

Appendix

Table 2A: Summary of LCA Studies Exploring Environmental Impacts of Dairy and Plant-Based Milk.

Source	Country	Scope/ Boundary	Midpoint indicators studied	Ingredients Compared	Functional Unit	Impacts
Balcha et al. (2022) [41]	Ethiopia	Cradle to farm gate	GWP EU	Cow Milk	1 kg of cow milk	2.8–3.2 CO ₂ -e/kg of milk
Garg et al., 2016 [51]	India	Cradle to farm gate	GWP	Cow milk	1 kg FPCM	1.9 -2.3kg CO ₂ -eq/kg FPCM
Samsonstuen et al., 2024 [52]	Norway	Cradle to farm gate	GWP	Cow milk	1 kg FPCM	1.14 kg CO ₂ eq (kg FPCM)
Woldegebriel et al., (2017) [79]	Ethiopia	Cradle to farm gate	LU, EU, GWP	Cow milk	1 kg of milk	1.75 kg CO ₂ -eq - 2.25 kg CO ₂ -eq
Vida & Tedesco, 2017 [53]	Italy	Cradle to farm gate	GWP	Cow milk	1 kg FPCM	1.11 kg CO ₂ eq/kg FPCM
Dalla Riva et al., 2015 [82]	Italy	Cradle to farm gate	GWP, TA,FE, LU, WD, CFED	Cow milk	1 kg of raw milk.	1.80-2.19 kg CO(2)eq
Naranjo et al., 2023 [54]	USA-South Dakota	Cradle to farm gate	GWP	Cow Milk	1 kg FPCM	1.23 kg CO ₂ eq/kgFPCM
Lovarelli et al., 2019 [55]	Italy	Cradle to farm gate	CC, POF, TA, FE,ME, TE, LU, MFRD	Cow Milk	1 kg FPCM	1.38 ± 0.33 kg CO ₂ eq/kg FPCM

Bacenetti et al., 2016 [56]	Italy	Cradle to farm gate	GWP, LU	Cowmilk	1 kg FPCM	1.12 kg CO ₂ eq/kg
Flysjö et al., 2011 [73]	New Zealand/ Sweden	Cradle to farm gate	GWP	Cow milk	1 kg ECM	1.00 kg CO ₂ eq kg ⁻¹ ECM in NZ and 1.16 kg CO ₂ eq

						kg-1 ECM in SE
Kiefer et al. 2015 [58]	Germany	Cradle to farm gate	GWP	Cow Milk	1 kg FPCM	1.53 kg CO ₂ eq/kg FPCM to 1.99 kg CO ₂ eq/kg
Bakken et al., 2017 [74]	Norway	Cradle to farm gate	GWP, TA, FD, TE, FE, LU	Cow milk	1 kg ECM	1.3–1.6 kg CO ₂ -eq/kg ECM
Fantin et al., 2012 [84]	Italy	Cradle to Distribution centers	GWP, EU, POF, FE,	Cow Milk	1 L of milk	1.5 kg CO ₂ eq/Lmilk
Flysjö et al., 2012 [72]	Denmark	Cradle to farm gate	GWP	Cow milk	1 kg ECM	1.07–1.13 kg CO ₂ eq/kg ECM
Berton et al., 2021 [59]	Italy/Austria	Cradle to farm gate	GWP, AP, EP, CED, LU	Cow milk	1 kg FPCM	1.2 kg CO ₂ -eq/kg
Thoma et al., 2013 [76]	USA	Cradle to grave	GWP	Cow milk	1 kg of milk	1.77–2.4 kg CO ₂ eq/kg milk
de Léis et al., 2015 [75]	Brazil	Cradle to farm gate	GWP	Cow milk	1 kg ECM	0.535–0.778 kg CO ₂ e kg ECM-1
Castanheira et al., 2010 [45]	Portugal	Cradle to farm gate	GWP	Cow milk	1 tonne of raw milk	1021.3 kg CO ₂ eq/tonne of milk
Schader et al., 2014 [60]	Switzerland	Cradle to farm gate	GWP	Cow milk	1 kg FPCM	0.89–1.08 kg CO ₂ -eq/kg milk

March et al., 2021 [55]	United Kingdom	Cradle to farm gate	GWP	Cow milk	1 kg FPCM	0.95–1.07 kg CO ₂ e/kg FPCM
Djekic et al., 2014 [81]	Serbia	Cradle to grave	GWP, AP, EP	Cow milk	1 kg of milk	1.24 and 1.67 kg CO ₂ eq/kg
Bartl et al., 2011 [69]	Peru	Cradle to farm gate	GWP, EP	Cowmilk	1 kg ECM	10.6 kg CO ₂ /kg ECM
Yan et al., 2011	Ireland	Cradle to farm gate	GWP, LU	Cow milk	1 kg of ECM	1.23 ± 0.04 kg of

[42]						CO2 Eq / ECM
Roer et al., 2013 [70]	Norway	Cradle to farm gate	GWP, FD, FET, FE, HT, MET, ME,OD, LU POF, TA,TET	Cow milk	1 kg of ECM	1.5–1.6 kg CO2-eq/A1:G7 kg (ECM)
Romano et al., 2021 [61]	Italy	Cradle to farm gate	GWP, TA, FE, ME, LU, WD, MD, FD	Cow milk	1 kg FPCM	1.08-1.32 kg CO2eq/kg FPCM
O’Brien et al., 2015 [66]	Ireland	Cradle to farm gate	GWP, EP	Cow milk	1 kg FPCM	0.87-1.72 kg CO2eq/kg FPCM
Rotz et al., 2010 [71]	USA	Cradle to farm gate	GWP	Cow milk	1 kg ECM	of 0.37 to 0.69 kg CO2-eq / kg ECM
Mc Geough et al., 2012 [43]	Canada	Cradle to farm gate	GWP	Cow milk	1 kg FPCM	0.92 kg of CO2 eq/kg ECM
Zanni et al., 2022 [67]	Italy	Cradle to farm gate	GWP	Cow milk	1 kg FPCM	40.41kg CO2eq/kg FPCM
Mazzetto et al., 2022 [62]	Global	Cradle to farm gate	GWP	Cow milk	1 kg FPCM	2.11 kg CO2eqkg –1 FPCM
Gollnow et al., 2014 [63]	Australia	Cradle to farm gate	GWP	Cow milk	1 kg FPCM	1.11 kg CO2eq·kg –1 FPCM

Wang et al., 2018 [68]	China	Cradle to farm gate	GWP, EP, AP, NREU), LU,WU	Cow milk	1 kg FPCM	1.34 kg CO2eq/1 kg FPCM
Mech et al., 2023 [57]	India	Cradle to Distribution	GWP	Cowmilk	1 kg FPCM	1.45 to 1.81 kg CO2-eq kg FPCM–1
Geburt et al. (2022) [79]	Germany	Cradle to Super Market	GWP, LU, TA WC, FE	Almond, oat, soy, cow milk	1 kg of milk.	Cowmilk 1.30-145kg CO2eq / kg milk Almond 0.61kg

						CO ₂ eq/ kg of milk, soy 0.40- 0.46kg CO ₂ eq / kg of milk, Oat 0.46kg CO ₂ eq / kg of milk
Winans et al., 2020 [82]	USA	Cradle to factory gate	GWP, WC	Almond	1kg of almond milk	0.39 kg CO(2)e/kg of milk
Riofrio & Baykara, 2022 [87]	Ecuado	Cradle to retail	GWP, FD), FET, FE, MET, ME), OD, LU, POF, TA,TET, HT	Soy milk	1 L oat milk	0.595kgCo 2eq/L
Buchan et al., 2022 [80]	USA	Cradle to retail	GWP	oat, almond milk, coconut milk	1kg of milk	oat 0.376kgCo 2eq/kg, almond 0.3kgCo2eq /kg, coconut 0.376kgCo 2eq/kg
Braun et al. 2016 [88]	USA	Cradle to retail	GWP,LU, WU	Soy milk	1kg protein	2.4 kg CO ₂ eq/kg protein

Wang et al., 2018 [68]	China	Cradle to farm gate	GWP, EP, AP, NREU), LU,WU	Cow milk	1 kg FPCM	1.34 kg CO ₂ eq/1 kg FPCM
Mech et al., 2023 [57]	India	Cradle to Distribution	GWP	Cowmilk	1 kg FPCM	1.45 to 1.81 kg CO ₂ -eq kg FPCM-1
Geburt et al. (2022) [79]	Germany	Cradle to Super Market	GWP, LU, TA WC, FE	Almond, oat, soy, cow milk	1 kg of milk.	Cowmilk 1.30-145kg CO ₂ eq / kg milk Almond 0.61kg CO ₂ eq/ kg of milk, soy 0.40-0.46kg CO ₂ eq / kg of milk,

						Oat 0.46kg CO ₂ eq / kg of milk
Winans et al., 2020 [82]	USA	Cradle to factory gate	GWP, WC	Almond	1kg of almond milk	0.39 kg CO ₂ e/kg of milk
Riofrio & Baykara, 2022 [87]	Ecuador	Cradle to retail	GWP, FD), FET, FE, MET, ME), OD, LU, POF, TA, TET, HT	Soy milk	1 L oat milk	0.595kgCo ₂ eq/L
Buchan et al., 2022 [80]	USA	Cradle to retail	GWP	oat, almond milk, coconut milk	1kg of milk	oat 0.376kgCo ₂ eq/kg, almond 0.3kgCo ₂ eq/kg, coconut 0.376kgCo ₂ eq/kg
Braun et al. 2016 [88]	USA	Cradle to retail	GWP, LU, WU	Soy milk	1kg protein	2.4 kg CO ₂ eq/kg protein