

**Winter wheat
bioethanol - Elsayed et al.**

	MJ/ha
cultivation	
fuel	4219
-ref sys fuel	-1023
N	2132
P ₂ O ₅	948
K ₂ O	558
insecticide	38
herbicide	1472
fungicide	795
seed	1620
sub total	10759
transport	765
drying	1696
sub total	2461
sub sub total	13220
processing	725
	12432
	89
sub total	13246
total input	26.47 GJ/ha/year
bioethanol yield	2.3 t/ha
fuel value	61.14 GJ/ha/year
balance	34.67 GJ/ha/year

assumptions :
 8 t wheat grain/ha
 transport 260km round trip
 150kg/ha N
 60 kg/ha P₂O₅
 60 kg/ha K₂O
 have not considered plant
 construction/maintenance costs
 calorific value bioethanol = 26.72 MJ/kg

**Winter wheat
biogas**

	MJ/ha
cultivation	
fuel	4219
-ref sys fuel	-1023
N	2132
P ₂ O ₅	948
K ₂ O	558
insecticide	38
herbicide	1472
fungicide	795
seed	1620
sub total	10759
transport	12
drying	1696
sub total	1708
sub sub total	12467
processing	20446
sub total	20446
total input	32.91 GJ/ha/year
methane yield	2840 m ³ /ha
fuel value	101.39 GJ/ha/year
balance	68.48 GJ/ha/year

assumptions :
 8 t wheat grain/ha
 transport 4km round trip
 digestion takes place on-farm
 150kg/ha N
 60 kg/ha P₂O₅
 60 kg/ha K₂O
 have not considered plant
 construction/maintenance costs
 calorific value methane = 35.7 MJ/m³
 grain has to be dried for storage
 process energy = 20% of fuel energy

**Oilseed rape
biodiesel - Elsayed et al.**

	MJ/ha
cultivation	
fuel	2647
-ref sys fuel	-1023
N	7960
P ₂ O ₅	790
K ₂ O	465
pesticide total	767
seed	39
sub total	11645
transport	552
drying	611
sub total	1163
sub sub total	12808
processing	2585
	444
	6162
sub total	9191
total input	22.00 GJ/ha/year
biodiesel yield	1.08 t/ha
fuel value	40.25 GJ/ha/year
balance	18.25 GJ/ha/year

assumptions :
 3 t rape seed / ha
 transport 260km round trip
 196kg/ha N
 50 kg/ha P₂O₅
 50 kg/ha K₂O
 have not considered plant
 construction/maintenance costs
 calorific value biodiesel = 37.27 MJ/kg
 assume grain has to be dried for storage

Have considered all input energies allocated to output fuel productions - no consideration of other outputs from the process.
 e.g. digestate for AD, straw, rape meal and glycerine for biodiesel