Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Supplementary Information

1 Vehicles mileage rate distribution

The figures below show the mileage rate distribution in a histogram plot for ethanol, biogas and Electric vehicles.

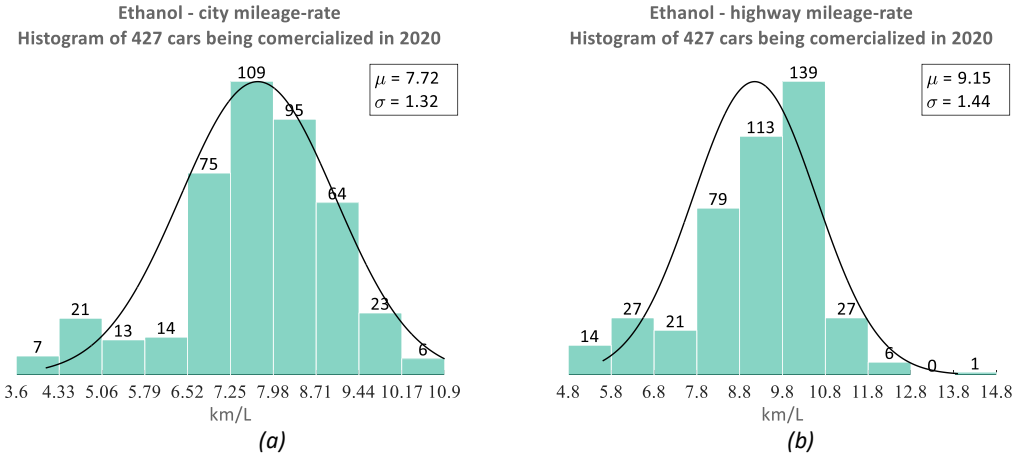

Figure 1 - Ethanol cars – (a) city mileage rate (b) highway mileage rate

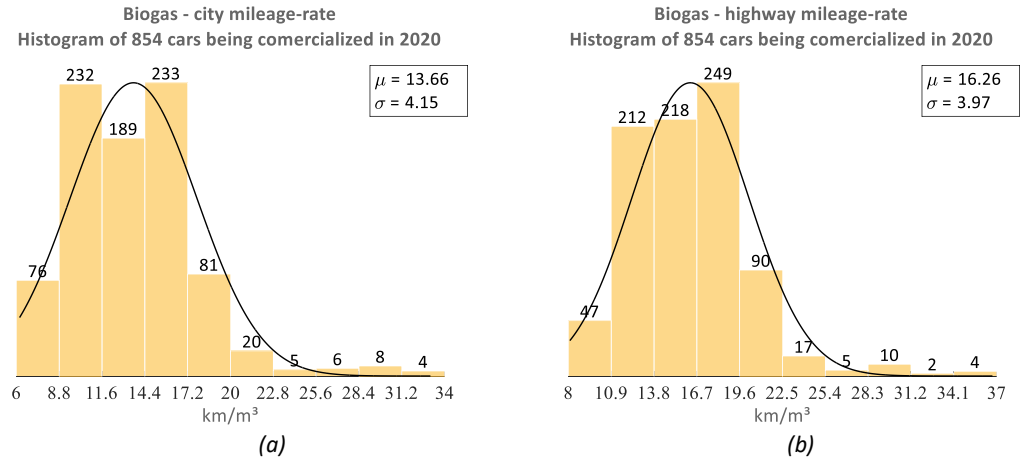

Figure 2 - Biogas cars - (a) city mileage rate (b) highway mileage rate

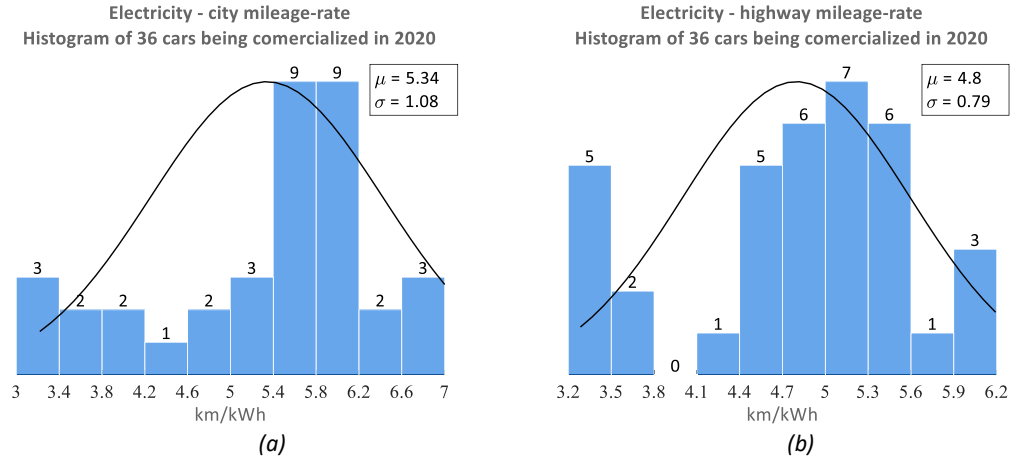

Figure 3 - Electric cars - (a) city mileage rate (b) highway mileage rate

2 CO2 emission

Figure 4 shows the CO_2 emission along the chain from the surplus bagasse and straw from the field through processing, manufacture, distribution, and use in a vehicle. The value of CO_2 emission in terms of kilograms equivalent comprises the sugarcane mill processing 3x10^9 kg of sugarcane per year. When the bar color does not appear in the plot, such as straw transportation, it is because it is insignificant when compared to the others emission step. The calculated value is shown in Table 1.

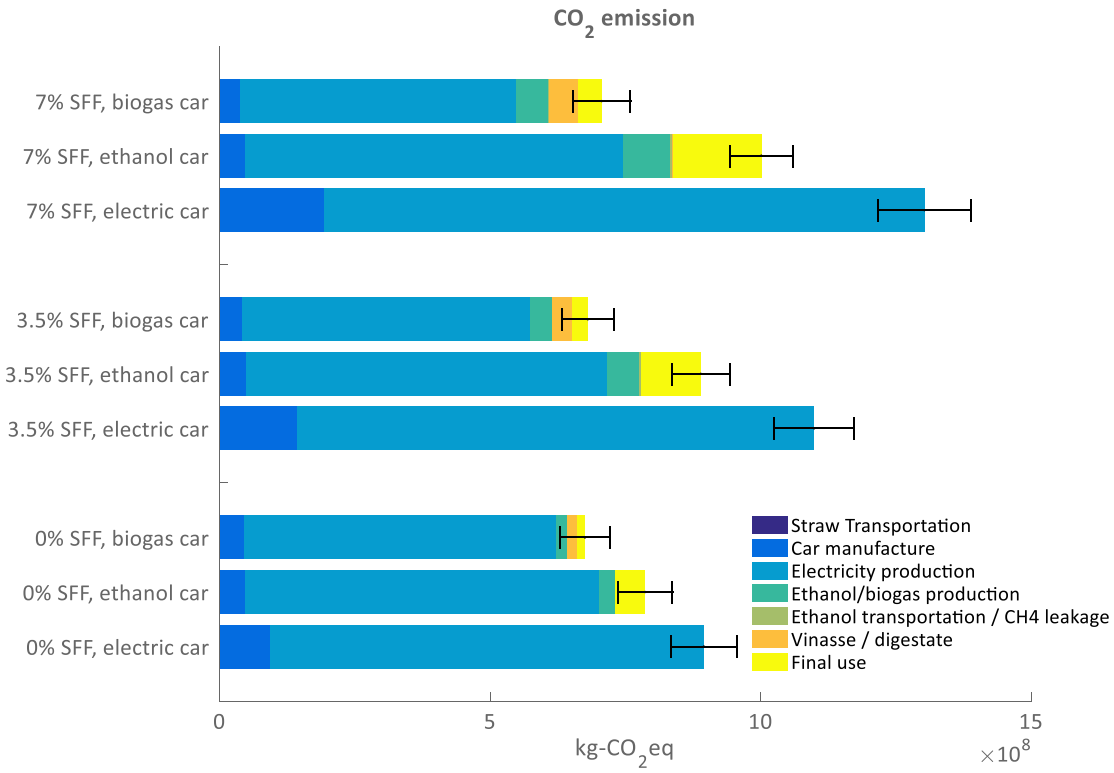

Figure 4 - CO2 emitted during the process of producing and using each fuel

Table 1 – CO2 emission given in kg of CO2 equivalent

	Straw transportation [a]	Car manufacture [b]	Electricity production [c]	Biogas/ethanol production [d]	Ethanol transportation of biogas leakage [e]	Vinasse / digestate	Final use
0% SSF, electric car	0	9.41E+07	8.00E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0% SSF, ethanol car	0	4.82E+07	6.53E+08	2.94E+07	1.36E+06	1.36E+05	5.46E+07
0% SSF, Biogas car	0	4.55E+07	5.78E+08	1.97E+07	3.34E+05	1.78E+07	1.44E+07
3.5% SSF, electric car	1.73E+05	1.44E+08	9.55E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3.5% SSF, ethanol car	1.73E+05	4.82E+07	6.69E+08	5.92E+07	2.74E+06	4.05E+05	1.10E+08
3.5% SSF, Biogas car	1.73E+05	4.15E+07	5.33E+08	4.00E+07	6.78E+05	3.61E+07	2.93E+07
7% SSF, electric car	3.45E+05	1.94E+08	1.11+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
7% SSF, ethanol car	3.45E+05	4.82E+07	6.97E+08	8.76E+07	4.06E+06	6.01E+05	1.63E+08
7% SSF, Biogas car	3.45E+05	3.76E+07	5.10E+08	5.96E+07	1.01E+06	5,38E+07	4.36E+07

[a] Refers to the contribution of the straw being transported using diesel trucks in an average distance from the filed to the industrial site of 22km; [b] Emission of CO2 due to vehicle manufacture, using electric and combustion engines is according to Qiao[1]; [c] Refers to the emission by the boiler; [d] Refers to the emission in the industrial process to produce second-generation ethanol or biogas; [e] Refers to the emission due to transportation of ethanol from the industrial site to the fuel stations or due to leakage of CH_4 in the pipeline grid and during cars fueling;

3 - Price of Ethanol Biogas and Electricity

In Figure 5 to Figure 7 are shown the price of the fuels and its correction by the inflation rate when necessary. It is also shown the average value and standard deviation used in the article analysis. The ethanol price was taken from UDOP[2]; the vehicular-natural-gas price was taken from ANP[3]. Ethanol and vehicular-natural-gas price were corrected by the inflation rate index IPCA from IBGE[4]. The electricity price was taken from national electricity agency ANEEL[5]: those prices are the average price paid to producers at power ouctions. The price released by ANEEL is already corrected by inflation rate index.

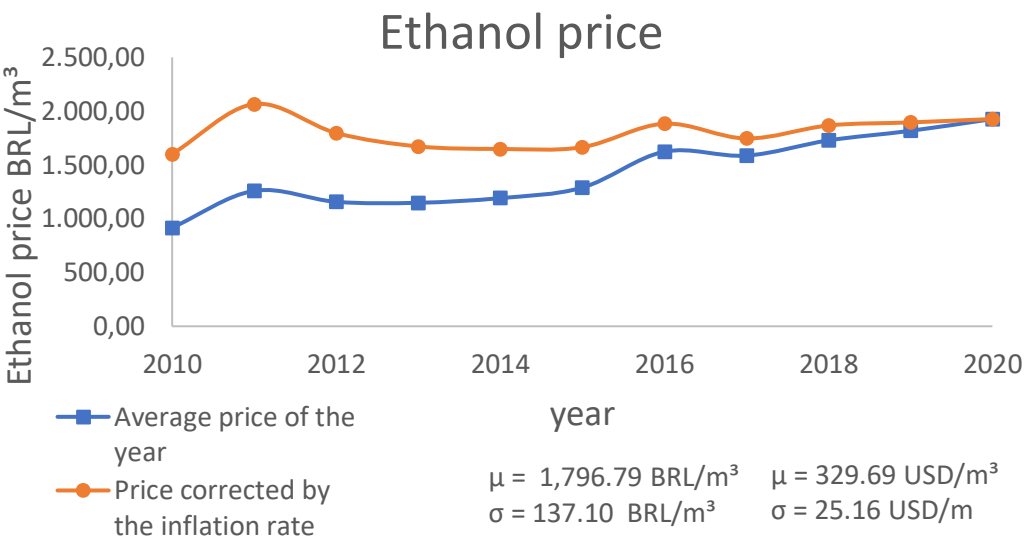

Figure 5 - Ethanol price paid at Paulínea - SP fuel distribution center

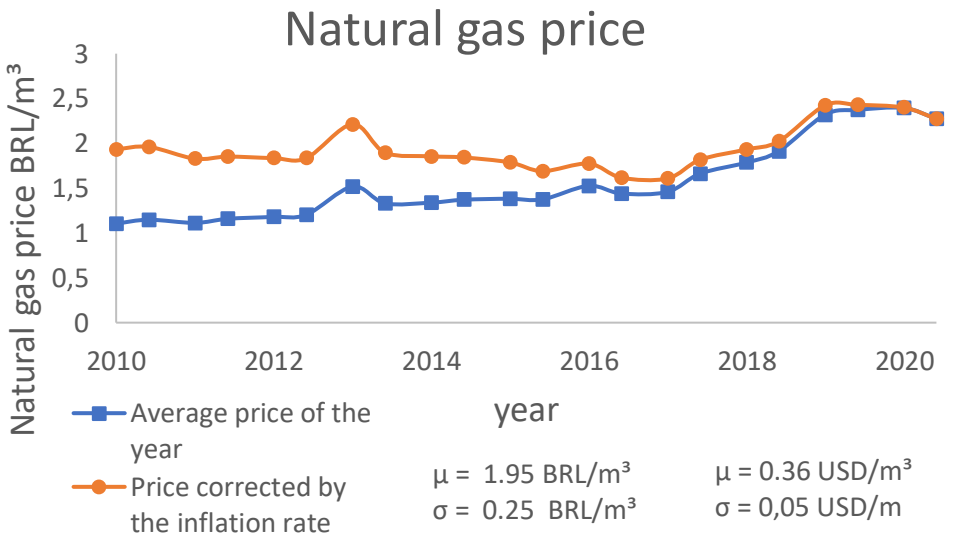

Figure 6 - Vehicular natural gas average price at São Paulo State

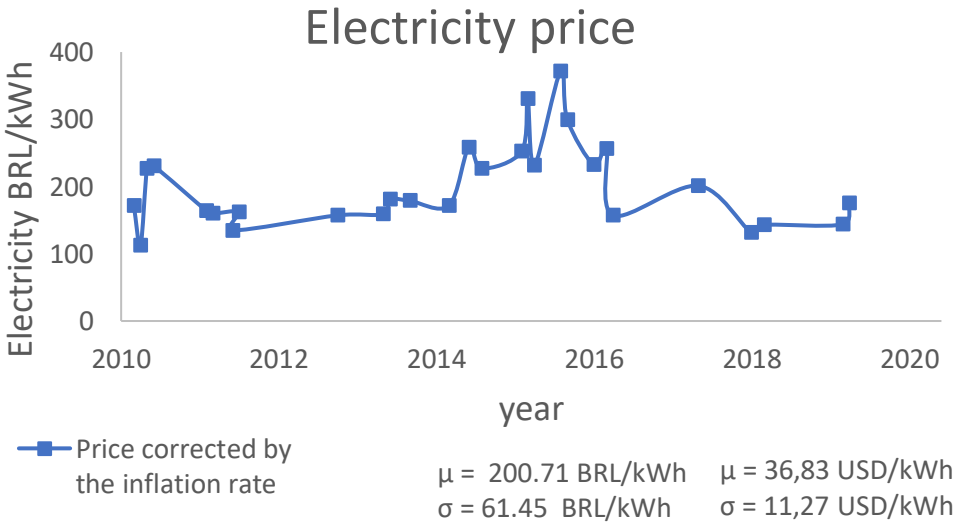

Figure 7 - Average price paid at power auctions