Supplementary Materials

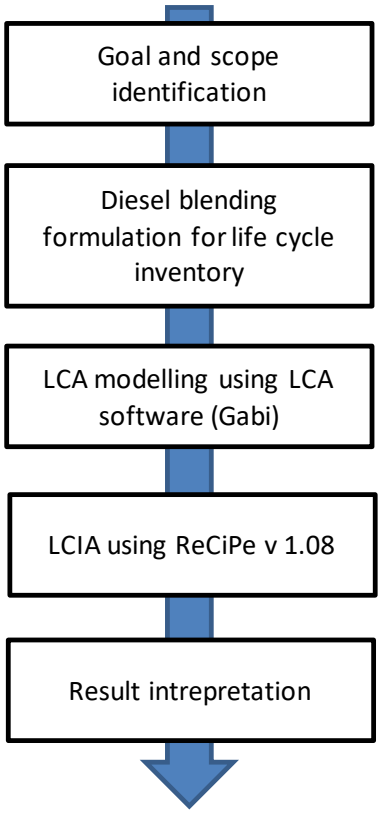

Fig. S1. Research methodology flow chart.

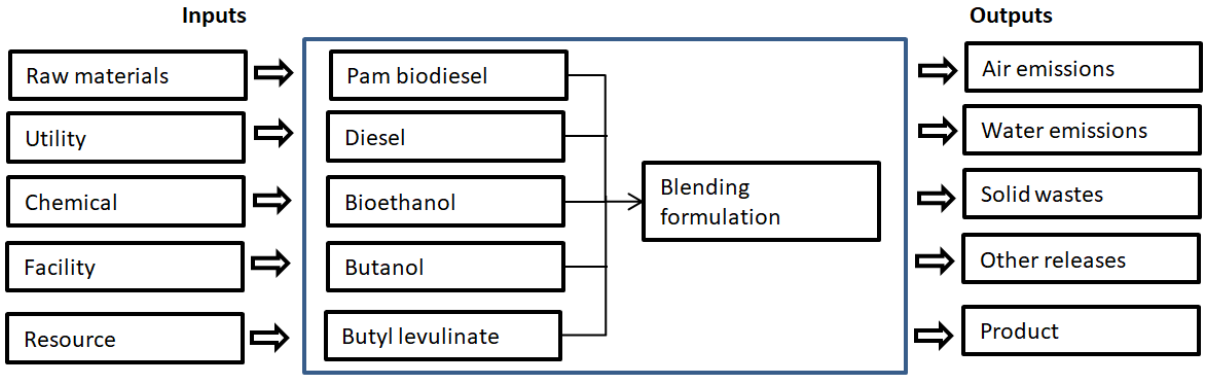

Fig. S2. LCA framework for the study.

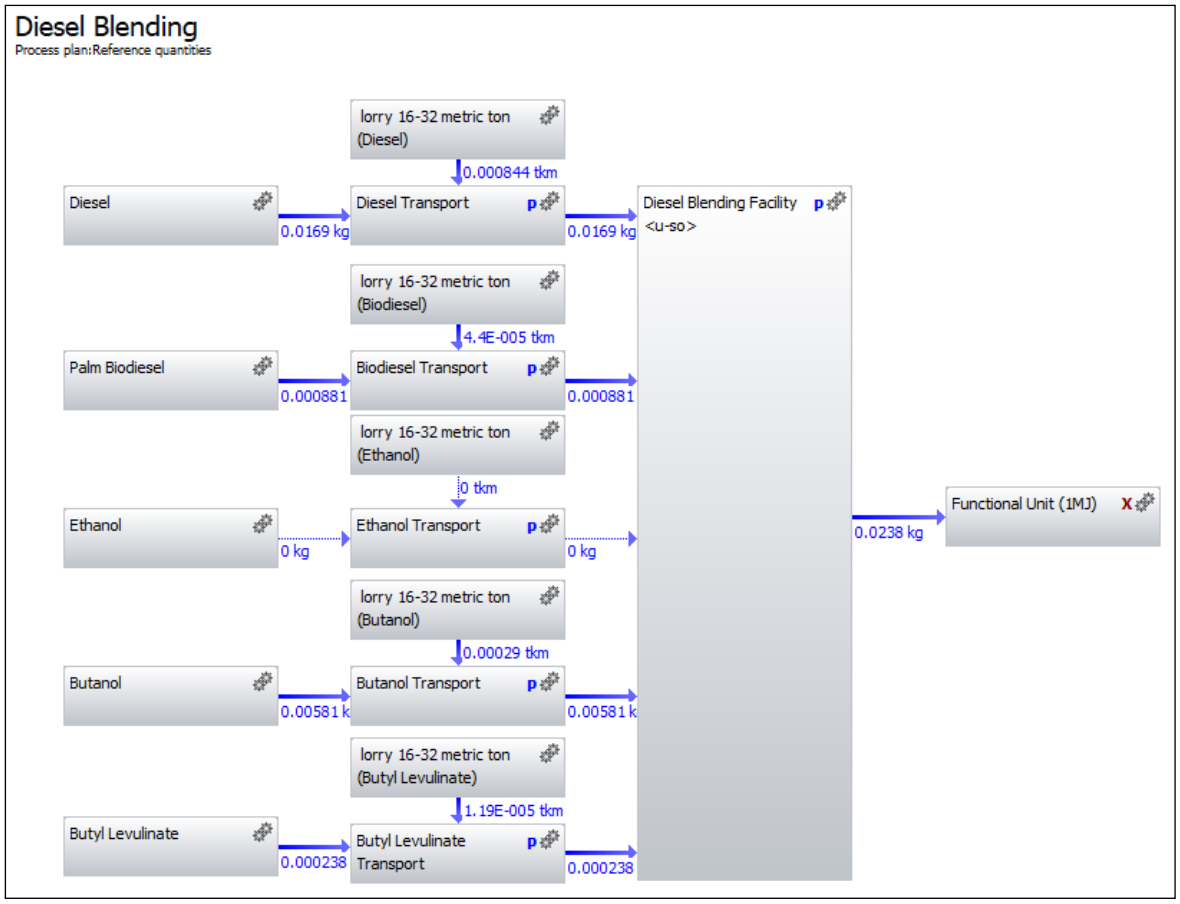

Fig. S3. LCA framework for the study.

Table S1. General Data Collected and Its Sources

Type of data collected	Method of collection	Source
LCA palm biodiesel	Database	Ecoinvent database v3.1 (MY: esterification of palm oil)
LCA diesel	Database	Ecoinvent database v3.1 (ROW: diesel production, low-sulfur)
LCA butanol	Database	Ecoinvent database v3.1 (ROW: market for 1-butanol)
LCA bioethanol	Database	Ecoinvent database v3.1 (ROW: market for ethanol, without water, in 99.7% solution state, from fermentation, at service station)
LCA butyl levulinate	Database	Ecoinvent database v3.1 (GLO: market for chemical, organic)
Transport	Database	Ecoinvent database v3.1 (ROW:transport, freight, lorry 16-32 metric ton, EURO5)

Table S2. Biofuel Yields for Different Feedstocks and Countries [18-21]

Crops	Global/National Estimates	Biofuel	Crop Yield	Conversion Efficiency	Biofuel Yield
			(Tonnes/ha)	(Litres/tonnes)	(Litres/ha)
Sugar beet	Global	Ethanol	46.0	110	5060
Sugar cane	Global	Ethanol	65.0	70	4550
Cassava	Global	Ethanol	12.0	180	2070
Maize	Global	Ethanol	4.9	400	1960
Rice	Global	Ethanol	4.2	430	1806
Wheat	Global	Ethanol	2.8	340	952
Sorghum	Global	Ethanol	1.3	380	494
Sugar cane	Brazil	Ethanol	73.5	74.5	5476
Sugar cane	India	Ethanol	60.7	74.5	4522
Oil palm	Malaysia	Biodiesel	20.6	230	4736
Oil palm	Indonesia	Biodiesel	17.8	230	4092
Maize	United States	Ethanol	9.4	399	3751
Maize	China	Ethanol	5.0	399	1995
Cassava	Brazil	Ethanol	13.6	137	1863
Cassava	Nigeria	Ethanol	10.8	137	1480
Soybean	United States	Biodiesel	2.7	205	552
Soybean	Brazil	Biodiesel	2.4	205	491