Table S1. Economic cost calculation models
(The model followed according to Nacimento, R.A., Luiz, V.T., Mendes, C.M.I., Giannetti, B.F., Gameiro, A.H., 2022. Sustainability comparison of commercial Brazilian organic and conventional broiler production systems under a 5SE$_N$SU model perspective. J. Clean. Prod. 377. https://doi.org/10.1016/j.jclepro.2022.134297)

Notes	Items	Data	Units	References	
Q_1	*Zootechnical information*				
	Water consumption=	35.58	m^3	Own data	**
	Initial weight =	0.042	kg	Own data	
	Final weight =	2,650	kg	Miele et al. (2010)	
	Final age =	42	d	Miele et al. (2010)	
	Flock =	6.27	un/yr	Miele et al. (2010)	
	Interval =	16	d	Own data	
	Bedding reuse =	6	times	Miele et al. (2010)	
	Maximum density =	13	birds/m^2	Own data	
IB	Starting number of birds =	16,000	un/flock	Miele et al. (2010)	
	Price paid per broiler =	0.88	R$/bird	Own data	
	Mortality				
$M1$	Initial mortality =	-	%	Own data	
$M2$	Growth mortality =	-	%	Own data	
$M3$	Final mortality =	4	%	Miele et al. (2010)	
	Mortality = ($M1$)+($M2$)+($M3$)				
	(__%)+(__%)+(__%)				
	=	4	%	Parameter	

SBr	Total of broilers =	(IB)*1-(Mortality)			
	=	(__un/flock) *1-(__%)			
	=	15,360	un/flock		Parameter
	Body weight gain=	(Final weight) - (Initial weight)			
	=	(__kg/bird) - (__kg/bird)			
	=	2,61	kg/bird		Parameter
	Feed consumption				
	Initial feed consumption =	1.149	kg/bird		Miele et al. (2010)
	Growth feed consumption =	1.985	kg/bird		Miele et al. (2010)
	Final feed consumption =	1.510	kg/bird		Miele et al. (2010)
	Total initial feed consumption =				
IFi	=	(Initial consumption) *(IB)*(1-($M1$)			
	=	(__kg/bird) *(__un/flock) *(1-(__%)			
	Total growth feed consumption =	16,847.10	kg		Parameter
GFi	=	(Consumption growth) *(IB)*(1-($M2$)			
	=	(__kg/bird) *(__un/flock) *(1-(__%)			
	Total final feed consumption =	29,025.46	kg		Parameter
FFi	=	(Final consumption) *(IB)*(1-($M3$)			
	=	(__kg/bird) *(__un/flock) *(1-(__%)			
	Total feed consumption =	21,990.43	kg		Parameter
Fi	=	(IFi)+(GFi)+(FFi)			
	=	(__kg/bird) +(__kg/bird)+(__kg/bird)			
	=	67,862.99	kg		Parameter
Q_2	*Depreciation and maintenance cost*				
					a
it_1	*Building*				
	Building area =	1,200	m^2		Own data
	Basic Unit Cost (CUB/SP) =	417.78	R$/m^2		SINDUSCON-SP, 2007

Initial value	=	(Area)*(CUB)			
	=	(__m^2) *(__R$/m^2)			
	=	501,336.00	R$	Parameter	
Residual rate	=	7.6	%	Miele et al. (2010)	
Useful life	=	40	yr	CONAB, 2010 p. 57	b
Residual value	=	(Initial value) * (Residual rate)			
	=	(__R$) * (__%)			
	=	38,101.54	R$	Parameter	
Depreciation	=	(Initial value) - (Residual value) / (Useful life)			
	=	(__R$) - (__R$) / (__year)			
	=	11,580.86	R$/year	Parameter	
Maintenance rate	=	1	%	Miele et al. (2010)	
Maintenance cost	=	(Initial value) *(Maintenance rate) / (Useful life)			
	=	(__R$) * (__%) / (__year)			
	=	125.33	R$/year	Parameter	

it_3 *Equipment*

Initial value	=	245,654.64	R$	Own data	
Residual rate	=	5.6	%	Miele et al. (2010)	a
Useful life	=	12	yr	CONAB, 2010 p. 52-7	a
Residual value	=	(Initial value) * (Residual rate)			
	=	(__R$) * (__%)			
	=	13,756.66	R$	Parameter	
Depreciation	=	(Initial value) - (Residual value) / (Useful life)			
	=	(__R$) - (__R$) / (__year)			
	=	19,324.83	R$/year	Parameter	
Maintenance rate	=	1	%	Own data	
Maintenance cost	=	(Initial value) *(Maintenance rate) / (Useful life)			
	=	(__R$)(__%) / (__year)			
	=	204.71	R$/yr	Parameter	

Q_{2a}	*Depreciation*					
	Total depreciation cost =	∑(i=3)^1(Depreciation $it_{1\ldots3}$)				
	=	∑(i=3)^1(__R$/year)				
	=	30,905.69	R$/year	Parameter		
	Total depreciation cost per batch =	(Q_{2a}) / (Flock)				
	=	(__R$/year) / (__flocks/year)				
	=	4,929.14	R$/flocks	Parameter		
Q_{2b}	*Maintenance*					
	Total maintenance cost =	∑(i=3)^1 (Maintenance cost $it_{1\ldots3}$)				
	=	∑(i=3)^1(__R$/year)				
	=	330.05	R$/year	Parameter		
	=	(Q_{2b}) / (flock)				
	=	(__R$/year) / (__flock/year)				
	=	52.64	R$/flock	Parameter		
	Fixed capital =	∑(Initial value $it_{1\ldots3}$)+ (Building)				
	=	(∑(i=3)^1(__R$)) + (__R$) + (__R$)				
	=	746,990.64	R$	Parameter		
Q_3	*Manpower cost*					
Q_{3a}	*Registered manpower*					
	Price paid per broiler =	0.88	R$/bird	Own data		
	Total of broilers =	15,360	birds			
P_{flock}	Payment per flock =	(Total of broilers)*(Price paid)				*c*
	=	(__un)*(__R$/bird)				
	=	13,516.80	R$/flock			
	Wage					*d*

	Number of employees =		1	un	Own data
	Wage (pro-labore) =		1,500.00	R$/flock	Own data
	Registered manpower =	∑(i=2)^1(P_{flock}; Registered manpower)			
		∑(i=2)^1(__R$/flock);(__R$/flock)			
	=		15,016.80	R$/flock	Parameter
Q_{3b}	*Catching services*				
	Catching service =		0.08	R$/bird	Own data
	Total of broilers =		15,360	birds	see Q_1; SBr
	Catching service cost =	(Total of broilers)*(Catching service)			
	=	(__birds)*(__R$/bird)			
	=		1,228.80	R$/flock	Parameter
Q_{3c}	*Technical assistance*				
	Wage =		3,577.50	R$/month	Own data
	Number of visits =		3	times/week	Own data
	Time spent =		2	hr/visit	Own data
	Worked hours =		160	hr/month	e
	Flocks =		6.27	flocks/year	
	Months per year =		12	months	
	Technical assistance cost (TAc) =	((Wage)*(Visits)*(Time spent)/			
		(Hours))(12)/(Flocks)			
		((__R$/month) * (__times/month) * (__hr/visit)/			
	=	(160))(12)/(_flocks /yr)			
	=		256.76	R$/flock	Parameter
	Manpower cost =	(Q_{3a})+(Q_{3b})+(Q_{3c})			
	=	(__R$/flock)+(__R$/flock)+(__R$/flock)			
	=		16,502.36	R$/flock	Parameter

Q_4	*One-day chicks*				
	Purchased chicks =	16,000	un/flock	Own data
	Price paid per chicks =	0.80	R$/chick	Own data
	=	(Purchased chicks)*(Price paid)		
	=	(__un/ flock)*(__R$/chick)		
	=	12,800.00	R$/flock	Parameter
Q_5	*Nutrition*			
	Initial phase			
IFi	Initial feed consumption =	16,847.10	kg	Miele et al. (2010)
	Corn =	55.64	%	Miele et al. (2010)
	Soybean meal 45% =	36.00	%	Miele et al. (2010)
	Price paid corn =	0.58	R$/kg	Own data
	Price paid soybean meal 45% =	1.25	R$/kg	Own data
	Consumption per ingredient =	(IFi) * (ingredient) * (price paid)		
	=	(__kg) * (__%) * (__R$/kg)		
	Corn =	10,228.86	R$/phase	Parameter
	Soybean meal 45% =	6,618.24	R$/phase	Parameter
NCi	Initial nutrition cost =	(Corn)+(Soybean meal 45%)		
	=	(__ R$/phase)+(__ R$/phase)		
	=	14,194.30	R$/phase	Parameter
	Growth phase			
GFi	Feed consumption growth =	29,025.46	kg	Miele et al. (2010)
	Corn =	58.19	%	Miele et al. (2010)
	Soybean meal 45% =	33.20	%	Miele et al. (2010)
	Price paid corn =	0.58	R$/kg	Own data
	Price paid soybean meal 45% =	1.25	R$/kg	Own data
	Consumption per ingredient =	(GFi) * (ingredient) * (price paid)		
	=	(__kg) * (__%) * (__R$/kg)		

	Corn =	18,481.14	R$/phase	Parameter
	Soybean meal 45% =	10,544.32	R$/phase	Parameter
NCg	Growth nutrition cost =	(Corn)+(Soybean meal 45%)		
	=	(__ R$/phase)+(__ R$/phase)		
	=	23,876.11	R$/phase	Parameter
	Final phase			
FFi	Final feed consumption =	21,990.43		Miele et al. (2010)
	Corn =	62.43	%	Miele et al. (2010)
	Soybean meal 45% =	28.59	%	Miele et al. (2010)
	Price paid corn =	0.58	R$/kg	Own data
	Price paid soybean meal 45% =	1.25	R$/kg	Own data
	Consumption per ingredient =	(FFi) * (ingredient) * (price paid)		
		(__kg) * (__%) * (__R$/kg)		
	Corn =	15,083.09	R$/phase	Parameter
	Soybean meal 45% =	6,907.34	R$/phase	Parameter
NCf	Final stage nutrition cost (NCf) =	(Corn)+(Soybean meal 45%)		
	=	(__ R$/phase)+(__ R$/phase)		
	=	21,990.43	R$/phase	Parameter
	Total Nutrition Cost (TNC) =	(NCi)+(NCg)+(NCf)		
	=	(__R$/phase)+(__R$/phase)+(__R$/phase)		
	=	60,973.04	R$/flock	Parameter
$\boldsymbol{Q_6}$	*Health cost*			
$\boldsymbol{Q_{6a}}$	*Cleaning and sanitization*			
	Sanitizer			
	Purchased =	2.436	kg/flock	Own data
	Used =	2.436	kg/flock	Own data
	Price paid =	27.00	R$/item	Own data

	Item cost =	(Used) * (Price) / (Purchased)			
	=	((__kg/ flock) * (__R$/item)/ (__kg/ flock)			
	=		27.00	R$/flock	Parameter
		Detergent			
	Purchased =		1.560	kg/flock	Own data
	Used =		1.560	kg/flock	Own data
	Price paid =		27.00	R$/item	Own data
	Item cost =	(Used)*(Price) / (Purchased)			
	=	(__kg/batch)*(__R$/item)/ (__kg/ flock)			
	=		27.00	R$/ flock	Parameter
	=	(Disinfectant)+(Detergent)			
	=	(__ R$/ flock)+(__ R$/ flock)			
	=		54.00	R$/ flock	Parameter
Q_{6b}	*Analysis*				
		Water analysis			
Q_{6b_1}	Declared value =		0	R$/year	Own data
	Number of flocks/year =		0	flocks/year	Own data
	Water analysis cost =	(Declared value) / (Flocks)			
	=	(__R$/year) / (__n/year)			
	=		0	R$/batch	Parameter
Q_{6b_2}	*Salmonella sp* analysis.				
	Declared value =		0	R$/batch	Own data
Q_{6c}	*Rodent control*				
	Declared value =		0	R$/year	Own data
	Number of flock/year =		6.27	Flocks/year	Own data
	Rodent control cost =	(Declared value) / (Flocks)			
	=	(__R$/year) / (__un/year)			

		=	0	R$/flocks	Parameter
	Analysis cost	=	(Analysis *of Salmonella* sp.)+ (Water analysis cost)		Parameter
		=	(__R$/flock)+(__R$/flock)		
	Total health cost	=	(Q_{6a})+(Q_{6b})+(Q_{6c})		
		=	(__R$/flock)+(__R$/flock)+(__R$/flock)		
		=	54.00	R$/flock	Parameter
Q_7	*Energetics*				
It_1	*Diesel*				
	Quantity	=	0	L/flock	Own data
	Price paid	=	0	R$/L	Own data
		=	(Quantity) * (Price)		
		=	(__L/flock) * (R$/L)		
		=	0	R$/flock	Parameter
It_2	*Gasoline*				
	Quantity	=	0	L/flock	Own data
	Price paid	=	0	R$/L	Own data
		=	(Quantity) * (Price)		
		=	(__L/flock) * (R$/L)		
		=	0	R$/batch	Parameter
It_3	*Firewood*				
	Quantity	=	13	m^3/flock	Own data
	Price paid	=	90	R$/m^3	Own data
		=	(Quantity) * (Price)		
		=	(__m^3/flock) * (__R$/m^3)		

		=	1,170.00	R$/flock	Parameter	
Q_{7a}	*Heating*					
	Heating cost =	(It_3)				
		(__R$/batch)				
	=		1,170.00	R$/flock	Parameter	
Q_{7b}	*Fuel*					
	Fuel cost =	(It_1)+(It_2)				
	=		0	R$/flock	Parameter	
Q_{7c}	*Electricity*					
	Quantity =		1,770	kWh/flock	Own data	
	Price paid =		0.40	R$/kwh	Own data	
	=	(Quantity) * (Price)				
		(__kwh/flock) * (__R$/kwh)				
	=		708.00	R$/batch	Parameter	
	Total energy cost =	(Q_{7a})+(Q_{7b})+(Q_{7c})				
	=	(__R$/flock)+(__R$/flock)+(__R$/flock)				
	=		2,502.00	R$/flock	Parameter	
Q_8	*Bedding*					
	Quantity =		20	t	Own data	g
	Price =		10.00	R$/t	Own data	
	Bedding reuse =		6	times	Own data	
	Total bedding cost (Lit) =	((Quantity)*(Price))*(Flocks) /				
		(n reuses) / (n reuses)				
	=	(__t) * (__R$/t) * (__un/year) /				
		(__times) / (__times)				

		=	33.33	R$/flock	Parameter
Q_9	*Insurances, certifications and rates*				
Q_{9a}	*Environmental license*				
	Declared value	=	125.59	R$/yr	Own data
Q_{9b}	*Insurance*				
	Buildings value	=	501,336.00	R$	Own data
	Rate	=	0.36	%	Own data
		=	(Fixed assets) * (Rate)		
		=	1,804.81	R$/yr	
Q_{9c}		=	(insurance)+(Environmental license) / (Flocks)		
		=	(__R$/yr)+(__R$/yr) / (__flocks/yr)		
		=	307.88	R$/flock	
Q_{9d}	*Funrural*				
	Declared rate	=	2.30	%	Own data
P_{flock}	Flock payment	=	13,516.80	R$/flock	see Q_3;P_{flock}
		=	(P_{flock})(Rate)		
		=	(__R$/flock)(__%)		
		=	310.89	R$/flock	Parameter
Q_{10}	*Transport cost*				
Q_{10a}	*Transport Farm - Agroindustry*				
	Declared value	=	0.23	R$/bird	Own data
	Number of birds delivered	=	15,360	birds	see Q_1;SBr
		=	(Declared value)* (N birds)		
		=	(__R$/bird)*(__un/flock)		

h,i

		=	3,548.16	R$/flock	Parameter
$\boldsymbol{Q_{10b}}$	*Feed transport*				
	Declared value =		0.04	R$/kg feed	Own data
$\boldsymbol{F_1}$	Starter feed consumption =		1.149	kg/bird	Own data
$\boldsymbol{F_2}$	Feed consumption growth =		1.985	kg/bird	Own data
$\boldsymbol{F_3}$	Final feed consumption =		1.510	kg/bird	Own data
SBr	Number of chickens delivered =		15,360	un/flock	see $\boldsymbol{Q_1}$;$\boldsymbol{SBr}$
	Total feed consumption =	∑(i=3)^1($\boldsymbol{F_{1\ldots3}}$)*($\boldsymbol{SBr}$)			
		= ∑(i=3)^1(__kg/bird.flock)*(__un/flock)			
		=	2,567.95	kg/flock	Parameter
		= (Declared value) *(Feed consumption)			
		= (__R$/kg feed)*(__kg/batch)			
		=	3,409.79	R$/flock	Parameter
	Transport cost =	($\boldsymbol{Q_{10a}}$)+($\boldsymbol{Q_{10b}}$)			
		= (__R$/flock)+(__R$/flock)			
		=	6,116.11	R$/flock	
$\boldsymbol{Q_{11}}$	*Miscellaneous costs*				
EMr	Estimated eventual rate (EMr) =		3	%	Miele et al. 2010
$Q6_a$	Cleaning and sanitization =		54.00	R$/flock	Parameter
$Q3_c$	Technical assistance =		256.76	R$/flock	Parameter
$Q10$	Transport =		6,116.11	R$/flock	Parameter
$Q4$	Day-old chicks =		12,800.00	R$/flock	Parameter
$Q5$	Nutrition =		60,973.04	R$/flock	Parameter
$Q6_b$	Analysis =		0	R$/flock	Parameter
$Q7$	Energetics=		2,502.00	R$/flock	Parameter
$Q8$	Bedding =		33.33	R$/flock	Parameter

Q_{11a}	Miscellaneous cost - Producer =	$\sum$(i=3)^1($Q_{6a,7,8}$)*(EMr)			
	=	$\sum$ (i=3)^1 (__R$/flock)) * (__%)			
	=	77.68	R$/flock	Parameter	
Q_{11b}	Miscellaneous cost - Agribusiness =	$\sum$(i=5)^1($Q_{3c,4,5,6b,10}$))*(EMr)			
	=	$\sum$(i=5)^1 (__R$/flock)) * (__%)			
	=	2,404.38	R$/flock	Parameter	
	Total miscellaneous cost =	(Q_{11a})+(Q_{11b})		Parameter	
	=	(__R$/batch)+(__R$/flock)			
	=	2,482.06	R$/flock	Parameter	

Q_{12} *Production factor costs*

Q_{12a} *Land factor cost*

Flock =	6.27	flocks/year	Own data
Land price =	0.00	R$/m^2	Own data
Area =	1,200	m^2	Own data
Interest rate =	6.00	%yr	SELIC rate
IGP-DI Index =	2.22	%	Own data

Land factor cost = (Land price) * (Area) * (Rate) - (Land price) * (Area) * (IGP-DI)

= ((__R$/m^2)*(__m^2)*(__%)) - ((__R$/m^2)*(__m^2)*(__%))

0.00 R$/flock Parameter

Q_{12b} *Fixed capital cost*

Flock =	6.27	one/year	Own data
Fixed assets =	746,990.64		Own data

	Interest rate =		6	%yr	SELIC rate	j
	Fixed capital cost (FC) =	(Fixed assets) * (Rate) / (Flocks)				
	=	(__R$) * (__%) / (__flocks/year)				
	=		7,148.24	R$/flock	Parameter	
Q_{12c}	*Working capital cost*					
	Labor					
Q_{3a}	Registered manpower =		3,497.06	R$/flock	Parameter	
Q_{3a1}	Payment per flock =		13,313.70	R$/flock		
Q_{3b}	Catching services =		3,944.80	R$/flock	Parameter	
Q_{3c}	Technical assistance =		310.34	R$/flock	Parameter	
	Sanity					
Q_{6a}	Cleaning and sanitization =		172.24	R$/flock	Parameter	
	Energy drinks					
Q_{7a}	Heating =		2,100.00	R$/flock	Parameter	
Q_{7b}	Fuel =		308.02	R$/flock	Parameter	
Q_{7c}	Electricity =		1,365.00	R$/flock	Parameter	
	Other costs					
Q_{10}	Transport =		6,116.11	R$/flock	Parameter	
Q_4	Day-old chicks =		12,800.00	R$/flock	Parameter	
Q_5	Nutrition =		60,973.04	R$/flock	Parameter	
Q_8	Bedding =		33.33	R$/flock	Parameter	
Q_{2b}	Maintenance =		52.64	R$/flock	Parameter	
Q_{11a}	Miscellaneous cost - Producer =		77.68	R$/flock	Parameter	
Q_{11b}	Miscellaneous cost – Agribusiness =		2,404.38	R$/flock	Parameter	
	Interest rate =		6	%	SELIC rate	j
Q_{12ca}	Working capital cost - Agribusiness =	∑(i=7)^1($Q_{3a1,3b,3c,4,5,10,11b}$) * (Rate)				
	=	∑(i=7)^1(__R$/flock) * (__%)				
	=		5,837.75	R$/flock	Parameter	

Q_{12cb}	Working capital cost - Producer =	$\sum$ (i=8)^1 ($Q_{2b,3a,6a,7a,7b,7c,8,11a}$)*(Rate)	
	=	$\sum$(i=8)^1(__R$/flock) * (__%)	
	=	1,134.76 R$/flock	Parameter
	Total cost with production factors =	(Q_{12a})+(Q_{12b})+(Q_{12c})	
	=	(__R$/flock)+(__ R$/flock)+(__ R$/flock)	
	=	14,120.75 R$/flock	Parameter

** MEKONNEN, MM; HOEKSTRA, AY The green, blue and gray water footprint of farm animals and animal products. Delf, the Netherlands UNESCO-IHE, , 2010. Available at: <papers3://publication/uuid/2A0FDCDE-D1D0-43B0-8404-C512B986D8B0>.

[a] The residual rate (%) and useful life (years) of facilities and equipment were used according CONAB (2010). For the building, a residual rate of 20% and a useful life of 40 years were defined. For “rotavator” equipment, a residual rate of 5% and a useful life of 12 years were defined. For other equipments (i.e feeding, watering and air conditioning systems), the values for residual rate and useful life were defined from the median of a database with information on 340 agricultural implements listed by CONAB (2010), being defined in 5% and 12, respectively. The use of the median is justified for this purpose since the values present a high discrepancy between them, and the median may represent reality more reliably for this data set.

[b] MIELE, M.; ABREU, PG; ABREU, VMN; JENISCH, FRF; MARTINS, FM; MAZZUCO, H.; SANDI, AJ; SANTOS FILHO, JI; TREVISOL, IM 2010. Technical coefficients for calculating the cost of broiler chicken production. Technical release 483, Embrapa Birds and Pigs, p. 14.

[c] Payment by the agroindustry to the producer in exchange for the care of the birds;

[d] Pro-labore;

[e] 08 hours worked per week, 05 days worked per week and 04 weeks per month were considered, totaling 160 hours worked per month;

[g] Number of flocks produced until the bed was changed for a new one;

[j] SELIC rate at 6% per year in 2018 (in Basic Interest Rates – Historical. Available at: https://www.bcb.gov.br/controleinflacao/historicotaxasjuros ; accessed on: 2023. Considering 70% of the value of the basic interest rate applied in savings

Average Currency exchange rate: 1.00 USD: 3.65 BRL in 2018