Inventory data for a soybean farming unit process (UP – 1 tonne of produced oil seed) related to the functional unit (FU – 19.5 kt/yr of biodiesel product) of a complete life cycle – variation in values for the Eastern Cape and KwaZulu-Natal Provinces of South Africa

Flow		Uncertainty (over Provinces)		Uncertainty (over life cycle)		Reference / Comments
		Min / UP ref. [tonne]	Max / UP ref. [tonne]	Min / FU [19.5 kt/yr]	Max / FU [19.5 kt/yr]	
Economic inputs						
Fertiliser	[t]	1.6×10^{-2}	2.7×10^{-2}	1.6×10^{3}	3.7×10^{3}	a
N	[t]	3.0×10^{-3}	5.0×10^{-3}	2.9×10^{2}	6.6×10^{2}	a
P	[t]	1.0×10^{-2}	1.7×10^{-2}	1.0×10^{3}	2.3×10^{3}	a
K	[t]	3.2×10^{-3}	5.3×10^{-3}	3.3×10^{2}	7.6×10^{2}	a
Electricity	[kWh]	1.3×10^{2}	2.2×10^{2}	1.3×10^{7}	3.1×10^{7}	b
Pesticides	[t]	6.7×10^{-5}	6.7×10^{-5}	6.8×10^{0}	9.4×10^{0}	c
Economic output						
Oil seed **(ref. flow)**	[t]	**1.0**		101.4×10^{3}	140.4×10^{3}	a
Elementary inputs and outputs						
Crude oil	[t]	3.7×10^{-2}	4.4×10^{-2}	3.7×10^{3}	6.2×10^{3}	c
Coal	[t]	8.0×10^{-3}	8.0×10^{-3}	8.6×10^{2}	1.2×10^{3}	c
Land – cultivated[d]	[ha]	4.0×10^{-1}	6.7×10^{-1}	4.1×10^{4}	9.4×10^{4}	c
Water – irrigated[d]	[Ml]	5.6×10^{-1}	1.4×10^{0}	7.8×10^{4}	1.4×10^{5}	b
CO_2	[t]	1.8×10^{-1}	1.8×10^{-1}	1.9×10^{4}	2.5×10^{4}	c
SO_2	[t]	6.0×10^{-4}	6.0×10^{-4}	6.0×10^{1}	1.8×10^{2}	c
N_2O	[t]	1.3×10^{-3}	1.3×10^{-3}	1.3×10^{2}	1.8×10^{2}	c
NO_3^- (water)	[t]	9.0×10^{-4}	1.5×10^{-3}	2.2×10^{1}	3.7×10^{1}	c
BOD (water)	[t]	3.4×10^{-5}	3.4×10^{-5}	3.5×10^{0}	4.9×10^{0}	c
COD (water)	[t]	2.4×10^{-4}	2.4×10^{-4}	2.5×10^{1}	3.3×10^{1}	c

a General literature
b South African field trip data
c Sheehan et al., 1998
d Existing cultivated land and associated water resources used for biofuels crop production

Inventory data for a sunflower farming unit process (UP – 1 tonne of produced oil seed) related to the functional unit (FU – 19.5 kt/yr of biodiesel product) of a complete life cycle – variation in values for the Eastern Cape and Mpumalanga Provinces of South Africa

Flow		Uncertainty (over Provinces)		Uncertainty (over life cycle)		Reference / Comments
		Min / UP ref. [tonne]	Max / UP ref. [tonne]	Min / FU [19.5 kt/yr]	Max / FU [19.5 kt/yr]	
Economic inputs						
Fertiliser	[t]	3.0×10^{-2}	3.2×10^{-2}	1.5×10^{3}	2.7×10^{3}	a
N	[t]	1.2×10^{-2}	1.3×10^{-2}	6.0×10^{2}	1.1×10^{3}	a
P	[t]	1.7×10^{-2}	1.8×10^{-2}	8.4×10^{2}	1.5×10^{3}	a
K	[t]	1.6×10^{-3}	1.7×10^{-3}	7.8×10^{1}	1.6×10^{2}	a
Electricity	[kWh]	2.7×10^{2}	2.8×10^{2}	1.3×10^{7}	2.5×10^{7}	b
Pesticides	[t]	6.7×10^{-5}	6.7×10^{-5}	3.3×10^{0}	5.9×10^{0}	c
Economic output						
Oil seed **(ref. flow)**	[t]	**1.0**		50.7×10^{3}	87.8×10^{3}	a
Elementary inputs and outputs						
Crude oil	[t]	4.4×10^{-2}	4.4×10^{-2}	2.1×10^{3}	3.9×10^{3}	c
Coal	[t]	8.0×10^{-3}	8.0×10^{-3}	3.9×10^{2}	7.4×10^{2}	c
Land – cultivated[d]	[ha]	7.5×10^{-1}	7.8×10^{-1}	3.7×10^{4}	7.0×10^{4}	c
Water – irrigated[d]	[Ml]	3.6×10^{-1}	1.1×10^{0}	3.1×10^{4}	5.5×10^{4}	b
CO_2	[t]	1.8×10^{-1}	1.8×10^{-1}	9.2×10^{3}	1.6×10^{4}	c
SO_2	[t]	6.0×10^{-4}	6.0×10^{-4}	2.9×10^{1}	5.3×10^{1}	c
N_2O	[t]	1.3×10^{-3}	1.3×10^{-3}	6.4×10^{1}	1.1×10^{2}	c
NO_3^- (water)	[t]	3.6×10^{-3}	3.9×10^{-3}	4.1×10^{2}	4.5×10^{2}	c
BOD (water)	[t]	3.4×10^{-5}	3.4×10^{-5}	1.7×10^{0}	2.9×10^{0}	c
COD (water)	[t]	2.4×10^{-4}	2.4×10^{-4}	1.2×10^{1}	2.1×10^{1}	c

a General literature
b South African field trip data
c Sheehan et al., 1998
d Existing cultivated land and associated water resources used for biofuels crop production

Inventory data for a canola farming unit process (UP – 1 tonne of produced oil seed) related to the functional unit (FU – 19.5 kt/yr of biodiesel product) of a complete life cycle – variation in values for the Eastern Cape and Western Cape Provinces of South Africa

Flow		Uncertainty (over Provinces)		Uncertainty (over life cycle)		Reference / Comments
		Min / UP ref. [tonne]	Max / UP ref. [tonne]	Min / FU [19.5 kt/yr]	Max / FU [19.5 kt/yr]	
Economic inputs						
Fertiliser	[t]	5.9×10^{-2}	5.9×10^{-2}	2.9×10^{3}	4.5×10^{3}	a
N	[t]	2.8×10^{-2}	2.8×10^{-2}	1.4×10^{3}	2.1×10^{3}	a
P	[t]	4.9×10^{-3}	4.9×10^{-3}	2.5×10^{2}	3.7×10^{2}	a
K	[t]	2.5×10^{-2}	2.5×10^{-2}	1.3×10^{3}	1.9×10^{3}	a
Electricity	[kWh]	2.4×10^{2}	2.4×10^{2}	4.7×10^{6}	1.2×10^{7}	b
Pesticides	[t]	6.7×10^{-5}	6.7×10^{-5}	3.5×10^{0}	5.1×10^{0}	c
Economic output						
Oil seed **(ref. flow)**	[t]	**1.0**		50.7×10^{3}	74.1×10^{3}	a
Elementary inputs and outputs						
Crude oil	[t]	4.4×10^{-2}	4.4×10^{-2}	8.6×10^{2}	2.1×10^{3}	c
Coal	[t]	8.0×10^{-3}	8.0×10^{-3}	4.3×10^{2}	6.4×10^{2}	c
Land – cultivated[d]	[ha]	7.0×10^{-1}	7.1×10^{-1}	3.7×10^{4}	5.3×10^{4}	c
Water – irrigated[d]	[Ml]	6.5×10^{-1}	1.2×10^{0}	4.9×10^{4}	6.4×10^{4}	b
CO_2	[t]	1.8×10^{-1}	1.8×10^{-1}	9.4×10^{3}	1.4×10^{4}	c
SO_2	[t]	6.0×10^{-4}	6.0×10^{-4}	3.1×10^{1}	4.5×10^{1}	c
N_2O	[t]	1.3×10^{-3}	1.3×10^{-3}	6.6×10^{1}	9.6×10^{1}	c
NO_3^- (water)	[t]	8.4×10^{-3}	8.4×10^{-3}	9.6×10^{2}	9.6×10^{2}	c
BOD (water)	[t]	3.4×10^{-5}	3.4×10^{-5}	1.7×10^{0}	2.5×10^{0}	c
COD (water)	[t]	2.4×10^{-4}	2.4×10^{-4}	1.2×10^{1}	1.8×10^{1}	c

a General literature
b South African field trip data
c Sheehan et al., 1998
d Existing cultivated land and associated water resources used for biofuels crop production

Inventory data for a soybean oil pressing unit process (UP – 1 tonne of processed oil seed), including transportation from the farming activities, related to the functional unit (FU – 19.5 kt/yr of biodiesel product) of a complete life cycle – variation in values for the Eastern Cape and KwaZulu-Natal Provinces of South Africa

Flow		Uncertainty (over Provinces)		Uncertainty (over life cycle)		Reference / Comments
		Min / UP ref. [tonne]	Max / UP ref. [tonne]	Min / FU [19.5 kt/yr]	Max / FU [19.5 kt/yr]	
Economic inputs						
Electricity	[kWh]	1.3×10^{2}	1.3×10^{2}	1.3×10^{7}	1.9×10^{7}	b
Steam	[t]	6.7×10^{-1}	6.7×10^{-1}	5.9×10^{4}	9.8×10^{4}	b
Water	[t]	4.5×10^{-3}	4.5×10^{-3}	4.5×10^{-1}	6.4×10^{-1}	c
Oil seed **(ref. flow)**	[t]	**1.0**		101.4×10^{3}	140.4×10^{3}	c
Economic outputs						
Meal/cake	[t]	7.9×10^{-1}	8.5×10^{-1}	80.0×10^{3}	119.0×10^{3}	c
Soy oil	[t]	1.6×10^{-1}	2.2×10^{-1}	19.7×10^{3}		a
Elementary inputs and outputs						
Crude oil	[t]	4.3×10^{-2}	4.5×10^{-2}	4.5×10^{3}	6.5×10^{3}	c
Coal	[t]	2.5×10^{-3}	3.0×10^{-3}	3.0×10^{2}	3.5×10^{2}	c
CO_2	[t]	1.4×10^{-1}	1.7×10^{-1}	1.7×10^{4}	2.0×10^{4}	c
SO_2	[t]	1.5×10^{-3}	1.5×10^{-3}	1.5×10^{2}	2.1×10^{2}	c
N_2O	[t]	3.8×10^{-3}	3.8×10^{-3}	3.9×10^{2}	5.3×10^{2}	c
NO_3^- (water)	[t]	1.6×10^{-8}	1.6×10^{-8}	1.9×10^{-3}	1.9×10^{-3}	c
BOD (water)	[t]	2.5×10^{-6}	2.5×10^{-6}	2.5×10^{-1}	3.5×10^{-1}	c
COD (water)	[t]	2.1×10^{-5}	2.1×10^{-5}	2.1×10^{0}	2.9×10^{0}	c

a General literature
b South African field trip data
c Sheehan et al., 1998

Inventory data for a sunflower oil pressing unit process (UP – 1 tonne of processed oil seed), including transportation from the farming activities, related to the functional unit (FU – 19.5 kt/yr of biodiesel product) of a complete life cycle – variation in values for the Eastern Cape and Mpumalanga Provinces of South Africa

Flow		Uncertainty (over Provinces)		Uncertainty (over life cycle)		Reference / Comments
		Min / UP ref. [tonne]	Max / UP ref. [tonne]	Min / FU [19.5 kt/yr]	Max / FU [19.5 kt/yr]	
Economic inputs						
Electricity	[kWh]	1.3×10^{2}	1.3×10^{2}	6.6×10^{6}	1.2×10^{7}	b
Steam	[t]	6.7×10^{-1}	6.7×10^{-1}	3.9×10^{4}	5.9×10^{4}	b
Water	[t]	4.5×10^{-3}	4.5×10^{-3}	2.1×10^{-1}	3.9×10^{-1}	c
Oil seed **(ref. flow)**	[t]	**1.0**		50.7×10^{3}	87.8×10^{3}	c
Economic outputs						
Meal/cake	[t]	5.6×10^{-1}	7.5×10^{-1}	27.3×10^{3}	66.3×10^{3}	c
Soy oil	[t]	2.5×10^{-1}	4.4×10^{-1}	19.7×10^{3}		a
Elementary inputs and outputs						
Crude oil	[t]	4.3×10^{-2}	4.5×10^{-2}	1.0×10^{3}	4.0×10^{3}	c
Coal	[t]	2.6×10^{-3}	1.1×10^{-2}	5.4×10^{1}	2.2×10^{2}	c
CO_2	[t]	1.4×10^{-1}	6.0×10^{-1}	3.3×10^{3}	1.2×10^{4}	c
SO_2	[t]	1.5×10^{-3}	1.5×10^{-3}	7.2×10^{1}	1.3×10^{2}	c
N_2O	[t]	3.8×10^{-3}	3.8×10^{-3}	1.9×10^{2}	3.3×10^{2}	c
NO_3^- (water)	[t]	1.6×10^{-8}	1.6×10^{-8}	2.0×10^{-3}	2.0×10^{-3}	c
BOD (water)	[t]	2.5×10^{-6}	2.5×10^{-6}	1.2×10^{-1}	1.2×10^{-1}	c
COD (water)	[t]	2.1×10^{-5}	2.1×10^{-5}	1.1×10^{0}	1.9×10^{0}	c

a General literature
b South African field trip data
c Sheehan et al., 1998

Inventory data for a canola oil pressing unit process (UP – 1 tonne of processed oil seed), including transportation from the farming activities, related to the functional unit (FU – 19.5 kt/yr of biodiesel product) of a complete life cycle – variation in values for the Eastern Cape and Western Cape Provinces of South Africa

Flow		Uncertainty (over Provinces)		Uncertainty (over life cycle)		Reference / Comments
		Min / UP ref. [tonne]	Max / UP ref. [tonne]	Min / FU [kilolitre]	Max / FU [kilolitre]	
Economic inputs						
Electricity	[kWh]	1.3×10^{2}	1.3×10^{2}	6.8×10^{6}	9.9×10^{6}	b
Steam	[t]	6.7×10^{-1}	6.7×10^{-1}	3.9×10^{4}	5.9×10^{4}	b
Water	[t]	4.5×10^{-3}	4.5×10^{-3}	2.3×10^{-1}	3.3×10^{-1}	c
Oil seed **(ref. flow)**	[t]	**1.0**		50.7×10^{3}	87.8×10^{3}	c
Economic outputs						
Meal/cake	[t]	5.9×10^{-1}	7.2×10^{-1}	29.3×10^{3}	54.6×10^{3}	c
Soy oil	[t]	2.8×10^{-1}	4.1×10^{-1}	19.7×10^{3}		a
Elementary inputs and outputs						
Crude oil	[t]	4.3×10^{-2}	4.5×10^{-2}	1.4×10^{3}	3.3×10^{3}	c
Coal	[t]	2.6×10^{-3}	1.8×10^{-2}	9.2×10^{1}	2.2×10^{2}	c
CO_2	[t]	1.0×10^{-1}	1.4×10^{-1}	5.5×10^{3}	1.3×10^{4}	c
SO_2	[t]	1.5×10^{-3}	1.5×10^{-3}	7.4×10^{1}	1.1×10^{2}	c
N_2O	[t]	3.8×10^{-3}	3.8×10^{-3}	1.9×10^{2}	2.9×10^{2}	c
NO_3^- (water)	[t]	1.6×10^{-8}	1.6×10^{-8}	2.0×10^{-3}	2.0×10^{-3}	c
BOD (water)	[t]	2.5×10^{-6}	2.5×10^{-6}	1.4×10^{-1}	2.0×10^{-1}	c
COD (water)	[t]	2.1×10^{-5}	2.1×10^{-5}	1.1×10^{0}	1.6×10^{0}	c

a General literature
b South African field trip data
c Sheehan et al., 1998

Inventory data for a biodiesel production unit process (UP – 1 tonne of biodiesel produced), including transportation from the oil pressing facilities, related to the functional unit (FU- 19.5 kt/yr of biodiesel product) of a complete life cycle – variation in values for all the Provinces of South Africa

Flow		Uncertainty (over Provinces)		Uncertainty (over life cycle)		Reference / Comments
		Min / UP ref. [tonne]	Max / UP ref. [tonne]	Min / FU [19.5 kt/yr]	Max / FU [19.5 kt/yr]	
Economic inputs						
Electricity	[kWh]	3.0×10^{2}	3.0×10^{2}	6.4×10^{6}	6.6×10^{6}	b
Methanol	[t]	1.1×10^{-1}	1.1×10^{-1}	2.3×10^{3}	2.5×10^{3}	b
KOH	[t]	1.2×10^{-2}	1.2×10^{-2}	2.3×10^{2}	2.3×10^{2}	b
HCl (aq.)	[t]	1.0×10^{-2}	1.0×10^{-2}	2.0×10^{2}	2.0×10^{2}	b
Plant oil	[t]	1.0×10^{0}	1.0×10^{0}	19.7×10^{3}	19.7×10^{3}	d
Water	[t]	1.8×10^{0}	1.8×10^{0}	3.7×10^{4}	3.9×10^{4}	b, c
Economic output						
Biodiesel **(ref.)**	[t]	**1.0**		19.5×10^{3}		a
Waste stream 1						
KCl (aq.)	[t]	1.2×10^{-2}	1.2×10^{-2}	2.0×10^{2}	2.0×10^{2}	d
Water	[t]	7.5×10^{-1}	7.5×10^{-1}	1.3×10^{4}	1.7×10^{4}	b
Waste stream 2						
Glycerol	[t]	1.1×10^{-1}	1.1×10^{-1}	1.9×10^{3}	2.3×10^{3}	d
Methanol	[t]	3.0×10^{-3}	3.0×10^{-3}	5.5×10^{1}	6.6×10^{1}	d
Elementary inputs and outputs						
Crude oil	[t]	4.3×10^{-2}	4.3×10^{-2}	9.5×10^{2}	9.5×10^{2}	c
Coal	[t]	1.2×10^{-2}	1.2×10^{-2}	2.5×10^{2}	2.5×10^{2}	c
CO_2	[t]	9.0×10^{-2}	9.0×10^{-2}	2.0×10^{3}	2.1×10^{3}	c
SO_2	[t]	2.5×10^{-3}	2.7×10^{-3}	5.3×10^{1}	5.5×10^{1}	c
N_2O	[t]	4.1×10^{-4}	4.1×10^{-4}	8.8×10^{0}	9.0×10^{1}	c
NO_3^- (water)	[t]	6.3×10^{-9}	6.3×10^{-9}	1.3×10^{-4}	1.3×10^{-4}	c
BOD (water)	[t]	2.4×10^{-6}	2.4×10^{-6}	5.3×10^{-2}	5.5×10^{-2}	c
COD (water)	[t]	2.0×10^{-4}	2.0×10^{-4}	4.3×10^{-1}	4.5×10^{-1}	c

a General literature
b South African field trip data
c Sheehan et al., 1998
d Harding et al., 2008