of poultry, are sheep (42%) – mainly in United Kingdom – and cattle (34%) – mainly in Germany and Austria, followed by pigs (9%) – mainly in Denmark – and goats (7%) – mainly in Greece. Authors' top 10 keywords were: organic farming (74 times), organic, animal welfare, animal health, cattle, livestock, farming, organic agriculture, organic livestock production and health (10 times each). Even if poultry is the most important species reared organically in Europe only the term 'cattle' appeared as an indicator of the species studied within those keywords. This could indicate that more research has been done in cattle because of the importance of this species in Germany. Moreover, the presence of the terms 'animal welfare' and 'animal health' within those keywords seems to indicate that the research on organic livestock production has been focussing on these two areas, which are the major concern for consumers on organic farming. This bibliometric analysis revealed that: (i) countries focalised their research on their main production, (ii) more research on organic livestock production in other species than cattle is needed, and (iii) more and more high-quality research on this topic is needed.

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Role of zinc and copper in the intensive swine production systems

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Animal manure represents a possible route of heavy metals and metalloids (HMMs) diffusion into the environment. HMMs can be released into groundwater, absorbed by crops and enter into food chain and could cause problems for animal and human health. Some HMMs are essential nutrients and they are widely used as additives. Nevertheless, after the digestive process, not absorbed elements are released in manure. The aim of this study was to estimate the input and the output of HMMs in swine production in order to establish strategy to implement the sustainability of livestock.
Samples of feed ($n = 16$), faeces ($n = 80$) and water ($n = 4$) were collected from four typical swine farms located in northern Italy. The collection of samples (in airtight nylon bags) was carried out considering the representativeness of matrix according to AOAC procedure. Samples were analysed for the principal components (AOAC, 2005; 152/2009). Mineralised samples (Microwave Digestion System) and water samples were evaluated by Inductively Coupled Plasma Mass Spectrometry (Bruker Aurora M90 ICP-MS), in triplicate, for the detection of Na, Mg, K, Ca, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Mo, Cd and Pb.
The principal nutrients' analysis presented proper composition linked with the swine nutritional requirements (NRC 2012). The undesirable elements (As, Cd, Pb, Co, Ni, Mo) did not exceed the thresholds levels (2002/32/EC) in the feed samples. Zinc (Zn) and copper (Cu) resulted widely applied in swine diets for their positive impact to help young animals to cope with pathogens. The evaluated Zn content of feed samples, probably related to its pharmacological use, was 821.74 ± 301.27 mg/kg (as fed) and 1737.88 ± 301.27 mg/kg (as fed) in the weaning and finishing phases, respectively. Pig diets also presented a high Cu concentration in the finishing (133.75 ± 11.55 mg/kg as fed) and in the weaning (160.09 ± 11.55 mg/kg as fed). The content of HMMs in faeces reflected their presence in the diet and swine manure represents a possible source of Zn and Cu pollution. In conclusion, Zn and Cu should be used as nutritional additives in a concentration lower than the maximum admitted level. Thus, alternative strategies are required to guarantee the health status of growing piglets, in line with the recent European Regulations (Reg. 1039/2018; EMA/394961/2017) aimed to reduce the total Cu level in complete feed and to ban the pharmacological use of ZnO.

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Environmental impact assessment of goat milk production

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Goat farms are spreading as an alternative to other milk production pathways. Given the wide interest in goat milk quality and composition and the different characteristics of goats breeding, their presence in intensive farming systems is increasing. Similarly, to food, environmental assessments play an important

role also in goat milk production. However, very few studies have been performed on the environmental sustainability of goat farming systems and efficiency improvements are searched on several points of view, among which breeding solutions and milk production.

In this study, the aim is to evaluate the environmental impact of goat milk production, taking into account all the livestock breeding phases.

The environmental impact was quantified by means of the Life Cycle Assessment method. An attributional approach was used with a 'from cradle to gate' system boundary. The selected Functional Unit of 1 kg of Fat and Protein Corrected Milk (FPCM) was used, and all inputs and outputs for milk production were referred to this unit. All data were gathered from questionnaires to farmers and using specific models for goat emissions (Tier 1 and Tier 2 by IPCC, and EEA) about enteric methane, manure storage and spreading on field, nitrate and phosphates to water. Also for feed intake and diets data were collected on farm and evaluated through specific models. Background data were taken from Ecoinvent database v3.0.

Twenty goat farms in Lombardy Region were visited to collect the inventory data on crops cultivation (area, yield, etc.) and goat livestock management (herd composition, milk production, effective length of the milking period, etc.), as well as on the composition of the diets. The ILCD characterisation method was used for the environmental impact assessment.

The environmental impact results showed a wide variability, which is broadly due to the differences among the studied farms in terms of herd dimension (from 26 to 450 goats), milk production (from 633 to 3817 g FPCM/head day), crops cultivation and livestock management. Enteric methane emission was estimated as 11.9 ± 1.78 kg/head year, following the equation suggested by INRA, based on diet characteristics and dry matter intake. Environmental impact assessment can be a useful tool in order to improve farm management and to look for innovative mitigation strategies.

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LIFE TTGG: improving the supply chain efficiency of European hard or semi-hard PDO cheeses by development of an Environmental Decision Supporting System (EDSS) for Product Environmental Footprint (PEF) assessment

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In order to limit global warming, the reduction of GHG emissions in the coming decades will have to be very consistent and should cover all sectors: not only the energy sector, which is responsible for the largest quantities of direct emissions in global terms, but also the agricultural sector, which today is a direct source of about 10–12% of total emissions worldwide. Available projections indicate that an increase in food consumption, without action, will rise GHG from the agricultural sector.

The European dairy sector represents one of the principal players in the world in terms of both importation and exportation. In the European ranking Italy and France are big European cheese producers, Italy has the sixth highest production in terms of cheese in general. The Grana Padano PDO accounting for ~24% of total milk output in Italy, is one of the most important cheese in the country. The EU has founded the 'LIFE TTGG' project, which aims to reduce the carbon footprint of hard and semi-hard cheese production by 10% (111,000 tons CO_2 eq/y) in the following 2/3 years after the project considering: the 25% of Grana Padano production, the 5% of other IT hard cheese PDOs, the 10% of FR hard cheese PDOs, involved in PEF reduction. Solutions are needed to improve Italian and France cheeses supply chain efficiency and to analyse and reduce their Product Environmental Footprint (PEF). In this regard the project proposed underlines the importance of implementing environmental solutions to improve the Grana Padano PDO's supply chain efficiency, supporting the development of a tool (EDSS) for PEF analysis and reduction.

The project, coordinated by Politecnico di Milano, provides the development of a life-cycle analysis (LCA) on a representative sample of Grana Padano PDO (65 farms, 18 dairies and 18 packaging producers) and on a French hard or semi-hard PDO cheese (35 farms and 15 dairies); the implementation of a Life-Cycle Inventory (LCI) datasets for the production of 1 L of cows' milk; the production of two of main feeds used for cows; the production of 1 kg of Grana Padano PDO; the production of 1 kg of French hard or semi-hard PDO cheese, the production of three packaging solutions. The LIFE TTGG project will be a useful contribution to the implementation of European environmental policies and also represents an opportunity to test Product Environmental Footprint Category Rules (PEFCR).

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