

Supplementary Materials

Table S1. Land classification in Ontario.

Classification	Descriptions
Class 1	Well developed and has no significant limitations in use for crops.
Class 2	Has moderate limitations that restrict the range of crops or requires moderate conservation practices.
Class 3	Has moderately severe limitations that restrict the range of crops or requires special conservation practices.
Class 4	Has severe limitations that restrict the choices of crops or requires special conservation and management practices, or both.
Class 5	Has very severe limitations that restrict their capability in producing perennial forage crops, and improvement practices are feasible.
Class 6	Unsuitable for cultivation, and can be used for unimproved permanent pasture.
Class 7	Has no capacity of arable culture or permanent pasture.

Table S2. Land area under different tillable land classes and various regions in Ontario, ha.

Regions	Land class and tillable land area, Ha *					^ Regional
	Class 1	Class 2	Class 3	Class 4	Class 5	Area, Ha
Southern Ontario	238,102	876,664	414,109	37,138	39,332	13,993,100
Western Ontario	724,831	254,067	239,130	73,112	130,091	56,311,787
Central Ontario	165,830	113,526	122,839	118,976	84,424	3,981,400
Eastern Ontario	32,005	312,567	304,841	148,471	65,166	3,529,600

* Kludze *et al.*, [17]; ^ Wikipedia, 2014 [55].

Table S3. Summary of parameters for which data are collected from literature.

Parameters/systems	Actual data	Sources
Miscanthus cultivation (kg CO ₂ e/tDM)	−88.77 to −167.67	[31]
Feedstock cost (\$/tDM)	62.63 to 71.50	[17]
* Crushing (size 3 mm) (kWh/kg)	0.06095	[22,23]
Ethanol processing plant construction	\$38 million	[56]
No. of labor (persons)	23	[56]
Enzyme:		
Energy consumption kWh/L	0.802	[57]
Material cost (\$/L)	0.014	[57]
Yeast (\$/gallon)	0.01	[50]
Vacuum extractive fermentation & distillation (MJ/kg hydrous ethanol)	7.525	[42]
Purification (MJ/kg ethanol)	1.085	[58]
Ethanol yield (L/kg-dry miscanthus)	0.305	[39,44–46]

Note: Plant capacity is 20000 kL/year; labor cost \$46,000/person/year; * assumed to be same that of straw; boiler efficiency 80% [59]; \$: Canadian dollar.

SI-4 Estimation methods of transportation distance [60].

Radius of the area:

$$R \text{ km} = (F/(\pi f_a f_{lc} Y))^{1/2} \quad (\text{S1})$$

where:

F = Annual feedstock demand

π = constant

f_a = fraction of total farmland from which feedstock can be collected or produced

f_{lc} = fraction of surrounding farmland containing crops

Y = biomass yield per unit area (dry), t/km²

Transportation distance (collection center–processing plant):

$$D \text{ km} = 2Rf_w/3 \quad (\text{S2})$$

where f_w = road winding factor (assumed to be 1.3; [61]).