02 g/cm3*.06 = 0.2317 kg LCI/Gal]
G	US	2015 - 2018	Hydrogen peroxide (100%; H2O2) (Hydrogen from steam reforming)	Sanitizer - Boost 3200 (hydrogen peroxide)	LCI*(6.3%); [1.45 g/cm3*.063 = 0.3458 kg LCI/Gal]
G	US	2015 - 2018	Potassium Carbonate (developed)	Sanitizer - Boost 3201 (potassium carbonate)	LCI*(6.0%); [2.43 g/cm3*.06 = 0.5519 kg LCI/Gal]

[Table S2 continued]

G	US	2015 - 2018	Soda (Na2CO3)	Sanitizer - Boost 3201 (sodium carbonate)	LCI*(6.0%); [2.54 g/cm3*.06 = 0.5769 kg LCI/Gal]
E	RER	2015	EDTA production	Sanitizer - Boost 3201 (tetrasodium EDTA)	LCI*(4.9%); [860 mg/mL*.049 = 0.1595 kg LCI/Gal]
E	GLO	2015	market for calcium chloride	Sanitizer - Calcium Chloride	Used as is
G	US	2015 - 2018	Calcium hypochlorite (developed)	Sanitizer - Calcium Hypochlorite	LCI*(100%); Used as is
G	US	2015 - 2018	Hydrogen peroxide (100%; H2O2) (Hydrogen from steam reforming)	Sanitizer - Oxonia Active (hydrogen peroxide)	LCI*(27.5%); [1.45 g/cm3*.275 = 1.5094 kg LCI/Gal]
E/G	RER/US	2015 - 2018	Peroxyacetic Acid (developed)	Sanitizer - Oxonia Active (peroxyacetic acid)	LCI*(5.8%); [1.0375 g/mL*.058 = 0.2278 kg LCI/Gal]
G	US	2015 - 2018	Phenol (from cumene)	Sanitizer - Phenols (1 stroke)	LCI*(20.5%); [1.08g/cm3*.205 = 0.8381 kg LCI/Gal]
E	RER	2015	esterquat production, from coconut oil and palm kernel oil	Sanitizer - Quaternary Ammonium Chloride	LCI*(50%); [8.1 lbs/gal*.5 = 1.8371 kg LCI/Gal]
E	RER	2015	esterquat production, from coconut oil and palm kernel oil	Sanitizer - Quorum Clear	LCI*(7.5%); [8.1 lbs/gal*.075 = 0.2756 kg LCI/Gal]
E	RER	2015	esterquat production, from coconut oil and palm kernel oil	Sanitizer - Sani Step (Quat)	LCI*(1.197%); [8.1 lbs/gal*.01197 = 0.04398 kg LCI/Gal]
E	RER	2015	esterquat production, from coconut oil and palm kernel oil	Sanitizer - Sani-T-10	LCI*(10.0%); [8.1 lbs/gal*.1 = 0.3674 kg LCI/Gal]
G	US	2015 - 2018	Sodium hypochlorite solution	Sanitizer - Sodium Hypochlorite	[1.11 g/cm3 = 4.2018 kg/Gal]
E	RER	2015	esterquat production, from coconut oil and palm kernel oil	Sanitizer - Verticide	LCI*(15.36%); [1.02 g/cm3*.1536 = 0.5931 kg LCI/Gal
E/G	RNA	2015-2018	Spawn (developed)	Spawn	Use as is
-	-	-	-	Spent compost (on-site recycled)	Accounted for in Model
-	-	-	-	Straw-bedded horse manure	Waste Product (no LCI needed / only transportation accounted for)
G	US	2009 - 2016	Wheat, at field	Straw - wheat	[Grain: $5.27/bushel = 0.981*LCI; Straw: $160/ton = 0.019*LCI]
-	-	-	-	Stumps (on-site recycled)	Accounted for in Model
G	US	2015 - 2018	Supplements (developed)	Supplements	Use as is
G	US	2009 - 2016	Transport, combination truck, average fuel mix	Transportation	Use as is
E	CA-QC	2015	-	Water - freshwater	Pumping accounted for in model
-	-	-	-	Water - precipitation	Waste Product (no LCI needed / only transportation accounted for)

[Table S2 continued]

-	-	-	-	Water - reused/goodie	Waste Product (no LCI needed / only transportation accounted for)
G	US	2015 - 2018	Urea (agrarian)	Urea 45 (nitrogen source)	LCI*(45/46)
G	US	2015 - 2018	Urea (agrarian)	Urea 46 (nitrogen source)	Used as is

Table S3. Global warming potential in kg CO_2e per kg of mushroom product (unweighted average)

Inputs	GWP_{20}	GWP_{20} with climate change feedback	GWP_{100}	GWP_{100} with climate change feedback
Electricity	7.55×10^{-1}	7.56×10^{-1}	6.94×10^{-1}	6.99×10^{-1}
Diesel	2.30×10^{-1}	2.30×10^{-1}	2.08×10^{-1}	2.09×10^{-1}
Natural Gas	1.74×10^{-1}	1.74×10^{-1}	1.28×10^{-1}	1.32×10^{-1}
Heating Oil	1.58×10^{-1}	1.58×10^{-1}	1.43×10^{-1}	1.44×10^{-1}
LPG	1.80×10^{-2}	1.80×10^{-2}	1.64×10^{-2}	1.65×10^{-2}
Compost Materials	1.48×10^{-1}	1.49×10^{-1}	1.26×10^{-1}	1.33×10^{-1}
Spawn, Supplements	3.69×10^{-2}	3.70×10^{-2}	3.36×10^{-2}	3.45×10^{-2}
Compost Emissions	9.45×10^{-1}	9.66×10^{-1}	3.87×10^{-1}	4.61×10^{-1}
Peat	7.93×10^{-2}	7.90×10^{-2}	9.38×10^{-2}	9.27×10^{-2}
Growing Materials	4.95×10^{-3}	4.95×10^{-3}	5.00×10^{-3}	5.00×10^{-3}
Refrigerants	1.70×10^{-1}	1.74×10^{-1}	6.73×10^{-2}	7.95×10^{-2}
Pesticides	7.22×10^{-4}	7.25×10^{-4}	6.09×10^{-4}	6.21×10^{-4}
Sanitizers	1.96×10^{-3}	1.96×10^{-3}	1.75×10^{-3}	1.76×10^{-3}
Total Transport	2.7×10^{-1}	2.75×10^{-1}	2.57×10^{-1}	2.59×10^{-1}
SMS Credits	-1.95×10^{-2}	-1.96×10^{-2}	-1.66×10^{-2}	-1.75×10^{-2}
Peat Emissions	2.38×10^{-1}	2.38×10^{-1}	2.38×10^{-1}	2.38×10^{-1}
Total	3.21	3.24	2.38	2.49

Table S4. Non-renewable, renewable, and total primary energy use in MJ per kg of mushroom product (unweighted average)

Inputs	Primary Energy from non-renewable resources (MJ)	Primary Energy from renewable resources (MJ)	Total Primary Energy (MJ)
Electricity	1.05×10	1.09	1.16×10
Diesel	5.03	4.12×10^{-2}	5.08
Natural Gas	4.33	1.75×10^{-3}	4.33
Heating Oil	3.45	2.83×10^{-2}	3.48
LPG	3.77×10^{-1}	6.08×10^{-4}	3.78×10^{-1}
Compost Materials	1.69	5.58×10^{-1}	2.25
Spawn and Supplements	5.10×10^{-1}	4.13×10^{-2}	5.52×10^{-1}
Compost Emissions	0.00	0.00	0.00
Peat	2.36	1.69×10^{-2}	2.38
Growing Materials	3.88×10^{-2}	1.62×10^{-3}	4.04×10^{-2}
Refrigerants	3.68×10^{-3}	1.51×10^{-4}	3.84×10^{-3}
Pesticides	8.46×10^{-3}	4.01×10^{-4}	8.87×10^{-3}
Sanitizers	2.62×10^{-2}	6.69×10^{-3}	3.29×10^{-2}
Total Transport	3.43	0.00	3.43
SMS Credits	-1.88×10^{-1}	-6.78×10^{-3}	-1.94×10^{-1}
Total	3.16×10	1.78	3.34×10

Table S5. Total freshwater use in kg of water per kg of mushroom product (unweighted average)

Inputs	**Total Freshwater Use (kg)**
Electricity	7.09×10^{2}
Diesel	8.08
Natural Gas	7.48×10^{-1}
Heating Oil	5.54
LPG	3.57×10^{-1}
Compost Materials	5.03×10
Spawn and Supplements	1.34×10
Compost Emissions	0.00
Peat	2.75×10^{-1}
Growing Materials	7.41×10^{-1}
Refrigerants	7.10×10^{-2}
Pesticides	3.92×10^{-3}
Sanitizers	8.07×10^{-1}
Total Transport	0.00
On-Site Water Use	8.36
SMS Credits	-2.89
Total	7.95×10^{2}

Table S6. CML impacts of Human Toxicity Potential (HTP), Marine Aquatic Ecotoxicity Potential (MAETP), Terrestrial Ecotoxicity Potential (TETP), Freshwater Aquatic Ecotoxicity Potential (FAETP), Acidification Potential (AP), Photochemical Ozone Creation Potential (POCP), Ozone Layer Depletion Potential (ODP), Eutrophication Potential (EP), Elements Abiotic Depletion (elements ADP), and Fossil Abiotic Depletion (fossil ADP) per kg of mushroom product (unweighted average)

Inputs	HTP (kg DCB eq.)	MAETP (kg DCB eq.)	TETP (kg DCB eq.)	FAETP (kg DCB eq.)	AP (kg SO_2 eq.)	POCP (kg C_2H_4 eq.)	ODP (kg CFC-11 eq.)	EP (kg PO_4 eq.)	Elements ADP (kg Sb eq.)	Fossil ADP (MJ)
Electricity	4.18×10^{-2}	5.21×10	3.88×10^{-4}	1.17×10^{-3}	2.42×10^{-3}	1.40×10^{-4}	3.01×10^{-10}	1.27×10^{-4}	1.01×10^{-7}	7.77
Diesel	2.67×10^{-1}	2.05×10^{2}	2.59×10^{-5}	5.49×10^{-2}	2.00×10^{-3}	2.06×10^{-4}	8.16×10^{-12}	4.43×10^{-4}	2.65×10^{-8}	5.00
Natural Gas	4.86×10^{-2}	3.64×10	1.51×10^{-5}	9.83×10^{-3}	9.91×10^{-4}	5.63×10^{-5}	1.18×10^{-13}	2.00×10^{-5}	6.39×10^{-8}	4.33
Heating Oil	1.21×10^{-1}	1.41×10^{2}	8.39×10^{-5}	3.76×10^{-2}	4.22×10^{-4}	7.11×10^{-5}	5.59×10^{-12}	5.61×10^{-5}	1.81×10^{-8}	3.42
LPG	1.42×10^{-2}	1.49×10	2.01×10^{-6}	3.97×10^{-3}	4.82×10^{-5}	7.97×10^{-6}	5.78×10^{-13}	6.17×10^{-6}	1.98×10^{-9}	3.75×10^{-1}
Compost Materials	5.31×10^{-2}	4.40×10	-6.83×10^{-5}	7.40×10^{-3}	2.16×10^{-3}	6.12×10^{-5}	3.59×10^{-9}	6.23×10^{-4}	1.17×10^{-5}	1.59
Spawn, Supplements	1.22×10^{-1}	1.26×10	3.59×10^{-4}	3.28×10^{-3}	2.79×10^{-4}	1.80×10^{-5}	9.22×10^{-12}	6.53×10^{-5}	6.08×10^{-9}	4.67×10^{-1}
Compost Emissions	2.21×10^{-4}	0.00	0.00	0.00	3.54×10^{-3}	5.98×10^{-5}	0.00	8.84×10^{-4}	0.00	0.00
Peat	8.04×10^{-4}	3.38×10^{-1}	1.08×10^{-5}	1.53×10^{-5}	9.09×10^{-6}	-3.93×10^{-7}	2.26×10^{-10}	2.72×10^{-6}	5.19×10^{-9}	2.36
Growing Materials	2.51×10^{-4}	6.86×10^{-2}	1.12×10^{-5}	7.51×10^{-6}	1.94×10^{-6}	1.25×10^{-7}	2.20×10^{-12}	3.75×10^{-7}	2.22×10^{-10}	3.76×10^{-2}
Refrigerants	2.47×10^{-5}	1.03×10^{-2}	2.38×10^{-7}	9.41×10^{-7}	9.12×10^{-7}	6.14×10^{-8}	1.38×10^{-6}	5.63×10^{-8}	9.99×10^{-9}	3.40×10^{-3}
Pesticides	1.57×10^{-3}	2.97×10^{-1}	4.66×10^{-6}	2.16×10^{-5}	9.93×10^{-6}	7.01×10^{-7}	9.69×10^{-11}	1.19×10^{-6}	5.17×10^{-9}	7.53×10^{-3}
Sanitizers	5.43×10^{-4}	1.61×10^{-1}	3.34×10^{-6}	2.44×10^{-5}	5.64×10^{-6}	6.72×10^{-7}	9.46×10^{-12}	9.95×10^{-7}	1.76×10^{-8}	2.31×10^{-2}
Total Transport	2.05×10^{-1}	2.73×10^{2}	1.28×10^{-5}	7.21×10^{-2}	1.26×10^{-3}	1.51×10^{-4}	9.07×10^{-12}	2.25×10^{-4}	6.16×10^{-11}	3.41
SMS Credits	-8.11×10^{-4}	-2.66×10^{-1}	-5.33×10^{-6}	-4.19×10^{-5}	-2.95×10^{-5}	-2.30×10^{-6}	-9.38×10^{-13}	-1.04×10^{-5}	-1.27×10^{-8}	-1.78×10^{-1}
Total	8.76×10^{-1}	7.80×10^{2}	8.43×10^{-4}	1.90×10^{-1}	1.31×10^{-2}	7.71×10^{-4}	1.38×10^{-6}	2.45×10^{-3}	1.20×10^{-5}	2.86×10

Table S7. TRACI impacts of Acidification, Ecotoxicity, Eutrophication, Human Health Particulate Air, Human Toxicity (cancer), Human Toxicity (non-cancer), Ozone Depletion, Resources (fossil fuels), and Smog Air per kg of mushroom product (weighted average)

Inputs	Acidification (kg SO_2 eq.)	Ecotoxicity (CTUe)	Eutrophication (kg N eq.)	Human Health Particulate Air (kg PM2.5 eq.)	Human Toxicity, cancer (CTUh)	Human Toxicity, non-cancer (CTUh)	Ozone Depletion (kg CFC-11 eq.)	Resources, Fossil Fuels (MJ surplus energy)	Smog Air (kg O_3 eq.)
Electricity	2.20×10^{-3}	7.28×10^{-4}	9.00×10^{-5}	1.67×10^{-4}	2.03×10^{-11}	1.61×10^{-12}	3.24×10^{-10}	3.76×10^{-1}	1.76×10^{-2}
Diesel	1.78×10^{-3}	7.48×10^{-4}	1.24×10^{-4}	9.99×10^{-5}	1.12×10^{-11}	4.48×10^{-11}	5.72×10^{-12}	4.75×10^{-1}	5.49×10^{-2}
Natural Gas	7.96×10^{-4}	4.55×10^{-4}	9.48×10^{-6}	4.99×10^{-5}	8.77×10^{-12}	3.77×10^{-12}	9.31×10^{-14}	4.91×10^{-1}	2.68×10^{-3}
Heating Oil	4.98×10^{-4}	8.09×10^{-4}	4.44×10^{-5}	3.05×10^{-5}	9.09×10^{-13}	5.30×10^{-13}	6.45×10^{-12}	5.36×10^{-1}	8.07×10^{-3}
LPG	5.30×10^{-5}	8.26×10^{-5}	2.51×10^{-6}	3.12×10^{-6}	8.97×10^{-14}	4.67×10^{-14}	6.08×10^{-13}	5.36×10^{-2}	9.51×10^{-4}
Compost Materials	2.94×10^{-3}	2.73×10^{-3}	7.94×10^{-4}	1.97×10^{-4}	6.27×10^{-12}	6.36×10^{-12}	6.57×10^{-9}	1.10×10^{-1}	9.96×10^{-3}
Spawn, Supplements	3.80×10^{-4}	7.99×10^{-4}	1.28×10^{-4}	3.87×10^{-4}	1.63×10^{-12}	7.98×10^{-12}	1.22×10^{-11}	6.16×10^{-2}	7.91×10^{-3}
Compost Emissions	3.92×10^{-3}	0	2.48×10^{-4}	1.39×10^{-4}	0	0	0	0	1.35×10^{-4}
Peat	1.11×10^{-5}	3.13×10^{-6}	2.19×10^{-6}	9.20×10^{-6}	2.49×10^{-13}	2.28×10^{-12}	3.10×10^{-10}	2.74×10^{-3}	2.77×10^{-4}
Growing Materials	2.24×10^{-6}	2.41×10^{-6}	3.36×10^{-7}	3.34×10^{-7}	1.77×10^{-14}	3.32×10^{-14}	2.85×10^{-12}	1.05×10^{-3}	4.75×10^{-5}
Refrigerants	1.09×10^{-6}	8.11×10^{-7}	3.96×10^{-8}	5.08×10^{-7}	1.05×10^{-14}	2.59×10^{-13}	1.51×10^{-6}	5.04×10^{-4}	1.04×10^{-5}
Pesticides	4.02×10^{-6}	2.61×10^{-5}	7.97×10^{-7}	3.43×10^{-7}	1.12×10^{-13}	3.54×10^{-14}	3.96×10^{-11}	4.16×10^{-4}	1.66×10^{-5}
Sanitizers	1.26×10^{-6}	6.10×10^{-7}	3.94×10^{-7}	1.92×10^{-7}	4.93×10^{-14}	1.54×10^{-14}	5.76×10^{-12}	3.65×10^{-4}	1.37×10^{-5}
Total Transport	1.12×10^{-3}	1.53×10^{-4}	6.23×10^{-5}	4.70×10^{-5}	3.81×10^{-13}	3.91×10^{-13}	6.65×10^{-12}	3.48×10^{-1}	3.07×10^{-2}
SMS Credits	-1.51×10^{-5}	-2.00×10^{-5}	-2.00×10^{-6}	-3.69×10^{-6}	-1.47×10^{-13}	-1.50×10^{-14}	-4.06×10^{-13}	-9.48×10^{-3}	-1.42×10^{-4}
Total	1.37×10^{-2}	6.52×10^{-3}	1.51×10^{-3}	1.13×10^{-3}	4.98×10^{-11}	6.81×10^{-11}	1.52×10^{-6}	2.45	1.33×10^{-1}

Table S8. TRACI impacts of Acidification, Ecotoxicity, Eutrophication, Human Health Particulate Air, Human Toxicity (cancer), Human Toxicity (non-cancer), Ozone Depletion, Resources (fossil fuels), and Smog Air per kg of mushroom product (unweighted average)

Inputs	Acidification (kg SO_2 eq.)	Ecotoxicity (CTUe)	Eutrophication (kg N eq.)	Human Health Particulate Air (kg PM2.5 eq.)	Human Toxicity, cancer (CTUh)	Human Toxicity, non-cancer (CTUh)	Ozone Depletion (kg CFC-11 eq.)	Resources, Fossil Fuels (MJ surplus energy)	Smog Air (kg O_3 eq.)
Electricity	2.25×10^{-3}	7.92×10^{-4}	9.33×10^{-5}	1.70×10^{-4}	2.10×10^{-11}	1.58×10^{-12}	3.20×10^{-10}	4.15×10^{-1}	1.82×10^{-2}
Diesel	2.58×10^{-3}	1.08×10^{-3}	1.80×10^{-4}	1.44×10^{-4}	1.61×10^{-11}	6.48×10^{-11}	8.27×10^{-12}	6.87×10^{-1}	7.93×10^{-2}
Natural Gas	8.67×10^{-4}	6.90×10^{-4}	1.13×10^{-5}	5.42×10^{-5}	9.56×10^{-12}	4.06×10^{-12}	1.25×10^{-13}	6.44×10^{-1}	3.34×10^{-3}
Heating Oil	4.37×10^{-4}	7.09×10^{-4}	3.89×10^{-5}	2.67×10^{-5}	7.97×10^{-13}	4.65×10^{-13}	5.66×10^{-12}	4.70×10^{-1}	7.08×10^{-3}
LPG	5.09×10^{-5}	7.94×10^{-5}	2.42×10^{-6}	3.00×10^{-6}	8.62×10^{-14}	4.49×10^{-14}	5.84×10^{-13}	5.15×10^{-2}	9.15×10^{-4}
Compost Materials	2.38×10^{-3}	3.85×10^{-3}	7.21×10^{-4}	1.57×10^{-4}	5.60×10^{-12}	7.46×10^{-12}	4.55×10^{-9}	2.24×10^{-1}	9.98×10^{-3}
Spawn, Supplements	3.32×10^{-4}	6.99×10^{-4}	1.12×10^{-4}	3.38×10^{-4}	1.42×10^{-12}	6.98×10^{-12}	1.07×10^{-11}	5.39×10^{-2}	6.92×10^{-3}
Compost Emissions	4.16×10^{-3}	0	2.63×10^{-4}	1.47×10^{-4}	0	0	0	0	1.43×10^{-4}
Peat	1.07×10^{-5}	3.03×10^{-6}	2.12×10^{-6}	8.88×10^{-6}	2.41×10^{-13}	2.20×10^{-12}	2.99×10^{-10}	2.64×10^{-3}	2.67×10^{-4}
Growing Materials	2.26×10^{-6}	2.43×10^{-6}	3.40×10^{-7}	3.36×10^{-7}	1.78×10^{-14}	3.38×10^{-14}	2.90×10^{-12}	1.05×10^{-3}	4.78×10^{-5}
Refrigerants	8.77×10^{-7}	6.52×10^{-7}	3.20×10^{-8}	4.08×10^{-7}	8.45×10^{-15}	2.41×10^{-13}	1.38×10^{-6}	4.05×10^{-4}	8.40×10^{-6}
Pesticides	1.02×10^{-5}	6.46×10^{-5}	2.10×10^{-6}	8.89×10^{-7}	2.71×10^{-13}	9.00×10^{-14}	1.07×10^{-10}	1.10×10^{-3}	4.42×10^{-5}
Sanitizers	5.99×10^{-6}	4.14×10^{-6}	1.16×10^{-6}	6.73×10^{-7}	1.48×10^{-13}	3.03×10^{-14}	1.19×10^{-11}	2.40×10^{-3}	7.80×10^{-5}
Total Transport	1.54×10^{-3}	2.09×10^{-4}	8.52×10^{-5}	6.42×10^{-5}	5.21×10^{-13}	5.34×10^{-13}	9.09×10^{-12}	4.75×10^{-1}	4.20×10^{-2}
SMS Credits	-3.69×10^{-5}	-4.91×10^{-5}	-4.92×10^{-6}	-9.05×10^{-6}	-3.61×10^{-13}	-3.69×10^{-14}	-9.97×10^{-13}	-2.33×10^{-2}	-3.49×10^{-4}
Total	1.46×10^{-2}	8.14×10^{-3}	1.51×10^{-3}	1.11×10^{-3}	5.55×10^{-11}	8.85×10^{-11}	1.38×10^{-6}	3.00	1.68×10^{-1}

Table S9. Average transport distances of each material from the manufacturer to the facility gate by phase for U.S. mushroom production

Category	Input Material	Average Distance Transported (miles)
Compost Materials (Phase 1)	Ammonium sulfate	60
Compost Materials (Phase 1)	Distiller's grain	135
Growing Materials (Phase 3)	Casing inoculum	822
Compost Materials (Phase 1)	Cocoa bean hulls	80
Natural Gas	Compressed natural gas	N/A[a]
Compost Materials (Phase 1)	Corn stover	68
Compost Materials (Phase 1)	Corncobs	700
Compost Materials (Phase 1)	Cotton seed burrs	135
Compost Materials (Phase 1)	Cotton seed hulls	181
Compost Materials (Phase 1)	Cotton seed meal	304
Diesel	Diesel	N/A
Compost Materials (Phase 1)	Dried poultry waste	121
Electricity	Electricity	N/A
Electricity	Electricity generation fuel – walnut shells	25
Compost Materials (Phase 1)	Grape pomace	96
Compost Materials (Phase 1)	Gypsum – mined	251
Compost Materials (Phase 1)	Gypsum – recycled	131
Compost Materials (Phase 1)	Hardwood tree leaves	5
Compost Materials (Phase 1)	Hay	158
Heating Oil	Heating oil	N/A
Growing Materials (Phase 3)	Lime – hydrated	83
Growing Materials (Phase 3)	Lime – sugar beet	413
Growing Materials (Phase 3)	Limestone	104
Liquefied Petroleum Gas (LPG)	LPG	10
Natural Gas	Natural gas	N/A
Compost Materials (Phase 1)	Nitrogen sources - other	155
Peat	Peat moss – black/reed sedge	2439
Peat	Peat moss - sphagnum	1613
Pesticides	Pesticides (Pesticides, insecticides, fungicides, herbicides)	480
Compost Materials (Phase 1)	Pima[b]	96
Compost Materials (Phase 1)	Poultry litter	120
Refrigerants	Refrigerants (Propylene glycol, R11[c], R12, R22, R123, R410a, Unspecified)	65
Sanitizers	Sanitizers	87
Spawn and Supplements	Spawn	648
Compost Materials (Phase 1)	Straw-bedded horse manure	105
Compost Materials (Phase 1)	Straw – wheat	206
Spawn and Supplements	Supplements	332
Compost Materials (Phase 1)	Urea 45	33
Compost Materials (Phase 1)	Urea 46	13

[a] Average distance transported is not applicable (N/A) in the case that transport distance is already accounted for in the reference life cycle inventory data.

[b] Pima is a cotton waste of the Pima variety of cotton.

[c] R11 refers to refrigerant 11, as R12, R22, R123, and R410a refer to refrigerants 12, 22, 123, and 410a, respectively