Uruguayan dairy partial carbon footprint

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Interinstitutional Group for the Livestock Environmental Footprint

Its a technical team from the ministries of enviroment, agriculture, INIA, INALE, INAC y UdelaR, aiming to incorporate the environmental dimention on the conceptualization of the production sistems.

3 working groups:

- **Carbon footprint** (**dairy** and meat),
- Soil and water footprint,
- Biodiversity footprint

Relevance and motivation

- The role of livestock sector GHG emisions (on CC), is an issue on global agenda.
- Public dialogue (national or international) on scientific bases and evidence
- Demonstrate the way Uruguay produce and its ennvironmental performance.
- Provide diferentiated goods to increasingly sofisticated and demanding customers.
- Comply with future or present requirements.

Metodological aspects

- **Indicator:** carbon footprint per product unit (CO2 equivalent kilogram / milk kilogram)
- **Scale:** farm level individual estimates, grouped for reporting sake
- **Partial life cycle aproach:** sistem conceived as “cradle to gate”
- **Metodological references:** IPCC (2006, 2019), IDF (2015), LEAP (2015)
- GHG Convertion metric: global warming potential 100 **AR2**
- **Data:** INALE-MGAP 2019 dairy survey (only industry integrated farms)

Footprint component and emissions estimation

- **CH4 enteric fermentation**
- **CH4 manure management**
- **N2O manure management**
- **N2O from urine and dung** deposited on managed soils
- **Electricity usage**
- Land use for **feed production** : **fertilisers, machinery, seeds, herbicide**
- **Feed imports**

All activity data (quanti and cuali) from the survey;
IPCC (2006) emission factors or coeficients

Total emissions and carbon footprint

Model	Farms	Animal productivity L/VO/día	Stock rate VM/ha VM	Milk FPCM Gg	Total emissions CO_2 eq. GWP100AR2 Gg	Emissions/Kg FPCM kg/kg
M1	426	9,8	0,92	35	49,16	1,387
M2B	217	12,0	0,75	42	52,41	1,238
M2A	214	16,2	1,09	45	47,93	1,058
M3B	200	15,1	0,71	75	80,08	1,068
M3A	232	19,5	1,06	85	75,10	0,883
M4B	215	15,9	0,81	150	169,67	1,129
M4A	219	19,7	1,28	150	145,49	0,967
M5B	187	19,4	0,91	323	321,68	0,997
M5A	173	21,4	1,23	319	284,37	0,892
M6	78	19,9	1,10	394	375,88	0,954
Total	**2.161**	**18,5**	**0,99**	**1.620**	**1.601,78**	**0,989**

footprint **0,989** kgCO2eq/Kg FPCM

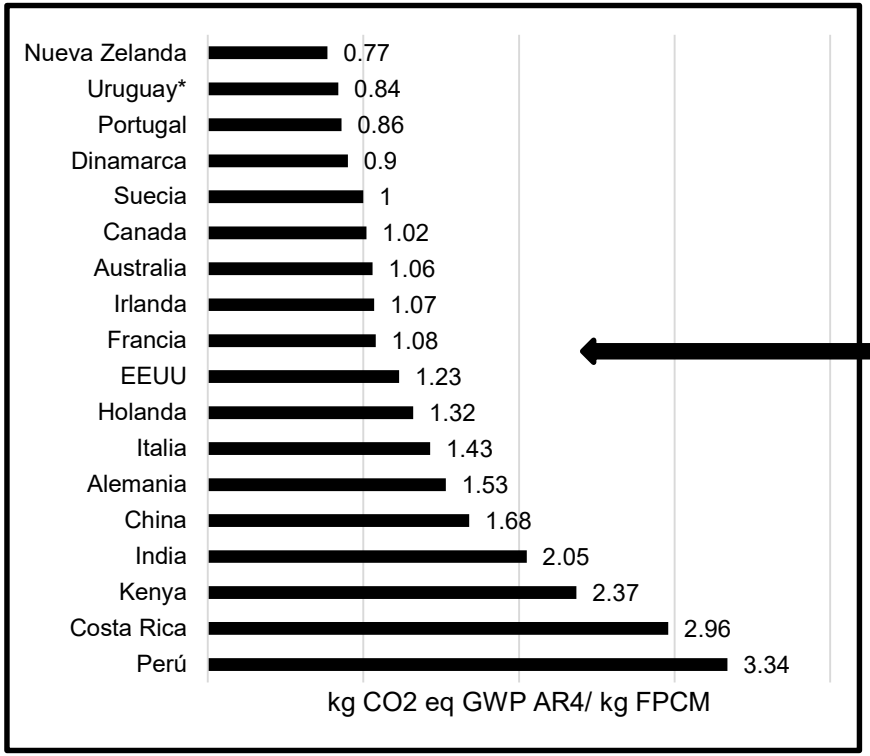
(rank: [0,883 – 1,387])

Antecedentes:

- Darre y Llanos (2020): 0,97*.
- Lizarralde (2014): [0,96 – 1,09]*
- Mazzetto (2021): 0,77 to 3,34*

Total emissions: international comparison & metric sensibility

Dairy carbon footprint by countries. Mazzetto et al, 2021



Uruguayan footprint by metric

Metric	Emissions/Kg milk (FPCM)
GWP 100 AR 2	**0,989**
GWP 100 AR 4	**1,091**
GWP 100 AR 5	**1,144**

Footprint component distribution

	Total emissions Gg CO_2 eq GWP100AR2	Emissions/ Kg leche	Weight
CH_4 emissions **enteric fermentation**	805,4	0,497	50,3%
CH_4 emissions **manure management**	155,7	0,096	9,7%
N_2O emissions (**MM, dung & urine**)	417,5	0,258	26,1%
emissions from **feed production**	166,7	0,103	10,4%
CO_2 emissions from **electricity**	1,8	0,001	0,1%
Emissions from **imported feed**	54,6	0,034	3,4%
Emisiones totales	**1.601,8**	**0,989**	**100,0%**

Antecedentes.
Astigarraga, Becoña et al. (2013).

Fermentación entérica 56%,
Excreción N 22%,
Uso suelo 10%,
Manejo estiércol 7%,
Compra alimento 4%.

Remarks and future work

- Relevant indicator on environmental performance, though one more piece of a bigger environmental footprint

- Commercial, environmental, and public dialogue relevance.

- Improvements: methodological refinements, new IPCC parameters, incorporate more information, change grouping typification.

- What are the factors that affect the footprint the most?. Highly associated with productive efficiency → policy and action