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SOCIETAL LCA

Towards a non-speciesist social life cycle assessment

Stefan Mann[1] · Sebastian Richter[2,3] · Melf-Hinrich Ehlers[1] · Andreas Roesch[4] · Melanie Douziech[4]

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Abstract

Purpose Social life cycle assessment has become an important tool for systematically including the social component in the sustainability assessment of value chains. However, the exclusion of non-human animals from social life cycle assessment (S-LCA) is problematic and essentially speciesist. This paper addresses this problem by developing strategies towards a non-speciesist S-LCA.

Method This is a conceptual contribution in which we discuss the rationale and identify the methodological options for considering the well-being and rights of both human and non-human animals in social life cycle analysis.

Results and discussion When applying the methodological options in practice, researchers may face challenges stemming from the current socioeconomic structures and speciesist values dominating society. However, we argue that approaches attentive to including non-human animals in a social life cycle assessment should take the well-being of animals as seriously as that of humans. To advance the methodology of social life cycle assessment, the range of impacts on the well-being of all sentient beings as well as their severity and duration should be considered as far as possible based on the available data and scientific literature. This should include issues of longevity and allow for a comparison of animal production and crop production. Thereby, it should allow for different ethical perspectives, like utilitarian and rights-based approaches, rather than following one particular route.

Conclusion S-LCA researchers who take up this challenge will inform the transformation of the agri-food sector towards greater sustainability, help to align the practice of S-LCA with recent developments in philosophy and science, and better prepare us for addressing future changes to the social demands placed on animal agriculture.

Keywords Speciesist · Social life cycle assessment · Socioeconomic structures

1 Introduction

Social life cycle assessment (S-LCA) has become an important tool for systematically including a social component in the sustainability assessment of value chains (Tragnone et al. 2022), thereby leading to what Huertas-Valdivia et al. (2020) have called an exponential growth of applications. In particular, the widely accepted Guidelines for S-LCA issued by UNEP (2009, 2020) have become foundational for encouraging numerous applications (e.g. Ekener-Petersen and Finnveden 2013; Foolmaun and Ramjeeawon 2013; Manik et al. 2013). Both the UNEP Guidelines and most of its applications focus exclusively on the well-being of humans, which essentially means that non-human animals are ignored. Some might see this as a legitimate decision to choose useful system boundaries. We argue against such a view and suggest that because animal welfare is of increasing social concern, accounting for it within this context is essential to ensuring sustainable livestock production. Our argument is supported by the potential trade-offs between the social, environmental, and economic aspects of S-LCA and, most importantly, the strong ethical arguments for including animals as key stakeholders in the sustainability evaluations of food system activities. Integrating animal welfare in this way

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✉ Stefan Mann
stefan.mann@agroscope.admin.ch

[1] Agroscope, Tänikon 1, Ettenhausen 8356, Switzerland

[2] Department of Food System Sciences, Research Institute of Organic Agriculture (FiBL), Ackerstrasse 113, Frick 5070, Switzerland

[3] Institute of Environmental Sciences (CML), Leiden University, Einsteinweg 2, Leiden 2333 CC, The Netherlands

[4] Agroscope, Reckenholzstr. 191, Zurich 8045, Switzerland

will align S-LCA with recent developments in philosophy and science and help prepare us for future changes to the social demands placed on animal agriculture.

Drawing on a review of existing attempts to include non-human animals in sustainability assessments and to deal with animal welfare in animal agriculture, we discuss the methodological options for including non-human animals in S-LCA, as well as the challenges that arise when doing so. These challenges include the difficulty of finding indicators that can reflect the complexity of the topic while ensuring reasonable data collection efforts, as well as the differences between countries with respect to how animal welfare is handled. A subsequent analysis of the social context of implementing these options in practice points to tensions and barriers arising from socioeconomic structures and dominating values in society that render the effective application of S-LCA that includes non-human animals difficult.

While our economic activities affect all kinds of animals, this paper will focus on farm animals as a case in point, as today, they constitute the majority of all mammals measured by biomass on the planet (Greenspoon et al. 2023) and are very actively involved in many agri-food value chains, one of the main realms of S-LCA applications (e.g. Brenes-Peralta et al. 2021; Arcese et al. 2023; Mancini et al. 2023).

The following section explores the problems arising from the failure to include non-human animals in S-LCA. Section 3 then identifies the methodological options for S-LCAs that include non-human animals. Section 4 provides an analysis of the socioeconomic context of implementing non-speciesist S-LCA and develops options for positioning the practice in present-day society. Section 5 discusses these options in the context of past S-LCA developments, and Section 6 offers a conclusion.

2 Non-human animals in social life cycle analysis

Various problems arise when non-human animals are not included in S-LCA. When neglecting non-human animals in S-LCA, one risks missing the potential trade-offs between sustainability dimensions; e.g. intensive production systems may lead to better environmental performance per kilogram of product but less favourable conditions for animals. Therefore, international organisations have begun to include animal welfare in sustainable food production roadmaps (European Commission 2020; Commission on World Food Security 2020). In addition, the Food and Agriculture Organization has, for example, shown several linkages between livestock and the sustainable development goals (FAO 2015).

Animals and their welfare are important for sustainability considerations in both direct and indirect ways. They are directly important because sustainable development is a normative concept oriented towards making current and future societies and human ways of behaving in the world fairer. This should include the just treatment of animals and respect for their dignity and rights (Bossert 2022; Milburn 2023). Accordingly, scholars have recently argued for the direct moral consideration of non-human animals in sustainability evaluations (e.g. Boscardin and Bossert 2015; Bossert 2022). Indirectly, animals are important to consider in sustainability evaluations because of the strong interrelations between their welfare and other sustainability outcomes. Prominent examples include the interrelation between animal health and antibiotic use, or the lifespan of dairy cows and the emission of methane. These interrelations are reflected in the approaches of One Health (Zinsstag et al. 2020) and One Welfare (Pinillos 2018).

Moreover, recent advances in biological research regarding the welfare-relevant capacities for a multitude of non-human species (cf., e.g. The Welfare Range Table n.d.) have strong implications for our own views and treatment of animals. This can be seen both in the discourse in philosophy, with prominent scholars arguing for a stronger consideration of animals and their interests in politics and social decisions (e.g. Korsgaard 2018; Nussbaum 2023)—and in broader science—as in the case of the recent The New York Declaration on Animal Consciousness, signed by more than 250 scientists who argue for the importance of considering recent evidence on the consciousness of animals and this accounting for their welfare in public decisions.

Speciesism is a fundamental issue at the root of efforts to exclude non-human animals in S-LCA. Speciesism, as defined by Ryder in 1970 (see Ryder 2000), refers to the ethically unjustified differential treatment between humans and non-human animals. As Singer (1975, p. 9) wrote, speciesists "allow the interests of their own species to override the greater interests of members of other species" (p. 9). Singer popularised the concept in his book on animal liberation and explained why there was no philosophical justification to weigh the utility of humans higher than that of non-human animals, as long as the same interests are concerned, and quantities do not differ. Similarly, rights-based scholars have emphasised that sentient non-human animals should enjoy fundamental rights similar to those of humans in areas where they have morally relevant interests, and that a speciesist discrimination that neglects these fundamental rights simply by virtue of their belonging to a different species is unjustified (Bekoff 1997; Korsgaard 2018; Milburn 2023). The concept of speciesism refers to the concept of racism, which entails the discrimination between different human races. As with racism, there is a broad consensus among ethicists that speciesism cannot be justified on ethical grounds (Bruers 2021).

The introduction of the S-LCA guideline states "The ultimate goal of sustainable development is human well-being" (United Nations Environmental Programme (UNEP) 2009, p. 16). Consequently, the first edition of the UNEP Guidelines referred only to indicators relevant to humans, whereas a vague reference to the "ethical treatment of animals" is made in the 2020 edition (p. 23). The Life Cycle Initiative (2022), hosted by UNEP, names workers, consumers, the local community, society, and value chain actors as relevant stakeholders. Non-human animals are not mentioned. This reflects the dominant anthropocentric understanding of sustainability that prevails today (Washington et al. 2017). Since sustainable development is a normative concept aimed at directing human action, and since animals are strongly affected by human activities, such a disposition is speciesist, just as a statement indicating that "the ultimate goal of sustainable development is the well-being of Asian ethnicities" would be racist, or as an S-LCA that systematically ignores women would be sexist.

However, while most empirical applications of S-LCA plainly ignore non-human animals, there have been attempts to integrate their well-being into life cycle assessment (LCA) and S-LCA. The Methodological Sheets for S-LCA of the UNEP (2021) include a chapter on "The Ethical Treatment of Animals" in which they briefly address the topic of animal welfare along with potential data sources and inventory indicators for integrating animal welfare into S-LCA, for example, by using the Five Freedoms of Farm Animals (Webster 2001) as a conceptual base and interviews with stakeholders as data sources. However, this only provides a very general orientation for considering the inclusion of animal welfare in S-LCA. In a review of 1460 LCA studies, Lanzoni et al. (2023) found 24 that included animal welfare in one way or another. However, many of these studies consider the impacts on animals only very marginally and fragmentarily.

Including animals in S-LCAs by considering variables that relate to non-human animals is necessary to resolve the problem of speciesism, but not yet sufficient on its own. Resolving this problem also depends on *how* the animals are included. To return to the imaginary racist study that focuses on the well-being of only Asian ethnicities, such an approach would remain racist, even if it suggests some minimum standards for other ethnicities. A non-speciesist inclusion of animals in S-LCA needs to take the well-being of non-human animals as seriously as the well-being of humans. Such an approach must not only include any type of indicators that are associated with impacts on animals, but more fundamentally try to find ways to model the entire range of impacts and their severity as best as possible, based on current knowledge and available data. This requires (i) that impacts in all stages of the animals' lives, from breeding to slaughter, as well as the salience and duration of these impacts are considered; (ii) that the best available indicators are carefully selected to represent impacts in these stages; and (iii) that the selected indicators are scored and weighed to best reflect the extent to which they impact the life quality of the animals (see Richter et al. 2024, for a detailed discussion). Steps into this direction have recently been taken, for example, by Turner et al. (2023) who, based on Tallentire et al. (2019), developed a more detailed, literature-based LCA approach with weighted indicators across the animal welfare dimensions of Biological Function, Natural Behaviour, and Affective States for assessing animal welfare impacts of egg production. Moreover, the Welfare Footprint Project has developed a framework, initially operationalised for the case of laying hens, that is applicable to LCA studies and aims to account for all (negative) affective states, including their severity and duration, resulting from the way the animals are kept throughout their entire life stages from birth to slaughter based on latest interdisciplinary evidence (see Alonso & Schuck-Paim 2021).

3 Methodological options for including non-human animals in S-LCA

If one advances from the notion that today's S-LCA suffers from severe speciesism to an attempt to outline principles for a non-speciesist approach to S-LCA, the general notion will have to be that S-LCA considers the well-being of all sentient beings. To operationalise this ambitious objective, it becomes necessary to understand the conceptual approach of S-LCA in greater detail. Because of the rich and heterogeneous landscape of contributions to the method, this is a difficult task. What are the (usually hidden) epistemological foundations of S-LCA? If anything is to be maximised or secured, what is it?

It may be attributed to the young age of LCA in general and of S-LCA in particular that these epistemological foundations have not really been agreed upon. If scholars lay them open, their ethical foundations differ. Sometimes, they rely on certain utilitarian assumptions, i.e. focusing on the consequences and effects of certain products or processes on the overall utility or welfare of affected groups or society. Ekener-Petersen (2014), for example, refers to the potentially positive and negative impacts of a product on society. In another study, Soltanpour et al. (2019) focused on the impact of different products on well-being. The endpoint indicator of "quality-adjusted life years" (QALY), originally suggested by Weidema (2006) and applied, e.g. by Hannouf et al. (2021), also makes a clear reference to utilitarian scales. Yet, scholars carrying out S-LCA assessments also regularly refer to rights-based assumptions, focusing on the overriding—i.e. consequence-independent—importance of fundamental human rights. In the Social Hotspot Database, a tool for inventory modelling in S-LCA, for example,

the impact subcategories are grouped into five categories, two of which are labour rights and human rights (Benoir-Norris et al. 2012; Schlör et al. 2017). Similarly, Hadler et al. (2023) considered human rights as one of four priorities in rating social sustainability. The natural conclusion here is that methods to include non-human animals in S-LCA should try to integrate utilitarian and rights-based approaches rather than following only one of these routes.

The literature on animal ethics is shaped by two different debates which are fundamental to the ethics of keeping and killing sentient beings. One explores the "how to" and is more prominent in the discussion on animal welfare. This debate centres around ways to increase the comfort and decrease the suffering of farm animals during their lifespan. Particularly prominent are the "Five Freedoms" that comprise the freedom from hunger and thirst; from discomfort; from pain, injury, and disease; from fear and distress; and finally the freedom to express normal behaviour (Webster 2016). In a seminal article, Garner (2006) acknowledges that "animal welfare is clearly not as 'sexy' or as 'cutting edge' as animal liberation or animal rights" (p. 161), but that paying attention to the well-being of farm animals is still a crucial ethical concern. This first debate about comfort and suffering is central for utilitarian approaches that focus, in their various forms, on the balance of pleasure and pain caused by different experiences throughout the life of an animal, as illustrated, for example, by the Welfare Footprint framework (Alonso & Schuck-Paim 2021).

The other debate (that receives less attention from the farming community, but more from animal ethicists) explores the normative foundations of keeping and killing farm animals—including the question of the legitimacy of premature killing. Whether premature killing should be regarded as a welfare issue *as such* is controversially discussed and frequently negated in animal welfare science (for an overview and discussion, see Richter et al. 2024). Many ethicists, however, argue that killing farm animals for the enrichment of human diets is unethical in general (Jones 2015). This second debate plays a particularly important role for rights-based approaches. In utilitarianism, depending on the version of the utilitarian approach, the death of an animal per se, i.e. independent of associated painful or negative hedonic experiences, must not necessarily be considered problematic under all circumstances (cf. the discussion in Chapter 5 of Singer 2011). Rights-based approaches, on the other hand, often consider premature killing of sentient animals as a key issue irrespective of whether they are accompanied with harmful experiences for the animals or not (e.g. Korsgaard 2018; Bossert 2022). This suggests that an S-LCA should address (and at the same time distinguish between) two different aspects: first, the aspect of well-being during an animal's lifespan, and second, the duration of this lifespan and whether it has been ended forcefully.

3.1 Considering animal welfare in S-LCA

A systematic and explicit inclusion of animal welfare in S-LCA entails two sub-questions. One is the question of appropriate indicators, and the second concerns their integration into existing S-LCA approaches. Intuitively, one may be tempted to seek support from current S-LCA practices, particularly for answering the first question: if one concurs with the current framework of S-LCA, except for its speciesism, how does this framework extend to non-human animals?

While participatory efforts at involving the affected parties currently rank high in contemporary approaches to establishing the relevant variables for S-LCA (Tokede and Traverso 2020; Bouillas et al. 2021; do Carmo et al. 2021), it is unlikely that they are helpful in finding appropriate categories for non-human animals, as the latter lack agency for such tasks. Due to their broad and holistic approach, the Methodological Sheets of the Life Cycle Initiative of UNEP (2021) provide a more fruitful base for drawing analogies from humans to other animals. This document covers all relevant actors along the chain and then focuses on those aspects that the respective product systems affect the most. Workers, for example, are considered with respect to their wages, their working hours, health and safety issues, and basic freedoms, like association freedoms. The consumer, on the other side of the chain, is also covered health-wise, but other relevant aspects here include transparency, end-of-life responsibility, and feedback mechanisms.

Animal welfare is, of course, as multidimensional as human well-being. An attempt to account for this multidimensionality in relation to farm animals is the Welfare Quality® protocol (Rios et al. 2020). This framework has been elaborated over a period of 5 years by a large group of scientists who have evaluated a substantial number of potential animal welfare indicators (Canali and Keeling 2009). They proceeded in a similar way as the architects of S-LCA, considering as many dimensions of (in this case, animal) well-being as necessary and ended up with a list of nine to 35 indicators per animal category. One criticism that has emerged, though, is that the aggregation and classification procedure is not transparent enough (Sandoe et al. 2019), and that applying the protocols on farms takes a lot of time (Heath et al. 2014). Nevertheless, holistic approaches to evaluating the quality of life for agricultural animals fit well with the overall approach of S-LCA. However, in practical S-LCA applications, data can lack for some of the indicators of holistic approaches. This can be addressed by two alternatives:

(i) One can rely on other available information of the underlying production systems, like using data for a standard organic dairy farm in Denmark instead of

a specific Danish organic dairy farm and evaluating their overall welfare implications).

(ii) Alternatively one could only apply a selection of indicators for which data is available while using an aggregation approach by compiling weighed averages from a given database, or by using a combination of both (Richter et al. 2024).

Traditionally, there has been some reluctance in the LCA community to aggregate different dimensions of sustainability such as toxicity and climate change (Kägi et al. 2016). Nevertheless, endpoint indicators in S-LCA exist. Weidema's (2006) suggestion to refer to Quality-Adjusted Life Years (QALY) is a case in point, as QALY are claimed to provide an overall indicator for the quality of life (Huang et al. 2018). If one includes the welfare of animals as an additional indicator in S-LCA, this raises the question of trade-offs between the utility of human and non-human animals, which ultimately leads to the complex field of inter-individual utility comparisons. Is there any reliable method to determine whether the distress of the cow on her way to the slaughterhouse is larger or smaller than my distress in the traffic jam? While the traditional position in welfare economics is that such comparisons cannot be made with sufficient reliability, philosophers have often argued against this view (e.g. Hare 1981). More importantly, it has been shown that interpersonal utility comparisons are regularly carried out in both welfare economics and happiness research (Mann 2007). For humans, it is common sense that "every individual counts equally with every other individual" (Schmidt 2008, p. 235). Extending this principle of equal weight for each individual to non-human animals might intuitively work better for cows than for ants. However, not only have classical utilitarians argued against such a view (Mill 1969), but so have many contemporary philosophers. For instance, Hauskeller (2011) attempts to explain why the life of a human is preferable to that of a non-human animal on hedonistic grounds, Schmidtz (1998) discusses why we should have respect for every species, but not necessarily equal respect, and Varner (2013) even attempts, with some success, to establish objective criteria for the degree of "personhood" of different species and to derive from that different utility levels to be expected from different lives. In contrast, Visak (2022) has provided arguments in favour of equally considering interests across species in welfare comparisons. Weightings for interspecies welfare comparisons have been derived from welfare proxies and welfare range tables that try to estimate the welfare capacities of different species, considering current research in animal cognition and behaviour science (Budolfson et al. 2023; The Welfare Range Table n.d.).

Historically, we appear to be in an early stage of overcoming speciesism. Many of the references cited here, however, show the sincere attempt to take the well-being of non-human animals as seriously as the well-being of humans. Biologists, animal welfare scientists, and ethicists will have to join forces to identify principles and related indicators that allow us to do so. It is difficult to weigh the difference in animal well-being, for example, between stanchion and loose barns against changes for humans, but there will be no way around it if we want to work with endpoint indicators in a non-speciesist S-LCA. However, this task is increasingly being taken over by researchers, and important first steps have been taken in this direction (cf. Fischer, 2024).

3.2 Considering longevity in S-LCA

Many animal ethicists denounce our practice of slaughtering farm animals as unethical. However, S-LCA has the power to compare important differences between current and prospective ways of producing food in which animals suffer more than in others. Identifying such systems is particularly important when designing the transition towards a more sustainable society. Therefore, it would be beneficial to shift from today's human-based S-LCA to a method that effectively considers the killing of animals (e.g. Scherer et al. 2018). As the deliberate killings of people are not part of today's production systems, the closest possible comparison would be fatal accidents, which are often dealt with in S-LCA. Often, estimates pertain to how many life years have been lost through these accidents, which are then considered in the overall balance of ethical judgement (Tong and Wang 2011; Baumann et al. 2013; Arvidsson et al. 2018).

Such an approach that focuses on years of life, including those of non-human animals but with possible quality adjustments, entails difficulties. It could be argued that a termination of dairy production, for example, would not allow cows to live until their natural end. In such a scenario, most cows would not exist, as most cows today are only "kept" for the purpose of dairy production. From a utilitarian perspective, this could even allow for the opposite perspective to be defended, in that dairy production allows many additional animals to live for many additional years. If animal welfare standards are high, this would weigh positively on an S-LCA that always considers quality of life (Lindkvist and Ekener 2023). However, Visak (2013), in her book on "killing happy animals", has examined this strain of arguments in admirable depth. Specifically, she draws the conclusion that utilitarianism does not deal with potential lives, but only with real ones, and that real-life cows would probably benefit if they were not killed in their course of lives.

The S-LCA's focus on QALY does not only allow to highlight if farm animals are killed, but also at which stage of their life. Milk- and egg-producing animals, in particular dairy cows, are killed at different ages in different production systems. If they are allowed to live a greater share of their

potential lives, this would not only reduce the per-product greenhouse gas emissions of the agricultural system (Grandl et al. 2018), but they may also enjoy the bright sides of their lives for a longer period (Mann 2024). It would be beneficial for this aspect of longevity to be considered in an overall evaluation of the social performance of different value chains, merely because not only the act itself, but also the time of killing has grave social impacts.

The most important advantage of the inclusion of this dimension of life and death would be the ability to judge the difference between crop-based and animal-based products. Today, environmental LCAs regularly conclude that the consumption of plant-based food is better for the planet than animal-based food (e.g. Poore and Nemecek 2018). A similar analysis in today's S-LCA would draw conclusions based on the well-being of the workers in the respective value chains. It does not yet have the toolbox for making comparisons that include the suffering of animals, since no indicator is systematically used to account for this important aspect of animal-based products, namely the longevity of their life and their life itself. It thus appears likely that a non-speciesist S-LCA usually concludes that the social footprint of an animal-based food item exceeds the social footprint of a plant-based food item.

4 Socioeconomic structures and values

The literature on animal ethics today largely argues against speciesism (Albersmeier 2021). At the same time, there seems to be no country in the world where speciesism would fail to attain a solid majority of support from the general population. In the USA, for example, a survey has shown that the percentage of respondents who think animals should have the same rights as humans has gone up, but still remains only around one-third (Yuhas 2015). Cohen et al. (2012) found the group of Dutch respondents considering humans superior to non-human animals to be almost double that of the group finding them to be of equal value. In addition, a study using a questionnaire that described different situations in which animals are deliberately killed and asked respondents how legitimate they perceived the killing found the majority of the Swiss population convinced that the killing of farm animals is morally legitimate (Dürr et al. 2011). In fact, a non-speciesist approach to animals that would most probably ban today's practice of animal husbandry is so far away from reality that it is usually not even put on the table of surveys; for instance, when a recent questionnaire on animal welfare was issued, it did not even include the question of whether animal husbandry was a legitimate system that should be continued (European Commission 2023). Therefore, it cannot be argued that S-LCA has been developed to be implicitly speciesist. Instead, speciesist S-LCA emerges out of a society that is deeply speciesist.

This raises the question about the methodological base of S-LCA and the compatibility of this base with our objective of making it non-speciesist. The development of the S-LCA Guidelines by UNEP (2009) and the many subsequent developments of the method (e.g. Barros Tellos do Carmo 2016; Norris 2018; Cadena et al. 2019) are based on extensive stakeholder engagement in which those involved can lay down their own arguments and opinions. This increases the democratic transparency of the evaluation and reduces subjective biases. However, such stakeholder involvement can be problematic for S-LCA that aims to be attentive to non-human animals in a speciesist society. In other words, as long as the key stakeholders involved are representing purely anthropocentric interests, there exists a trade-off between a democratic process in the setup of S-LCA guidelines and a non-speciesist way of carrying out S-LCA that would be appropriate from an ethical perspective. At least partly, this is because farm animals would be important stakeholders but are unable to voice their interests. This is not at all a new finding, as Adams (2009) has described the problem of animals being treated as objects by law. In a related vein, Baggot (2006) has suggested that the problem be overcome by asking veterinarians to represent animal rights in a stakeholder consulting process, a suggestion that is questionable because of Dürr et al.'s (2011) findings indicating that veterinarians could be more speciesist than the general population. Clearly, a transformation of S-LCA towards a non-speciesist assessment tool will be facilitated if society transforms towards a less speciesist one—and findings of recent studies suggest that this might indeed be the case in many countries (e.g. Ammann et al. 2024; Song and Jung 2022). More importantly, however, scientific research offers the opportunity to take new findings from the cognitive and behavioural sciences and from philosophy seriously and to disregard the speciesist prejudices still prevalent in wider society and among some stakeholders.

5 Discussion

We explored important reasons for considering non-human animals in S-LCA and presented promising options for doing so. At the same time, we identified several challenges in the inclusion of non-human animals in S-LCA, making it unlikely that S-LCA immediately skips its speciesist stances. How are we going to dissolve this contradiction?

Storey (2019) reminds us that "fatalism is usually little more than a means to defend the prevailing structures of power" (p. 39). New concepts need to be conceptualised and operationalised before they can be considered sufficiently mature to be applied in practice. The S-LCA by itself is

a case in point. O'Brien et al. (1996) suggested extending LCA towards the realm of social issues at a time when life cycle analysis itself was still contested in practice (see Mclaren et al. 2002). It took another 13 years until an international organisation came forward with detailed suggestions for its implementation. This reflects the time scientific developments need between first ideas and implementation. And yet, from today's perspective, the contribution from 1996 was most helpful in paving the way for the development and implementation of current approaches of S-LCA.

The history of S-LCA exemplifies the utility of continuing to work on a non-speciesist S-LCA. As the fight against speciesism has many good arguments on its side, the integration of these perspectives into the toolbox of S-LCA cannot be too premature. Our analysis has shown that current suggestions by the UNEP do not go far enough to overcome the speciesist approach of S-LCA. We need more ambitious animal welfare standards than just the five freedoms referred to by the UNEP (2021). Perhaps even more importantly, we need to consider a malus in S-LCA for animal-based products as compared to plant-based products due to the suffering of animals involved. However, determining the correct size of such a malus is not trivial and requires further research.

Veterinarians and animal welfare scientists can contribute to this process by providing important knowledge about the welfare needs of non-human animals, while experts on S-LCA and on animal ethics can contribute to the technical and normative basis of the S-LCA methods. They have to collaborate to develop a sound methodology for S-LCA that takes the well-being of all sentient species into account. In parallel, it is important to intensify the public debate about the (probably lacking) justification of speciesism and the path towards a more sustainable society that can overcome speciesism and make its decisions on a non-speciesist basis. However, this is an objective that extends far beyond the mere reform of S-LCA.

6 Conclusion

The inclusion of non-human animals in S-LCA entails challenges. This includes the fact that non-human animals, different from most human stakeholders, are unable to speak for themselves. They are a stakeholder group needing humans who represent them in analysis and decision making. Our analysis showed that it is both important and possible to include non-human animals in S-LCA. In this context, two key arguments have been developed: First, today's practices of S-LCA fail to meet basic ethical standards when it comes to non-human animals; namely, they are speciesist in disregarding the interests of non-human animals. Second, this speciesist practice is very much supported by current majorities. Nevertheless, there is a lot in motion in many societies. For example, when citizens are asked about the weak spots in agricultural systems, animal welfare has become one of the top concerns in Europe (Ammann et al. 2024). A growing minority in the Global North has turned against the expropriation of farm animals, a movement that is particularly salient among younger generations (Song and Jung 2022). We should adapt to an S-LCA that at the very least identifies social hotspots for non-human animals in the different production processes and therefore has the potential to contribute to some improvements in the production system. More fundamentally, however, S-LCA experts, ethicists, and animal welfare scientists should contribute to develop truly non-speciesist S-LCAs. For this, concepts such as QALY that take into account both the quality of life and longevity appear particularly promising.

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