

Supplementary Materials

Table S1. CO₂ emissions per kg of product/substance.

Process	Unit	CO ₂ emissions
SOYBEAN PRODUCTION		
Soybean seeds	kg CO ₂ eq/kg	0.25
Seed treatment	kg CO ₂ eq /L	5.2
Adjuvant	kg CO ₂ eq/L	0.34
Nitrogen	kg CO ₂ eq/kg	3.11
Phosphate	kg CO ₂ eq/kg	1.84
Potassium	kg CO ₂ eq/kg	1.30
Electricity	kg CO ₂ eq/kWh	0.0737
Fuel	kg CO ₂ eq/L	3.53
Fungicides	kg CO ₂ eq/L	8.15
Herbicides	kg CO ₂ eq/L	31.29
Insecticide	kg CO ₂ eq/L	40.22
Firewood	kg CO ₂ eq/Kwh	1.08
BOVINE MEAT PRODUCTION		
Brachiaria Seeds	kg CO ₂ eq/kg	0.30
Nitrogen	kg CO ₂ eq/kg	3.11
Phosphate	kg CO ₂ eq/kg	1.84
Potassium	kg CO ₂ eq/kg	1.30
Electricity	kg CO ₂ eq/kWh	0.0737
Fuel	kg CO ₂ eq/L	3.53
Urea	kg CO ₂ eq/kg	0.61
Mineral salt	kg CO ₂ eq/kgDM	1.62
Water	kg CO ₂ eq/m ³	0.137
CH ₄	kg CO ₂ eq/kg	27.9
BRAZIL NUT PRODUCTION		

Process	Unit	CO ₂ emissions
Electricity	kg CO ₂ eq/kWh	0.0737
Fuel	kg CO ₂ eq/L	3.53
Water	kg CO ₂ eq/m ³	0.137

Adapted from [1-10].

Table S2. Basic requirements defined for each subcategory of stakeholder workers.

STAKEHOLDER WORKERS	SUBCATEGORY	BASIC REQUIREMENT
	Salary and benefits	Minimum wage in 2022 (1,212.00)
	Child labor	There must be no workers under the age of 16
	Equal opportunities/ discrimination	Equality of opportunities in the labor market regarding race and sex
	Forced labour	Absence of conditions analogous to slavery
	Freedom of association and collective bargaining	Unions of categories in the region for association

Adapted from [11-16].

Table S3. CO₂ emissions for production of 3,300kg of soybeans/ha.

Process	CO₂ emissions (tCO₂eq)
SEED TREATMENT	
Seeds	0.01715
Seed treatment	0.00125
Adjuvant	0.00051
Total	0.01891
SOWING	
Fertilizers	
Nitrogen	0.0311
Phosphate	0.0736
Potassium	0.0858
Energy	
Fuel	0.1765
Total	0.367
MANAGEMENT	
Fungicides	0.0326
Herbicides	0.12516
Insecticide	0.00804
Adjuvant	0.00255
Energy	
Fuel	0.33535
Total	0.5037
HARVESTING	
<i>Input</i>	
Energy	
Fuel	0.1059
Total	0.1059
DRYING	

Process	CO ₂ emissions (tCO ₂ eq)
<i>Input</i>	
Energy	
Electricity	0.00007
Coal	0.0837
Total	0.08377
TOTAL	1.079

Table S4. CO₂ emissions for production of 271.25kg of beef/ha.

Process	CO₂ emissions (tCO₂eq)
BRACHIARIA	
SOWING	
<i>Input</i>	
Seeds	0.018
Fertilizers	
Nitrogen	0.0426
Phosphate	0.02005
Potassium	0.00611
Energy	
Fuel	0.1765
Total	0.24706
MANAGEMENT	
<i>Input</i>	
Urea fertilizing	0.03812
Energy	
Fuel	0.1765
Total	0.21462
CATTLE BREEDING	
<i>Input</i>	
Mineral salt	0.180
Water	0.004
Enteric emission	4.033
<i>Output</i>	
Total	4.217
SLAUGHTER/PROCEDURES	
<i>Input</i>	
Water	9E-5

Process	CO ₂ emissions (tCO ₂ eq)
Energy	
Electricity	0.0719
Total	0.07199
STORAGE	
<i>Input</i>	
Energy	
Electricity	0.0013
Total	0.0013
TOTAL	4.7513

Table S5. CO₂ emissions for production of 2,000 kg of Brazil nuts/ha.

Process	CO ₂ emissions (tCO ₂ eq)
HARVEST	
<i>Input</i>	
Energy	
Fuel	0.19768
Total	0.19768
BENEFICIATION	
<i>Input</i>	
Water	0.00115
Energy	
Electricity	0.02653
Total	0.02768
TOTAL	0.22536

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