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technological, environmental and territorial features, social and economic ones, allows to achieve a more integrated LCA.

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Carbon footprint of PDO cheeses: Grana Padano and Gorgonzola

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The aim of the study was to evaluate the carbon footprint of two PDO Italian cheeses: Grana Padano and Gorgonzola.
Grana Padano is a hard long ripening cheese, composed by 65% of dry matter, consisting of 38% protein and 24% fat. Gorgonzola cheese, instead, is a blue soft cheese with a short ripening period composed by 58.6% of dry matter (28.7% fat and 21.4% protein).
The productive process of Grana Padano was studied at a cheese factory that in 2015 processed 86,165,255 L of milk, producing 183,611 cheese wheels, with an average yield of 7.6%. For Gorgonzola, a cheese factory was studied; in 2015, it processed 12,542,552 L of milk, producing 126,910 Gorgonzola wheels with an average cheese yield of 12.5%.
The Carbon footprint was quantified using Life Cycle Assessment (LCA) method, carried out through a "cradle to cheese factory gate" point of view. All data considered were referred to 2015 and the functional unit was 1 kg of cheese. Gas emissions of milk production, at farm level, were calculated using IPCC (2009) and EEA (2009) equations, then impact categories were evaluated using IPCC (2007) method. Both economic and dry matter allocations were applied.
Assuming the economic allocation and considering the whole productive process, Global Warming Potential (GWP) was 16.9 kg CO_2 eq. per kg of Grana Padano, higher than GWP of Gorgonzola that resulted 10.7 kg CO_2 eq. Using the DM allocation, the unitary GWP resulted 10.3 kg CO_2 eq. for Grana Padano and 6.0 kg CO_2 eq. for Gorgonzola. These different values are mainly due to the lower cheese yield of Grana Padano in comparison to Gorgonzola, which implies a higher unitary value of environmental impact.
The milk production at farm was the most important contribute of the GWP using an economic allocation at cheese factory (excluding ripening and packaging): 95.6% for Grana Padano and 90.3% for Gorgonzola.
The phase of milk processing slightly contributed to GWP of both cheese but some differences were observed: a higher use of cleaning products (0.54% *vs* 0.02% of GWP) for the sanitization of the plant and use of electricity, principally for air conditioning of cheese factory (5.79% *vs* 1.64% of GWP) for Gorgonzola and Grana Padano processing respectively.
The outcomes of this study highlight how, due to the multiple products produced at the dairy plants, the choice of the allocation method deeply affects of the environmental burdens of cheeses.

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In vitro study of the effects of different tannin extracts on rumen ammonia and methane production

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Several feeding strategies have been proposed to mitigate CH_4 and NH_3 production. Dietary tannins may modulate the activity of rumen microbes and modify carbohydrates fermentation, lipid bio-hydrogenation and protein degradation. However, effect on rumen fermentation may significantly differ accordingly to the nature of tannins (i.e. condensed or hydrolysable tannins). Changes in CH_4 and NH_3 accumulation during in batch fermentation may be useful to compare the effectiveness of different tannins in the modulation of rumen metabolism. Four different tannin extracts have been compared: Mimosa (MT; *Acacia dealbata*) and Gambier (GT; *Uncaria gambir*) as condensed tannins and Tara (TT; *Casealpinia spinosa*) and Chestnut (CT; *Castanea sativa*) as hydrolysable tannins. Tannins were included at 4% of DM in a diet composed by barley, wheat bran, alfalfa hay, soybean cake, molasses and vitamin mix. Control (C) diet contained the same ingredients with the addiction of 4% of bentonite. Samples of rumen liquor were collected from 5 sheep, conditioned with the C diet, using a stomach tube connected to a manual pump. Feeds (2 g) were incubated in triplicate with 200 mL of inoculum filtered into a flask under a continuous flow of CO_2. The incubator consisted of a thermostatic chamber (39-40 °C) equipped with glass fermentation vessels provided with one inlets (to release gas through a valve) and connected to an electronic pressure transducer. Gas pressure inside the vessels was recorded every 30 seconds over 24-hours. CH_4 and NH_4^+ concentration was analysed at 0, 6, 12

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