

Spearman Rank Correlation: Parameters vs Metrics

Fermentation titer [g/L]	-0.09	0.00	0.04	0.09
Fermentation tau [hr]	0.23	0.78	0.48	0.52
Product yield [%]	-0.45	0.04	0.07	-0.43
Biomass yield [%]	0.10	0.62	0.43	0.41
Centrifuge split [multiplier]	-0.44	0.12	-0.10	-0.43
Cell disruption efficiency [-]	-0.21	-0.08	-0.06	-0.39
Filtration capture [-]	-0.01	-0.04	-0.01	-0.00
Diafiltration retention [-]	-0.09	-0.18	-0.12	-0.19
Turbogenerator efficiency [-]	0.11	-0.01	-0.04	-0.14
Electricity price [\$/kWh]	-0.02	0.06	0.09	-0.10
Glucose price [\$/kg]	0.18	0.03	0.48	-0.00
Ammonia price [\$/kg]	-0.05	0.05	0.12	0.09
Buffer/Seed cost [multiplier]	-0.07	-0.04	0.34	-0.07
Operating days [days/yr]	-0.16	0.07	0.65	0.10
IRR [fraction]	0.75	-0.04	-0.01	0.02
Income tax [fraction]	0.03	0.00	-0.00	-0.06
Electricity GWP [kg CO2/kWh]	-0.04	0.17	0.08	0.25
Glucose GWP [kg CO2/kg]	-0.14	0.08	-0.11	0.13
Ammonia GWP [kg CO2/kg]	0.07	0.12	-0.05	0.15
Buffer/Seed GWP [multiplier]	-0.09	0.08	-0.02	0.12
	PreFerS: MSP [\$/kg]	PreFerS: TCI [10 <sup>6</sup> \$]	PreFerS: AOC [10 <sup>6</sup> \$/yr]	PreFerS: GWP [kg CO2-eq/kg]

Heatmap visualization of Spearman Rank Correlation between Parameters (Rows) and Metrics (Columns). The color scale represents Spearman's  $\rho$ , ranging from -1.00 (dark blue) to 1.00 (dark orange).

Parameters (Rows):

- Fermentation titer [g/L]
- Fermentation tau [hr]
- Product yield [%]
- Biomass yield [%]
- Centrifuge split [multiplier]
- Cell disruption efficiency [-]
- Filtration capture [-]
- Diafiltration retention [-]
- Turbogenerator efficiency [-]
- Electricity price [\$/kWh]
- Glucose price [\$/kg]
- Ammonia price [\$/kg]
- Buffer/Seed cost [multiplier]
- Operating days [days/yr]
- IRR [fraction]
- Income tax [fraction]
- Electricity GWP [kg CO2/kWh]
- Glucose GWP [kg CO2/kg]
- Ammonia GWP [kg CO2/kg]
- Buffer/Seed GWP [multiplier]

Metrics (Columns):

- PreFerS: MSP [\$/kg]
- PreFerS: TCI [10<sup>6</sup> \$]
- PreFerS: AOC [10<sup>6</sup> \$/yr]
- PreFerS: GWP [kg CO2-eq/kg]

Spearman's  $\rho$  scale: -1.00, -0.75, -0.50, -0.25, 0.00, 0.25, 0.50, 0.75, 1.00.