How values and perceptions shape farmers' biodiversity management: insights from ten European countries

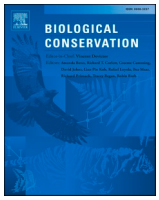
Klebl, F. ORCID: https://orcid.org/0000-0003-4877-3160, Parisi, A., Häfner, K., Adler, A., Barreiro, S., Valentin Bodea, F., Brönnimann, V., Reinier de Vries, J. P., Dos Santos, A., Hood, A. S. C. ORCID: https://orcid.org/0000-0003-3803-0603, Melts, I., Popa, R., Vajna, F., Velado-Alonso, E. and Kernecker, M. L. (2024) How values and perceptions shape farmers' biodiversity management: insights from ten European countries. Biological Conservation, 291. 110496. ISSN 0006-3207 doi: https://doi.org/10.1016/j.biocon.2024.110496 Available at https://centaur.reading.ac.uk/115309/

Biological Conservation 291 (2024) 110496

Contents lists available at ScienceDirect

Biological Conservation

journal homepage: www.elsevier.com/locate/biocon



How values and perceptions shape farmers' biodiversity management: Insights from ten European countries

Fabian Klebl [a,b,*], Anton Parisi [a], Kati Häfner [a], Anneli Adler [c], Sílvia Barreiro [d], Flaviu Valentin Bodea [e], Viviane Brönnimann [f], Jan Peter Reinier de Vries [g], Alice Dos Santos [h], Amelia S.C. Hood [i], Indrek Melts [j], Răzvan Popa [e], Flóra Vajna [k], Elena Velado-Alonso [l], Maria Lee Kernecker [a]

[a] Leibniz Centre for Agricultural Landscape Research (ZALF), Eberswalder Straße 84, 15374 Müncheberg, Germany
[b] Agricultural and Food Policy Group, Albrecht Daniel Thaer Institute of Agricultural and Horticultural Sciences, Humboldt-Universität zu Berlin, Unter den Linden 6, 10099 Berlin, Germany
[c] Swedish University of Agricultural Sciences, Department of Crop Production Ecology, P.O.-Box 7043, SE-750 07 Uppsala, Sweden
[d] MED – Mediterranean Institute for Agriculture, Environment and Development, Universidade de Évora, Casa Cordovil 2° Andar, Rua D. Augusto Eduardo Nunes 7, 7000-890 Évora, Portugal
[e] Faculty of Biology and Geology, Universitatea Babeș Bolyai, Str. Clinicilor 5-7, 400006 Cluj-Napoca, Romania
[f] Agricultural Landscape and Biodiversity Sector, Agroscope - Swiss Federal Research Institute, Reckenholzstrasse 191, 8046 Zurich, Switzerland
[g] Plant Ecology and Nature Conservation Group, Wageningen University, Droevendaalsesteeg 3a, 6708PB Wageningen, the Netherlands
[h] Centre d'Etudes Biologiques de Chizé, UMR7372, CNRS & Université de La Rochelle, 79360 Villiers-en-Bois, France
[i] Centre for Agri-Environmental Research, School of Agriculture, Policy and Development, University of Reading, Earley Gate, PO Box 237, Reading RG6 6AR, UK
[j] Institute of Agricultural and Environmental Sciences, Estonian University of Life Sciences, Kreutzwaldi 5, 51006 Tartu, Estonia
[k] Lendület Ecosystem Services Research Group, Institute of Ecology and Botany, Centre for Ecological Research, Alkotmány út 2-4, 2163 Vácrátót, Hungary
[l] Estación Biológica de Doñana-CSIC, Avenida Américo Vespucio 26, 41092 Sevilla, Spain

ARTICLE INFO

Keywords:
Biodiversity conservation
Environmental ethics
Utilitarianism
Deontology
Ecosystem services value
Sustainable agriculture

ABSTRACT

Farmers play a pivotal role in addressing biodiversity loss whilst maintaining food production. To rethink conservation in agricultural landscapes, it is crucial to understand their decisions regarding biodiversity and its management on the farms. In this study, we conducted 48 semi-structured interviews across ten European countries in 2021/22 to explore how farmers' perceptions and valuations relate to their biodiversity management. Employing reflexive thematic analysis, we identified recurring patterns of shared meanings. Our findings underscore the profound influence of farmers' biodiversity perceptions on their biodiversity management practices: 1) Narrow and targeted interventions were closely tied to instrumental values of biodiversity, whereas holistic management strategies were linked with recognising an inherent value of nature. 2) Targeted approaches were related to farmers' interpretations of biodiversity as specific taxa and functions, relying on easily assessable and emotionally connoted indicators. 3) Holistic approaches aligned with a broader biodiversity concept and an emphasis on intricate functional relationships within ecosystems. 4) Actual decisions to implement measures were significantly constrained by perceived dependencies, namely production pathways, social dependencies, and landscape conditions. These findings raise a critical question about the prioritisation of ecocentric intrinsic versus anthropocentric instrumental values in conservation strategies. We propose an approach of ethical pluralism, acknowledging that instrumental values may provide practical solutions for certain challenges, while intrinsic values hold ethical significance, particularly in the context of complex or large-scale biodiversity conservation initiatives. Engaging in dialogue that accounts for diverse values will be essential for shaping effective and socially meaningful biodiversity conservation.

* Corresponding author at: Eberswalder Straße 84, 15374 Müncheberg, Germany.
E-mail address: fabian.klebl@zalf.de (F. Klebl).

https://doi.org/10.1016/j.biocon.2024.110496
Received 3 November 2023; Received in revised form 24 January 2024; Accepted 7 February 2024
Available online 19 February 2024

1. Introduction

Biodiversity conservation strategies are derived from values associated with biodiversity (Balvanera et al., 2022; Barton et al., 2022). The process of valuing biodiversity and nature in general involves identifying what aspects of nature hold value and by whom, serving to guide the governance of natural resources (Balvanera et al., 2022). Díaz et al. (2015) emphasise the importance of aligning biodiversity valuation with stakeholders' value systems to accurately delineate the distribution of costs and benefits of conservation efforts for ultimately contributing to a good quality of life. This requires a fundamental understanding of how people perceive and value biodiversity and non-human nature and the relationship between perception, value, and conservation practices.

However, the value of biodiversity is ambiguous, with the term *value* carrying multiple interpretations, including principles, expressions of worth, or quantifiable measures such as price (Balvanera et al., 2022; Pascual et al., 2017). Moreover, the valuation of biodiversity varies depending on the specific perspective on biodiversity and the chosen valuation approach, which is influenced by the knowledge system and scientific disciplines involved. These approaches encompass biophysical assessments that focus on ecological importance, economic considerations related to preferences and human well-being, socio-cultural approaches that examine social environments and perceptions, and holistic perspectives drawing on indigenous and local knowledge systems, emphasising human-environmental relationships (Termansen et al., 2022). Within the last decades, most of the attention has been directed towards valuation methods originating from welfare and environmental economics. Two main concepts for economically valuing environmental goods and services, equally applicable to biodiversity, are the ecosystem services framework highlighting the contribution of ecosystems to human well-being and the Total Economic Value framework as the sum of use and non-use values (Bartkowski et al., 2015; Bartkowski, 2017), both mainly focusing on monetary valuation methods (Fish et al., 2011; Gómez-Baggethun et al., 2010).

These different perspectives on the values of biodiversity are, in turn, grounded in a set of values and ethical principles themselves (Pascual et al., 2021). Concepts, such as the ecosystem service concept, are strongly loaded with values (Jax et al., 2013). This underscores the fact that both scientific valuation and the development of biodiversity conservation strategies are fundamentally underpinned by a value system. These values also influence individuals' behaviours concerning biodiversity.

Biodiversity conservation in agricultural landscapes is highly dependent on farmers' management practices. Indeed, sustainable farm management practices, such as establishing and maintaining landscape elements, introducing mixed grassland regimes and planting wildflowers, can increase the diversity and abundance of wild species (e.g. Blaauw and Isaacs, 2014; Boetzl et al., 2021; Fraser et al., 2014; Weibull et al., 2003). Therefore, our primary focus lies on understanding farmers' perceptions and valuations, how these interrelate with their management decisions and, subsequently, what implications this holds for the scientific understanding of values and the practical aspects of biodiversity management strategies. Prior research has demonstrated that farmers' perceptions, worldviews, and value systems play an important role in influencing their commitment to biodiversity conservation (Klebl et al., 2023). While several studies have made valuable contributions towards a deeper understanding of the implication of farmers' perceptions for biodiversity conservation (Busse et al., 2021; Herzon and Mikk, 2007; Kelemen et al., 2013), some have made an explicit link between their perceptions of biodiversity and their willingness to participate in biodiversity-enhancing agri-environment schemes (Herzon and Mikk, 2007). Yet, a conceptual approach to understanding the relationship between farmers' perceptions, valuations of biodiversity, and their decisions to conserve it is missing. To the best of our knowledge, no study has analysed farmers' perception of biodiversity across a range of farming systems and regions, and no study has bridged the outcomes of a qualitative in-depth analysis of farmers' perceptions with their broader on-farm biodiversity management.

Building on a wealth of literature, this study addresses the following central research questions: 1) How are farmers' intentions to manage biodiversity on their farm shaped? And 2) how do their perceptions and values of biodiversity influence their approach to biodiversity conservation? Through an inductive analysis of 48 in-depth interviews, we aim to reconstruct farmers' rationalities underlying their on-farm biodiversity management across diverse farming systems in Europe. The findings were integrated into a broader discussion on the importance of instrumental, intrinsic,[1] and relational values in biodiversity conservation.

2. Methodology and methods

2.1. Theoretical foundations: ontology, epistemology, and reflexivity

For the research structure, approach, and outcomes, the ontological and epistemological signify reflexivity as relevant. As perceptions of farmers are both outputs and inputs in larger social systems, the research and analysis are understood to be shaped by the contexts surrounding the research team. This includes ontological and epistemological assumptions as well as structural influences such as our position as highly educated researchers. As the results cannot be separated from the analysis, we acknowledge that our approach and interpretation cannot account for all explanations. For this reason, explicating research assumptions or positions is a necessary part of qualitative analysis (Braun and Clarke, 2006, 2022a; Madill et al., 2000).

We adopt an ontological approach situated between realism and constructivism. Our perspective recognises a certain external objectivity that individuals subjectively interpret and attribute meaning to, aligning closely with the theory of *critical realism*. The research was influenced by assumptions surrounding the main traits of critical realism as ontological realism, epistemological relativism, judgemental rationalism, and an orientation towards causation (Bhaskar, 2007, 2010). The relationship between the real and the relative, or objective and subjective, was marked by an understanding that meanings and the discourses they are embedded in are socially constructed and reproduced while also employing real minds and bodies, making the abstract concrete (Fairclough et al., 2004). Through judgmental rationalism, causal relationships and mechanisms were uncovered to provide probable explanations regarding farmers' perceptions in relation to approaches to biodiversity. Behaviour, and the norms and ideas which guide it, require an earnest justification on a personal level and structural elements on the social level (Bhaskar, 2007). The former demonstrates that reflexive capacities transform the latter, and that reasons produce causation (De Souza, 2014).

Epistemologically, the analysis followed a contextualist logic, centring factors and conditions both outside and within interview texts. As a form of relativism, this helped focus on particular factors surrounding phenomena (here, perceptions and decisions) and from a critical realist ontology, looked at how certain factors may have causal properties. Hence, in critical and other non-positivist social science discourses that accept knowledge as contextually and historically grounded (Mauthner and Doucet, 2003), contextualism explains the intersubjective accounts in experiential analysis (Braun and Clarke, 2022a). Lived experiences and contexts were understood to inform meaning-making, which in turn influence attitudes, interpretations, and decisions in real contexts (Fairclough et al., 2004), as well as how relations and larger structures are reciprocal with individual actions (De Souza, 2014).

[1] The conceptualisation of intrinsic value of nature in literature is often vague (Batavia and Nelson, 2017). When using this term, we refer to the perception that non-human nature possesses a universal inherent value. A glossary of key terms and concepts is provided below.

2.2. Study areas

The current paper draws on interviews conducted in diverse study areas across Europe (Fig. 1). These regions encompass a range of landscapes and farming intensities, including mixed arable land and grassland of medium farming intensity in England and Sweden, semi-natural coastal meadows in Estonia, extensive grassland in Hungary, vast extensively managed pastoral land in Transylvania, Romania, diverse and small-scaled but intensively managed agricultural land in the southern Netherlands and northern Switzerland, intensive arable land in western France, and intensive fruit orchards in southern Spain and Portugal. These regions form part of the H2020 SHOWCASE research project (https://showcase-project.eu/), serving as ecological and socio-economic experimental sites that extend beyond the farm and field levels.

2.3. Semi-structured interviews

2.3.1. Study preparation

The formulation of interview questions drew upon insights from a systematic literature review (Klebl et al., 2023), which explored factors influencing farmers' decision-making regarding biodiversity-friendly farm management. The development of the questions for the semi-structured interviews involved an iterative process conducted in close collaboration with the local researchers to tailor them to specific local conditions, providing flexibility for follow-up questions. To reach methodological consistency, workshops and briefings were organised to harmonise approaches within the research team. A comprehensive interview guideline was distributed among the team, providing detailed instructions for the interview process (Fig. A1 in the appendix).

2.3.2. Study sample

We employed purposeful sampling techniques to carefully select interview participants, with the primary objective of gathering information-rich cases for our in-depth study (see Patton, 2002, 264). Within each case study, we sought to identify farmers and farm managers who could serve as representative examples of the region in terms of various factors such as farm type, intensity, and size, essentially adopting a typical case approach that targets a normal or average sample (Palinkas et al., 2015; Patton, 2002). However, our intention was not for every farmer to match average characteristics; rather, we aimed for the selected farmers to collectively capture the essence of regional farming structures. While this strategy was successful in many case studies, it encountered difficulties in others. Additionally, we made efforts to introduce a high level of heterogeneity by selecting case studies that covered a wide range of regional differences across Europe, aligning with the strategy of maximum variation. Overall, we recruited 48 farmers to participate in our interviews (for details on the sample see Table A1 in the appendix).

2.3.3. Data collection and preparation

The in-depth questions on farmers' attitudes, implementation of incentives, and the role of external influences were embedded in a wider interview containing questions on structural characteristics of farms and farmers. To ensure accuracy for analysis, the interviews were audio-recorded. All farmers were informed of and declared their consent to data collection and processing in line with European General Data Protection Regulations. Interviews were conducted face-to-face during the winter of 2021/22 in the respective native languages.

The audio recordings of 22 h in total were transcribed and underwent scientific editing by an external contractor. A machine translation service (DeepL, https://deepl.com) was utilised to translate transcripts into English. Original transcripts and English translations were then

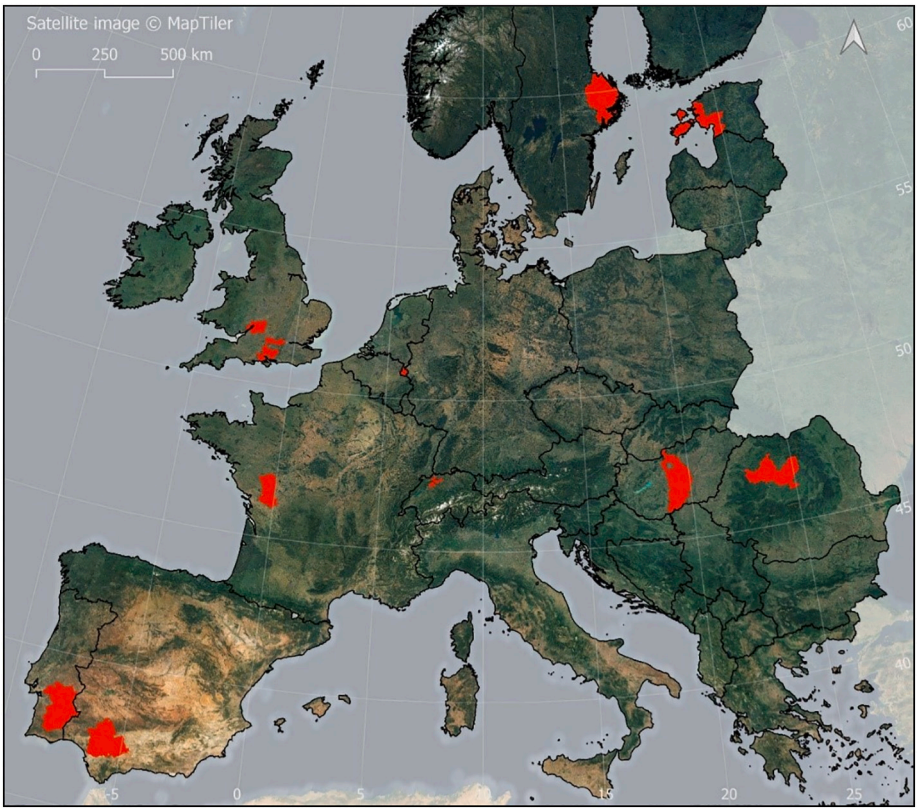


Fig. 1. Study regions at NUTS-3 level in ten European countries: Estonia (Lääne-Eesti), France (Deux-Sèvres), Hungary (Bács-Kiskun, Pest), Portugal (Alentejo Central, Baixo Alentejo), Romania (Cluj, Mureş), Spain (Sevilla), Sweden (Stockholms län, Uppsala län), Switzerland (Solothurn), the Netherlands (Zuid-Limburg), and UK (Berkshire, Central Hampshire, Gloucestershire).

reviewed by the research team to rectify any errors and clarify potential misunderstandings.

2.4. Reflexive thematic analysis

Our analytical approach took an inductive perspective, guided by the insights and reasoning of the interviewed farmers. To analyse responses and capture farmers' perspectives across the ten study sites, we chose thematic analysis (TA) following the framework proposed by Braun and Clarke (2012, 2022b). TA provides a flexible rather than pre-defined method of analysis for generating codes to identify patterns and iteratively developing themes, i.e. "expression of shared or similar ideas or meanings, across different contexts" (Braun and Clarke, 2022b, 77). These themes were subsequently expanded to form broader frameworks and contribute to an overall understanding of complex logical interconnections.

Reflexivity played a crucial role in both data generation and analysis. We acknowledged our subjective interpretation throughout the analysis, recognising that it is impossible to entirely eliminate our influence. Instead, we remained conscious of our subjectivity and leveraged it as a resource. Our aim is not to assert objectivity but rather to provide a coherent, insightful, and thoughtful analysis that reconstructs the farmers' perceptions of reality as close as possible (see Braun and Clarke, 2022a).

Following the phases defined by Braun and Clarke (2012, 2022b), we first familiarised ourselves with the dataset to gain an overview and identify initial topics for analysis (Phase 1). The coding process (Phase 2) was conducted independently by two researchers using MAXQDA software (https://maxqda.com), resulting in numerous semantic and latent codes. While the involvement of two coders was understood not to improve reliability in reflexive TA (see Braun and Clarke, 2022a), it allowed discussing and re-evaluating interpretations of the transcripts. Initial codes were iteratively re-assessed, deleted, merged, and synthesised, resulting in 132 codes. Based on the codes, initial themes revolving around broad central concepts were generated (Phase 3). In Phase 4, we reviewed viability of potential themes by revisiting the entire dataset and ensuring that the themes met various criteria, including identifiable boundaries, coherence, and sufficiency within the data, and meaningful information conveyed, with adjustments and improvements being made accordingly. Following this, we provided a detailed definition for each theme (Phase 5), specifying the central organising concept, boundaries, uniqueness, and the contribution of each theme to the overall analysis. Writing up (Phase 6) served as an additional means of reviewing themes and allowing for potential shifts in their composition. Inconsistencies were identified during the writing phase, leading to final adjustments in the arrangement and relationships between themes.

2.5. Limitations and potential bias

Data analysis encountered challenges due to language barriers and potential cultural misunderstandings. The analysis of data collected in ten different languages and cultural settings carried a risk of inherent complexities and nuances of language and culture introducing unintended biases or misinterpretations. However, we limited this bias by having interviewers review the original transcripts and translations before data coding.

Another potential limitation arises from the topic of biodiversity in relation to agriculture in general, which may elicit defensive reactions among farmers. The reliance on self-reporting in face-to-face interviews bear the possibility of social desirability bias. Participants may provide responses that they believe are socially acceptable or align with societal norms, rather than reflecting their thoughts. In our study, farmers may have striven to answer in a manner they perceived as aligning with the researchers' expectations. Consequently, this bias may have resulted in an overemphasis of the positive aspects of biodiversity and a potential underrepresentation of more sensitive or controversial viewpoints among farmers. We minimised this bias by trying to create an open and comfortable atmosphere during the interviews, by framing the questions without any implication, and by emphasising that the answers could not be right or wrong, but that we were interested in their subjective opinions.

3. Results and analysis

The following chapter is divided into two sections. The first part introduces the themes identified through TA, focusing on how farmers conceptualise biodiversity their perceptions of the relationship between biodiversity, and the factors influencing their biodiversity management decisions. The second section explores the interconnections between these themes, shedding light on farmers' rationalities and the connections between their perceptions, values, and actions.

3.1. Themes

Interview analysis revealed multifaceted perspectives of farmers regarding biodiversity conservation and their agricultural practices. Patterns of shared meanings across the interviews were identified and distilled into five core themes (Table 1). It is worth noting that while reflexive TA is not intended to quantify frequencies (Braun and Clarke, 2022a), there are instances where frequencies have been employed to provide a sense of the consensus levels evident in the interviews.

The formation of themes in the analysis addresses some of potential limitations mentioned above, drawing on farmers' perspectives across interview sites and thereby identifying patterns beyond individual viewpoints, and by integrating normative and non-normative components of their considerations such as certain external dependencies.

3.1.1. The assessability of biodiversity

Farmers exhibited varying perspectives on biodiversity, with a majority focusing on species diversity in their definitions. However, several farmers also referred to habitats (EE-5; HU-4; RO-2; UK-1; UK-3), ecosystems (ES-3; ES-5; PT-5; UK-5), and functional relationships between organisms (CH-5; EE-2; ES-4; FR-2; HU-5; PT-3; RO-2; SE-1; SE-3). Moreover, 16 farmers explicitly included weeds and pests in their definition of biodiversity.

The perception of biodiversity among farmers is closely related to its assessability and how they measure or observe it. They often rely on the

Table 1
Description of themes and their central organising concepts along the overarching themes of farmers' perceptions of biodiversity and of biodiversity management.

	Theme	Central organising concept
Perception of biodiversity	The assessability of biodiversity	The concept of biodiversity primarily refers to species that are observable and emotionally connoted
	Biodiversity serves human needs vs. inherent value of nature	The perception of biodiversity is based on two fundamental conceptions: biodiversity is primarily a resource and species have an inherent value that legitimises their existence
Biodiversity management	The inevitability of harming biodiversity	Sustaining food security is perceived to go along with certain unavoidable negative impacts on biodiversity
	Social dependencies	Farmers give considerable weight to anticipated feedback from social networks in biodiversity management decisions
	Landscape dependencies	Management decisions reflect socio-environmental contexts

use of easily measurable indicators that are charged with emotions. This emphasis on observability was supported by multiple farmers who highlight the importance of visible elements in their understanding of biodiversity. For instance, one farmer explicitly stated that biodiversity encompasses "*the diversity of animals, of birds because we can see it with our own eyes*" (EE-4). Another farmer emphasised species richness in terms of the number of species present on the ground (EE-5). The visibility and experiential aspects of various organisms such as mammals, birds, insects, and plants consistently emerged as key elements in farmers' definitions of biodiversity across different regions (e.g., PT-5; SE-4; UK-3).

When assessing the state of biodiversity in their landscapes, farmers referred to particular indicators they use (Table 2). They frequently focused on insects, especially butterflies (PT-3; RO-2; UK-4) and bees (CH-1; UK-4), and birds, including certain species such as partridges (ES-2; ES-3; NL-4) and skylarks (CH-1; FR-5), along with various mammal species, notably hares and wild boar. Farmers not only considered species abundance but also exhibited strong emotional connections and aesthetic appreciation towards specific taxa. These were, again, birds ($n = 11$), insects (8), with an emphasis on bees (3) and butterflies (2), and flower species (4), which are highly visible and valued for aesthetic appeal. However, as already reflected in the definition of biodiversity, several farmers recognised the functioning of ecosystems. Here, farmers also focused on observable indicators, including soil life (e.g., presence of earthworms), the diversity of flora, and the presence of specific ecosystem types such as water bodies or forests within the landscape.

The importance of visibility extends to the assessability of the effects of farming practices on biodiversity. Farmers notice the immediate impact of their actions that are visible to the eye. For example, one farmer stated that "*if I dump an insecticide, a fungicide that kills bees, you can see that the next day*" (ES-3). When farmers visually sense consequences of their farming practices, they reinforce their understanding of the relationship between their actions and biodiversity. Visibility motivates farmers, as they derive satisfaction from witnessing positive outcomes of their efforts. As expressed by a farmer, "*I'm motivated by the same change that you can see with the eye*" (EE-1). In turn, a lack of observable positive effects can also limit the scope of their interest, illustrated by another farmer, "*I'm only interested in water retention because I actually see its benefits in a large extent. All the rest is important, but it doesn't fundamentally affect the story*" (HU4).

Aesthetics play a role not only in how farmers perceive biodiversity but also in its aesthetic value, often referring to specific taxa or landscape compositions. For instance, one farmer responded to what biodiversity means, saying: "*Just beautiful. The junipers are beautiful*" (EE-3). Some mentioned the beauty of diversity in landscapes, finding it visually pleasing and less monotonous (ES-2). Birds, hares, butterflies, landscape elements, and flowers were among the aspects of biodiversity that farmers found aesthetically appealing. Notably, farmers did not mention the beauty of diverse soil life, beetles, or spiders, despite their relevance as indicators for biodiversity.

Table 2
Biodiversity indicators mentioned by the farmers interviewed.

Indicator		n	Farmers
Animal classes	Insects	17	CH-1; ES-2; ES-3; ES-5; FR-4; FR-5; NL-1; NL-4; PT-2; PT-3; PT-4; PT-5; RO-2; RO-3; UK-3; UK-4; UK-5
	Birds	16	CH-1; EE-2; EE-3; EE-4; ES-2; ES-3; ES-5; FR-4; FR-5; NL-4; NL-5; PT-2; PT-4; SE-3; SE-4; UK-4
Mammal species	Hares	10	CH-1; CH-2; CH-3; ES-2; ES-3; NL-4; PT-1; PT-2; PT-3; UK-2
	Wild boar	7	ES-3; PT-1; PT-4; PT-5; SE-1; SE-3; SE-5
	Deer	5	CH-1; CH-2; CH-3; PT-5; SE-1
	Foxes	4	EE-3; ES-3; PT-1; PT-5
Plants	Hedges and shrubs	4	CH-4; ES-4; UK-1; UK-3
	Trees	4	CH-4; ES-4; FR-1; UK-1
Ecosystems	Soil life	5	NL-1; NL-3; NL-4; SE-5; UK-4
	Water bodies and wetlands	4	EE-1; EE-5; HU-4; SE-3
	Plant diversity	3	EE-2; ES-2; HU-2
	Forests	3	FR-1; RO-2; SE-3
Management-based indicators	Crop diversity	7	CH-2; ES-5; NL-1; SE-1; SE-2; SE-3; UK-4
	Meadows	3	RO-2; SE-1; SE-3
	Grazing	3	EE-5; NL-2; SE-2

3.1.2. Biodiversity serves human needs vs. inherent value of nature

The interviews revealed contrasting opinions on the value of biodiversity, presenting two distinct perspectives. The first perspective considers biodiversity primarily as a resource with a value determined by its contribution to human well-being, mostly in terms of agricultural production. Farmers holding this viewpoint value biodiversity for providing ecosystem services. These farmers emphasised the instrumental value of biodiversity, regarding it as a "*work tool*" (FR-4) that can be utilised to enhance agricultural productivity, ensure food security, and improve economic outcomes. As one farmer explicitly stated, "*we promote that biodiversity as much as possible, okay, because it's useful to us*" (PT-5). The interdependence of agriculture and human life with biodiversity was recognised by many farmers ($n = 18$), acknowledging the essential role of nature and biodiversity in farming.

Within this perspective, biodiversity is often valued based on its capacity to deliver specific services. The importance of pollination, particularly for the cultivation of fruit trees, was highlighted, with bees being recognised for their crucial role in this function (e.g., ES-1; ES-2; ES-3; PT-1; UK-1). One farmer argued that pollination by bees makes these insects "*very valid*" (ES-1). According to another farmer, species only have a value "*if it has been proven that it is beneficial or that this little animal fulfils, within its ecosystem, a task*" (ES-3). This farmer went as far as stating that they "*will respect biodiversity as much as biodiversity respects the profitability of the crop. This crop is here to make money, it has no other reason to exist*". Similarly, a farmer who already implemented several biodiversity-friendly interventions confirmed that "*it wasn't driven by my love of bees […], it was a 100 % commercial decision*" (UK-1). Others highlighted the importance of biodiversity for soil fertility (CH-1; NL-4), viewing soil biota as an essential agricultural input (PT-3). Many farmers ($n = 16$) also referred to the role of biodiversity in natural pest management, with farmers aiming to strengthen nature to increase the abundance of beneficial insects (CH-4). This was particularly relevant for Portuguese farmers with their large share of permanent crops, who even described biodiversity as a "*weapon*" in "*biological warfare*" against pests (PT-1).

In contrast, the second perception of biodiversity acknowledges an inherent and universal value of nature, ecosystems, and all living species, irrespective of their utility to humans. Farmers adopting this perspective prioritise the conservation of biodiversity due to their deep connection with nature. Nature and biodiversity are a central element of their farming activities, as articulated by one farmer, "*for us, biodiversity is everything. I mean, we're trying to work with nature, not against it. We are a part of it*" (SE-1). This sentiment was further exemplified by a farmer who considers the opportunity to conserve nature a driving factor in their decision to pursue farming (HU-4). These farmers are willing to invest their personal resources in safeguarding nature, even without immediate benefits to themselves (e.g., SE-1; UK-3).

Farmers holding this perception tended to advocate for preventing harm to nature rather than actively promoting biodiversity (e.g., EE-5; RO-3). Their approach can be summarised as "*don't create it, leave [nature] alone*" (FR-2), reflecting their commitment to preserving natural ecosystems. Some farmers expressed their appreciation of untouched land, rejecting practices such as fertilisation and deforestation (EE-5; RO-3). They were mindful of the consequences of human actions on the environment, and expressed their frustration towards fellow farmers who "*destroy their own trees and these areas, right, without thinking about*

what they are doing to their environment" (EE-1).

The recognition and respect for the environment and the value of biodiversity are frequently rooted in moral obligations, exemplified by statements such as "*we have a global responsibility as part of the world to contribute to a better world for all the organisms*" (SE-1). Another farmer emphasised the moral imperative, stating, "*firstly, there is a whole moral reason. So we have no right to destroy our natural heritage*" (HU-3). These moral values sometimes intertwine with religious worldviews, as illustrated by one farmer, "*I love nature. I understood that nature was God's gift to man, not to destroy. […] So we must, the big and the small, live in harmony, that's why God left you on this earth, and protect what there is to protect*" (RO-3). The moral obligations constitute an important aspect of the broader discourse on farmers' sense of responsibility for biodiversity conservation.

3.1.3. The inevitability of harming biodiversity (operational dependencies)

The challenge of feeding the growing global population is a pressing concern for farmers (CH-1; PT-2), who perceive themselves as responsible for meeting these demands (FR-1; FR-5; UK-3). However, focusing on production seemingly inevitably comes at the cost of biodiversity, leading to the idea that "*we can't […] have rich biodiversity everywhere*" (SE-4). Several conventional and organic farmers share the assumption that organic farming alone cannot feed the world's population (e.g., CH-1; CH-2; EE-4). This creates a dilemma where human sustenance may take priority over biodiversity preservation (e.g., CH-2; ES-3; FR-1; FR-5; NL-2; NL-3; PT-1; RO-2; UK-3; UK-5). The origins of such productivist values often trace back to the aftermath of World War II, which left a lasting impact on farmers. One farmer vividly described how the memories of those times shaped their own perspective on agriculture, concluding, "*it does not fit in today's world, there is still hunger […] and what we grow is hardly enough to feed everyone*" (NL-2). The historical reflections also extend to subsequent generations. Considering the food insecurity due to World War II, one farmer critically raised the question to what extent past policy achievements to enhance production should be reversed (UK-3).

Economic market conditions significantly affect farmers' ability to prioritise biodiversity conservation. One farmer highlighted the precariousness of relying solely on natural predators to control pests, stating, "*you can sit there for two weeks and hope that some predators are going to appear. But if your rapeseed crop disappears, you haven't got an income*" (UK-3). Balancing economic viability and environmental stewardship becomes a delicate task, as another farmer expressed, "*I live here and I like this landscape. At the same time, we have to earn an honest living*" (NL-4).

Numerous farmers struggle to prioritise nature conservation amidst market pressures, particularly when extensively produced commodities are undervalued compared to products from large, intensive agribusinesses. Differences in prices along the agricultural supply chain pose a major challenge, as intermediaries exert pressure on farmers to minimise production costs (RO-2). The high demand for low-priced food perpetuates this cycle, with farmers facing financial constraints in their efforts to protect biodiversity (UK-3; UK-4). Another economic dependency arises from the constrained market access for biodiversity-friendly crops (EE-1; SE-3) or livestock such as sheep that offer alternatives to herbicide application (ES-4).

Adverse effects on biodiversity are claimed by farmers to be unavoidable due to the technical requirements of food production. Many farmers view the use of pesticides (CH-1; CH-4; ES-1; ES-3; NL-4; PT-2; PT-3; PT-5; RO-2; SE-1) or other potentially harmful farming operations such as ploughing (EE-5; FR-1; FR-4; RO-2) as necessary. Reflecting this perspective, one farmer stated, "*I am close to nature. Hopefully, one can use fewer pesticides, or be allowed to use fewer pesticides and be able to*" (CH-4). Another farmer highlighted the need for pesticide employment, affirming, "*if you have to do it, you have to do it*" (ES-1). Similarly, a Spanish farmer pointed to a limited scope for reducing glyphosate use in fruit tree systems, arguing that they "*can't reduce the use of glyphosate. We are already at the minimum*" (ES-3).

Farmers consistently expressed their reluctance to harm the environment, yet they feel compelled to do so due to moral obligations associated with food production and economic pressures, resulting in limited alternatives but to accept a certain degree of environmental impact. Several practices are argued to be essential to meet production demands and economic viability, because "*that's what the world demands from you*" (RO-2). Echoing this sentiment, another farmer asserted, "*I believe that no normal producer wants to use these pesticides, but in the end, you have to get a decent production, it's still money that counts. Nobody wakes up every morning and thinks, 'I would like to poison a lot now'*" (EE-4). A Portuguese olive producer shared a similar view, striving to reduce the use of fungicides as banning them is not feasible, in order "*not to spoil this wonderful world we live in*" (PT-2). Many farmers seek compromises that balance agricultural practices with biodiversity conservation efforts (CH-2; CH-4; FR-1; PT-1; SE-4; UK-1; UK-2; UK-3), acknowledging the complexity of this relationship, which was described as "*a fraught relationship that will never be entirely compatible*" (UK-1).

3.1.4. Social dependencies

The interplay between the personal and the societal is seen in aspects of farmers' identities as being socially negotiated. This includes aligning with or distancing from prevailing social values, with recognition and validation from their community holding importance, as one farmer expressed, "*it's a source of pride to know that I'm doing a good job*" (PT-2). Ideas of what defines a 'good farmer', however, differ in prioritisations of efficient production ("*a farmer who produces a large harvest at a low cost*", ES-1), profitability ("*a good farmer is synonymous with making money*", ES-3), or distinctions of 'real farmers' from corporate agriculture ("*not those guys from Agribusiness […], people who have worked seriously for generations really have no goal of depleting the land for quick profits*", NL-4).

Farmers' identities extend beyond the individual level and encompass the farming community and society at large. One farmer explained, "*I think it's very important that you're seen as a good farmer. But a good farmer, according to people in the parish, would be biodiversity. And according to a couple of my neighbours, it would be what you yield*", but the farmer's role in relation to the farming community and society depends on whether "*you've got your farmer's hat or your conservationist's hat on"* (UK-3). This underscores the significance of external judgements and the expectations placed upon farmers. As "*no human being is immune to social pressures*" (SE-1), farmers feel compelled to adhere to prevailing rules in order gain social approval, which may even lead them to conduct biodiversity conservation "*because it's part of the rules that are acceptable and that allow us to evolve in a way*" (FR-1). The validation of their practices relies on the normative judgment of others. This was expressed by another farmer, who said, "*we're not going to be good if others don't say we're good. This does not exist. We can't be alone saying that we are good when everyone around us says that we are bad*" (PT-3).

The broader society is perceived to have become increasingly aware of harmful management practices (CH-3; CH-5; HU-1; NL-5), prompting farmers to recognise their accountability to informed consumers. As one farmer stressed, "*we also have to be accountable, not only to our region, but also to the consumer. […] I think this is an important motivation, it gives us power, but it also gives us quite a big responsibility*" (PT-3). Farmers acknowledge the impact of their actions extending beyond their individual farms, with one emphasising that "*the main consideration is certainly simply to behave in a contemporary way towards nature and society*" (CH-4). Additionally, some farmers are motivated by the approval they receive from others, as it fosters a positive impression and attracts public attention (CH-5; NL-5; UK-2).

Social ties, especially within farming families, create a strong sense of responsibility towards the farm. Fulfilling expectations and justifying practices to both parents and future generations was a recurring theme. These practices can align with biodiversity conservation goals (CH-2; EE-5; HU-5; PT-2; RO-4), but can also target productivity or economic

efficiency, as expressed by a farmer who said, "*my dad [hinders me]. It needs to make financial sense. He wouldn't let me just do it because I want to*" (UK-5). On the other hand, farmers feel compelled to justify their farming practices to their children, as illustrated by the quotation: "*I also have a bit of an obligation towards my apprentice and also towards my junior. I have to be honest. I can't let them go to school and get a little bit sensibilised about [biodiversity], and I can't somehow talk everything down again at home and say that it's for nothing and that it's useless […]. Biodiversity is an obligation*" (CH-4). The desire to leave a healthy land for future generations weighs heavily on farmers' minds (CH-3; EE-4; ES-4; FR-5; NL-4; PT-2; RO-3; SE-1; SE-4), exemplified in the words of another farmer, "*I was never tempted by money because we give a penny and destroy everything, and tomorrow our grandchildren won't know what a butterfly is*" (RO-3). This sense of responsibility is intertwined with the perception of farming as a social contract, extending beyond the immediate family to former and future generations. The traditions and habits passed down by previous generations hold deep significance for many farmers. This was expressed by statements such as "*the old people have taken care of it [i.e. biodiversity]*" (EE-2), pointing to the inherited knowledge of sustainable land management (NL-5; PT-2; RO-3; SE-2).

Additionally, the preservation of natural values is intrinsically linked to cultural identity (PT-3), as exemplified by a farmer's sentiment, "*of course we lose a bit, but we all grew up here and we just don't know any better, it's the way it is*" (NL-5). Other farmers would even not name their extensive and de facto biodiversity-friendly management as such, because "*that's just normal*" (EE-5). However, their view can be challenged by prevailing educational systems that prioritise intensified agricultural practices at the expense of biodiversity conservation. Farmers revealed concerns about the influence of such systems, with one describing, "*in school we are asked to produce more, targeting wheat, and it has to be clean, so we remove some of the weeds, we destroy some of the biodiversity*" (FR-5). Another farmer confirms the influence of education, stating, "*my generation is nagged since school, in home economics lessons, the most important thing you were taught was to hunt for extra prizes. Like cheap food is good food*" (SE-2).

3.1.5. Landscape dependencies

The role of the landscape in setting the frame for farmers' actions towards biodiversity conservation emerged as important. One farmer emphasised that the distinctiveness of their region's landscape fostered biodiversity for centuries, explaining, "*that's not because the farmers here are better, but because the area is simply better designed for a nature-inclusive landscape*" (NL-5). The composition of the landscape, including the presence of landscape elements and rivers (ES-3; NL-1), and proximity to the sea (EE-2), exerts a significant influence. Farmers are motivated to contribute to biodiversity conservation due to existing landscape habitat diversity (NL-3; NL-4; NL-5).

Landscape geology presents a further consideration, important to land suitability for agriculture. Mountainous areas could allow only for extensive management (EE-5; NL-3), while also being intertwined with cultural mentalities, reflected in aesthetic and moral attitudes (PT-5). However, limited productivity and challenges in management on steep slopes may discourage some biodiversity implementations (ES-2). Soil productivity also plays a role, with better soils deemed suitable for agriculture and not appropriate for conservation (UK-1; NL-2; CH-5), or in contrast, that some areas are "*obviously […] not meant to be an arable land*" (HU-1). As a result, implementing biodiversity measures on less productive land is viewed as a prudent agronomic decision (CH-2; CH-5; EE-4), a necessity (FR-5; HU-1), an economic consideration to minimise opportunity costs (UK-4; UK-5), and a means to ensure food security (UK-1).

Moreover, cultural heritage manifested in the landscape remarkably influences farmers' perspectives on biodiversity conservation. The preservation of cultural heritage is evident through the efforts of several farmers to uphold traditional practices or restore lands to their historical state from centuries or even thousands of years ago (e.g., HU-1; HU-4; HU-5). These farmers recognise the significance of regional variations and farming traditions in shaping their approaches. For instance, one farmer highlighted regional differences in the interpretation of natural pastures, which in their region are defined as pastures with trees, differing from assumptions underlying European rules (SE-2). Similarly, farmers, particularly those from Estonia, stressed their unique landscape conditions and traditions, which are distinct from intensive agriculture in other places (e.g., EE-4).

3.2. Causal relations of themes

The themes reveal the interconnectedness of various factors shaping farmers' perspectives and actions towards biodiversity conservation. Farmers' understanding and valuation of biodiversity are shaped by observable elements and easily measurable indicators, influencing their perception of its value. Some prioritised its instrumental value for ecosystem services and agriculture (e.g., "*we see so much biodiversity at the level of insects, we promote that biodiversity as much as possible, okay, because it's useful to us*", PT-5), while others emphasise its inherent worth and conservation. However, these values are constantly challenged by the perceived inevitability of harming biodiversity in the face of global food security concerns, creating a delicate balance between conservation and production goals. Social dependencies add complexity as farmers navigate societal expectations, community validation, and intergenerational values related to nature, farming, and society. The landscape dependencies theme underscores the role of the physical environment in shaping farmers' motivations and practices, with considerations such as land suitability, landscape composition, and cultural heritage influencing decisions. Together, these themes demonstrate the multifaceted nature of farmers' engagement with biodiversity conservation, highlighting the complex interplay between economic, social, cultural, and environmental factors in shaping their practices and attitudes towards nature.

When analysing the interviews, we observed a connection between the themes centred around farmers' intentions and how they manage biodiversity. Their definition and conceptualisation of biodiversity, shaped by assessability and knowledge about biodiversity, as well as the value they assign to it (i.e., biodiversity serves human needs vs. inherent value of nature), appear to influence the complexity associated with and extent of their commitment to biodiversity conservation. This ranges from specific, targeted biodiversity-friendly farming practices to comprehensive, holistic management approaches.

3.2.1. Targeted management approaches

Adopting a targeted biodiversity management is defined as implementing a limited set of biodiversity measures that target specific outcomes (e.g., habitat for species, pollination services) with a relatively narrow spatial scope. For example, when asked about increasing biodiversity, one farmer (UK-4) suggested to "*think of the needs of a grey partridge*" and to implement measures such as wild bird cover to support this specific bird, which also benefits pollinators. This motivation roots in a strong affinity for the grey partridge, frequently observed in their landscape. While biodiversity is closely associated with bees and farm birds, the farmer acknowledged the services provided through biodiversity, stating, "*biodiversity in general is incredibly important. You have to think of the pollinators which are there to help the plants that are not self-pollinating*".

Another farmer (NL-4) evaluates biodiversity by considering the population levels of hares, pheasants, partridges, insects, and spiders, confining the concept of biodiversity to agricultural systems. Their motivation to protect biodiversity stem from recognising the services it offers and the desire to preserve cherished animal species. According to this farmer, effective measures to conserve biodiversity are acoustic signals to scare away wildlife, modifying mowing directions, and reducing the use of chemical sprays, all aimed at mitigating potential harm to the mentioned species.

In narrowing the concept of biodiversity even closer to the production system, particular benefits to production were pivotal for biodiversity measures. For one farmer, "*biodiversity is a set of bugs […] but some of them are predators of others and they end up having their function*" and the value of biodiversity lies in "*taking advantage of those bugs that live in that biodiversity*" (PT-1). They advocated reducing pesticide usage, focusing on pest management. This was echoed by a farmer who linked reducing chemical inputs with farm products which "*become healthier and healthier*" (ES-1). Another also expressed biodiversity in the context of productive benefits and human health, asserting that, "*a crop without biodiversity and the human being without biodiversity has lost a lot of advantages*" (PT-4).

3.2.2. Holistic management approaches

In contrast, holistic approaches are perceived as comprehensive biodiversity management strategies focusing on entire ecosystems at the landscape scale. A farmer (ES-4) counting "*any living element of nature*" in the definition of biodiversity is motivated by insights into the intricate interrelationships and functional roles within ecosystems. The farmer holds the position that every component within the system serves a purpose, even weeds, which provide food for animals and contribute to the natural fertilisation process. As such, the farmer emphasises the need to consider the farm as a whole and assigns meaning to every element, rejecting the notion of anything being merely a weed. Concerns about the destruction of nature through excessive focus on production underscore the importance of respecting the environment. Guided by this understanding, the farmer strives to conserve habitats for wildlife and advocates for limiting practices that harm nature, going so far as to propose "*forcing the farmer to be wildlife-friendly*".

The perspective of a farmer (EE-5) who embraces a comprehensive understanding of biodiversity, encompassing all living species and habitats, illustrates the emotional connection and personal value associated with biodiversity. For this farmer, biodiversity should be regarded as something that is "*close to your heart*". The farmer points out the importance of protecting biodiversity by avoiding harm to nature, driven by strong feelings and emotions. Consequently, the farmer adjusted management practices to preserve semi-natural areas, stating, "*I'm happy to protect them, even though I have so much trouble with them*".

Farmer ES-5 likewise offered a broad definition of biodiversity, describing it as "*species richness that corresponds to that ecosystem*". The farmer emphasises the moral imperative to respect the environment and argues that "*we have to change the culture*" of how agriculture is performed. This necessitates implementing transformative changes across the entire farming system, rather than focusing solely on isolated practices, which include a shift towards organic farming.

Addressing the decline in biodiversity and habitat diversity, one farmer exhibits a deep sense of concern and personal commitment, declaring, "*whatever happens, I'm going to be a conservationist and I'm going to change that*" (HU-1). This farmer is committed to implementing land management practices that prioritise species diversity and the strengthening of rare species populations: "*We are trying to make the rarer species more abundant so that we don't have to use special management for the rarer species later on*". This statement conveys a strong sense of responsibility towards safeguarding rare species, prompting consideration of the appropriate strategies. The suggested measures include the restoration of natural grasslands requiring measures at the landscape scale and the conversion of arable land into grassland, which implies changes in the regional farming systems.

Another farmer (HU-4) presented a definition of biodiversity that highlights the complex interactions among species within ecosystems throughout landscapes. Expressing this viewpoint, they asserted that "*it would take landscape level intervention to reverse*" the decline of biodiversity. The farmer calls for substantial decreases in agricultural production within ecologically sensitive areas and the revival of wetlands as essential steps in addressing this issue. Expressing their motivation, they underscore a deep concern for biodiversity and the preservation of habitats within the landscape, and are resolute in upholding their pro-nature values even against local customs.

3.2.3. Framing rationalities for biodiversity management

Interview data indicates that the farmers' perceptions of biodiversity strongly influence how they manage their land for biodiversity. Many farmers incorporate their experiences and attitudes into their conceptualisation of biodiversity, focusing on specific species, classes, or habitats. As highlighted in the examples above, this limited perspective, combined with a positive emotional connection to certain species, influences their management practices by prioritising the conservation or creation of habitats for those species (Fig. 2). In contrast, other farmers adopt a broader understanding of biodiversity, emphasising its intricate functional relationships within ecosystems. These farmers advocate for landscape-scale measures, such as wetland restoration, the creation of ecological corridors, and system transformations, driven by a holistic view of biodiversity dynamics. The link between farmers' understanding of biodiversity and their preferred conservation approaches is evident among 20 farmers of nine countries.[2] Contrary to the prevailing trend, one farmer deviates from the argument by favouring targeted management approaches despite possessing a more comprehensive perspective on biodiversity.

Farmers' interpretations of biodiversity carry subjective meanings, particularly regarding whether biodiversity primarily serves humans or whether nature and its living species possess inherent value. The interviews indicate that when biodiversity is seen as a service to humans, targeted management approaches, such as establishing flower strips for pollination services or aesthetic reasons, tend to be favoured. Accordingly, attributing inherent value to nature mostly resulted in a more holistic approach to biodiversity management. These farmers are highly motivated to contribute to landscape-scale biodiversity measures. While 18 farmers from eight countries strongly supported this argument, two farmers contradicted it by favouring complex and extended biodiversity measures without expressing inherent value, and one farmer showed a targeted approach while recognising an inherent value of nature. Despite a slight tendency for organic farmers to provide holistic biodiversity definitions and reveal a deeper relation to biodiversity, no clear distinction between organic and conventional farmers was detected.

Considering the remaining themes, it becomes apparent that farmers' decisions are not made in isolation but in the context of various dependencies that either support or hinder their intentions. These dependencies include the perceived conflict between agricultural production and biodiversity conservation, the moral obligation to produce, social dependencies, and conditions imposed by the landscape. The inevitability of harming biodiversity theme is primarily associated with operational dependencies, as many farmers pointed out that agricultural practices, particularly under current market conditions, inherently lead to damage to nature and negative impacts on biodiversity. However, they justify these consequences based on the essential need to produce food for human sustenance. In this context, the justification intersects with social dependencies, as farmers feel an obligation to meet society's demand for food. While this was apparent among farmers irrespective of their associated value concepts, the extent to which such adverse interventions are perceived inevitable varies.

4. Discussion

4.1. Conceptual contexts of biodiversity perceptions, values, and action

Farmers' perceptions of biodiversity and its value represent

[2] Please note that this link was observed during the interview analysis, even though we did not ask for it specifically. While it is very likely that the decisions of other farmers are likewise influenced by their biodiversity perception, we cannot substantiate this as they did not explicitly reference it.

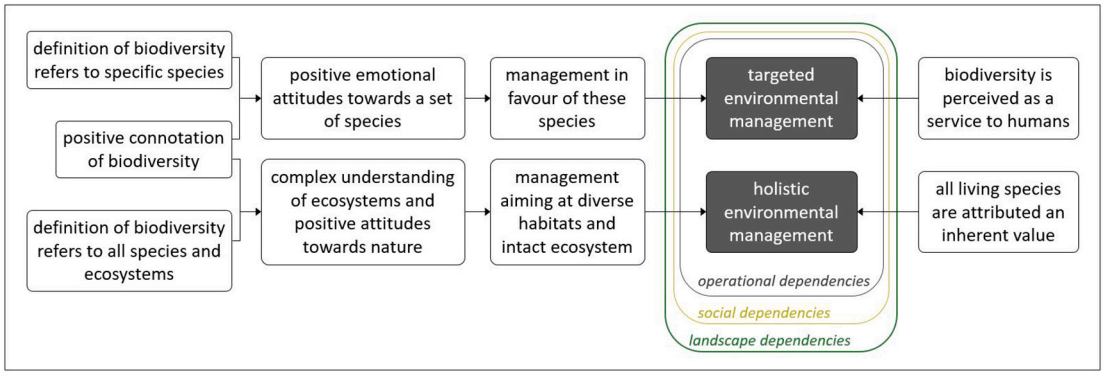


Fig. 2. Causal relations between themes as factors influencing farmers' on-farm biodiversity management. These factors include the conceptualisation of biodiversity based on assessable indicators, values attributed to biodiversity, and perceived decision dependencies, i.e. operational dependencies derived from the notion that farming inevitably comes at the expense of biodiversity, intertwined with social dependencies and constraints related to landscape conditions.

fundamental paradigms within environmental ethics and have profound implications for biodiversity conservation. These viewpoints not only reflect contrasting ideas about the relationship between humans and the natural world but also shed light on the farmers' decisions regarding the implementation of biodiversity conservation measures. Along with their framing of social dependencies, these perceptions can be translated into the utilitarian-deontological dichotomy of moral judgment and the anthropocentric-ecocentric polarisation of environmental values (Fig. 3).

4.1.1. Anthropocentric utilitarian ethics

The perspective expressed in the notion that biodiversity serves human needs reflects a utilitarian standpoint that is inherently anthropocentric. Those who subscribe to this perspective perceive non-human nature as being subject to human control, existing primarily to fulfil human needs. Within this utilitarian framework, the value of nature and biodiversity is determined by their utility to humans. It is worth noting that this perspective does not necessarily imply egoism; in fact, it can be driven by altruistic motivations, seeking to maximise the welfare of others or future generations. However, it places the well-being of humans as superior to that of other species.

Utilitarian principles are grounded in a consequentialist framework of moral judgment, with a focus on maximising overall utility or 'the Good' (Freeman, 1994; White, 2009). The historical background of such ethical principles can be traced to the works of Jeremy Bentham (1780) and John Stuart Mill (1863). Following this tradition, utilitarian theories of moral judgment are derived from a (neo-)classical economic paradigm and place the actor's urges and preferences at their core (Etzioni, 1989; Randall, 1991). Utilitarians state that the morality of an action depends on its expected outcomes and is situational (Freeman, 1994; Gawronski and Beer, 2017). The outcome is, in turn, measured by an instrumental value that is relative to the subject to whom something is considered valuable (Justus et al., 2009) and is relative to the value of other things (Randall, 1991), constituting a hierarchy of values (McDonald, 2014). As such, utilitarian ethics belongs to the consequentialist or, more broadly, teleological theories.

Utilitarian judgements within environmental ethics demonstrate a strong anthropocentric perspective, expressing an instrumental relation between humans and the natural environment (Oksanen, 1997; Randall, 1991). Anthropocentric arguments are rooted in the opinion that the value of objects is dependent on the subject to which they are subjected, thus subordinating the concept of 'good' to human-centric interests (McDonald, 2014). Oksanen (1997) argues that restrictions on human interaction with nature are derived from the duties owed to fellow humans, emphasising the preservation of biodiversity as necessary to prevent harm to humanity.

The anthropocentric utilitarian perspective of valuing ecosystems based on their contribution to human well-being has gained significant traction, as evident in the ecosystem service concept (see Loreau, 2014; Muradian and Gómez-Baggethun, 2021). This perspective views ecosystems as a form of 'living natural capital', highlighting their instrumental value for humans (e.g., Sukhdev et al., 2010; Turner and Daily, 2008). Biodiversity plays a crucial role in providing various services that directly benefit humans. While the existence of ecosystem services holds non-use values for potential future use, it often assumes a secondary role in the overall perspective (Chan et al., 2011).

4.1.2. Ecocentric deontological ethics

In contrast, the assertion that nature and all living species have an inherent value represents a normative moral judgment concerning biodiversity. Under this viewpoint, the protection of biodiversity is not contingent on specific circumstances and is not driven by anticipated outcomes. Instead, it arises from a moral duty to preserve biodiversity and the natural environment as a whole. This deontological perspective is ecocentric as it is grounded in moral principles that are not primarily based on human interests. However, this does not diminish the significance of human interests; rather, they are not the guiding principle for action. Recognising the reliance of humans on functional ecosystems combines the intrinsic value of non-human nature with human needs. Therefore, the distinction between these perspectives is not based on the inclusion or exclusion of human needs and preferences, but rather on the underlying motivation for conserving biodiversity.

Deontological theories of morality focus on the adherence to universal rules and moral duties rather than the outcomes of actions. As such, deontological theories are often defined as a counterpart to teleological concepts, i.e. being non-teleological (Gaus, 2001; White, 2009). The core of these theories is captured by William Frankena's often-quoted definition, which reads:

> "Deontological theories […] deny that the right, the obligatory, and the morally good are wholly, whether directly or indirectly, a function of what is nonmorally good or what promotes the greatest balance of good over evil for self, one's society, or the world as a whole. They assert that there are other considerations that may make an action or rule right or obligatory besides the goodness or badness of its consequences – certain features of the act itself other than the *value* it brings into existence, for example, the fact that it keeps a promise, is just, or is commanded by God or the state" (Frankena, 1973, 15).

Deontological ethics emphasise the importance of moral intentions and universal moral duties (Etzioni, 1989; Freeman, 1994; McDonald, 2014). Accordingly, the moral status of an action is determined by its alignment with these moral norms (Alexander and Moore, 2021; Gawronski and Beer, 2017), often referencing Immanuel Kant's

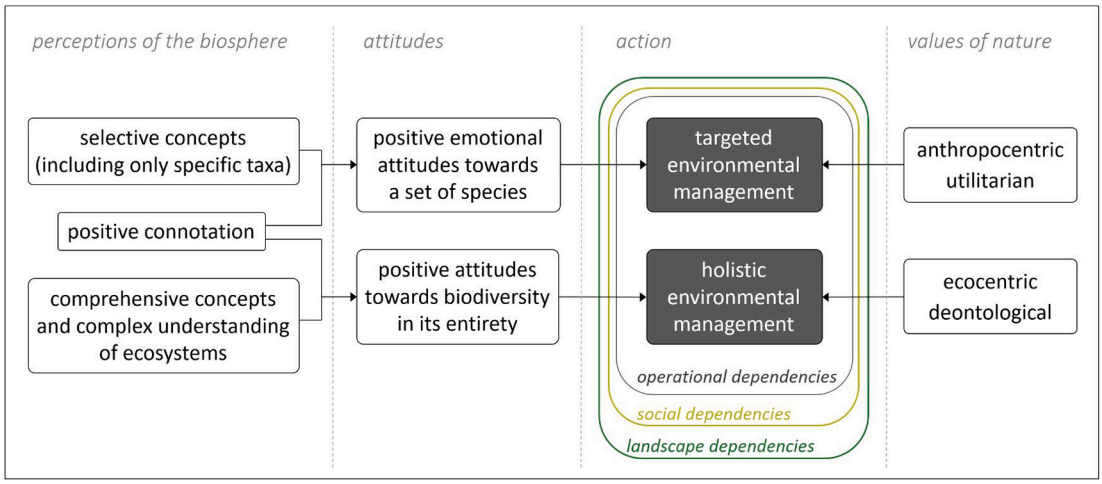


Fig. 3. Conceptual framework of how farmers' perceptions of biodiversity and values of nature influence the characteristics of their on-farm biodiversity management, considering perceived operational, social, and landscape dependencies limiting their scope of action.

principles of normative moral theory (Kant, 1785). Deontological ethics are characterised by their focus on individual moral agency and agent-relative reasons for action. They highlight the personal responsibility to uphold categorical obligations and maintain one's own moral integrity (Alexander and Moore, 2021). In this context, deontological judgements are situation-independent (Gawronski and Beer, 2017), prioritising the consistency with moral principles regardless of external factors.

Ecocentric positions are founded on the ethical stance that nature inherently possesses value. These positions involve perspectives recognising inherent value of all life and ecosystems, accentuating the interconnectedness of humans as part of nature (Washington et al., 2017). Unlike anthropocentric perspectives, ecocentric concepts value the natural environment independently of its usefulness to human beings, embracing values that extend beyond direct human demands. Consequently, ecocentric arguments align closely with deontological ethics,[3] asserting a moral duty to protect the environment for its own sake (Karlsson and Edvardsson Björnberg, 2021; McDonald, 2014). This duty includes the preservation of both an adequate number of individuals within a species to ensure genetic and environmental viability, as well as the protection of their habitats (McDonald, 2014). Ecocentric holism then goes beyond *biocentrism* (recognising intrinsic value of the living world) and the individualistic emphasis on ecological entities, to value species, ecosystems, and the biosphere, as well as the processes that foster and maintain these entities (Oksanen, 1997).

4.2. Implications for biodiversity conservation strategies

Strategies for conserving biodiversity are deeply influenced by different philosophical perspectives. Utilitarians advocate for the assignment of economic value to ecosystem services as a means to enhance conservation efforts (Justus et al., 2009; Loreau, 2014). However, our findings suggest that this perspective may lead to an incomplete view of the ecosystem and selective conservation approaches. On the contrary, a more holistic biodiversity management approach, grounded in a deeper understanding of biodiversity and ecosystem functioning, aligns with deontological principles. These perspectives also appreciate the positive impact of biodiversity on agriculture, yet they prioritise conservation based on moral duty and intrinsic value, emphasising that the agricultural benefits are not the primary reason for biodiversity preservation (e.g., HU-1; SE-1; UK-3).

Restricting the value of ecosystems to instrumental values has repeatedly been criticised, as it implies that objects within ecosystems are substitutable (Himes and Muraca, 2018). This perspective raises concerns that biodiversity may be left unprotected if technological substitutes emerge for genetic materials or the amenity value of natural environments (Randall, 1991). This, along with compensating for biodiversity through practices such as biodiversity offsetting, is considered incompatible with deontological ethics (Karlsson and Edvardsson Björnberg, 2021). Conservation practices guided by deontological ethics may leave biodiversity unprotected only if the moral duty to preserve it is outweighed by other moral principles (Randall, 1991).

Furthermore, focusing solely on ecosystem services to effectively deliver conservation aims requires a thoroughly comprehensive understanding of ecosystem functioning, which is challenging considering the complexity of ecosystems and their ever-changing statuses under climate change, biodiversity loss, and the resultant shifting population dynamics. This is equally applicable to socio-ecological systems, in which cultural and religious values of landscapes and places cannot be entirely captured as services, as they have unique and profound relationships with humans (James, 2015). Critics of instrumental value concepts highlight that nature's overall value, encompassing aesthetic beauty, cultural significance, and evolutionary importance, cannot be adequately measured or compared (McCauley, 2006). This challenges the anthropocentric ecosystem service concept, which assumes a separation of humans from nature (Flint et al., 2013).

Contrary to common arguments in the recent debate on 'compassion conservation' (Griffin et al., 2020), preserving familiar and charismatic species while paying less attention to overall life cycles and ecosystems was most observable among farmers holding utilitarian perspectives. Moreover, the critique regarding the absence of empathy scaling – the notion that individual suffering on a small scale evokes more empathy than an emotionally overwhelming crisis on a large scale (Griffin et al., 2020) – could not be substantiated. Biodiversity loss, as a global crisis, incited farmers who adhere to deontological ethics to take part in a wider intervention at the landscape level (e.g., Farmer HU-4 engages in biodiversity conservation "*because I am personally […] concerned about biodiversity and the habitats*", arguing that "*it would take landscape level intervention to reverse*" the loss of biodiversity in the landscape they are farming in).

While deontological perspectives hold intrinsic ethical appeal for biodiversity conservation, it is acknowledged that utilitarian instrumental values could be more readily communicated and embraced by

[3] This does not allow for the reverse conclusion that deontological environmental ethics are ecocentric per se.

farmers. In some cases, instrumental values may offer pragmatic solutions to specific biodiversity conservation challenges (Justus et al., 2009). As we navigate these different ethical viewpoints, adopting an integrated approach that appreciates both perspectives may offer the most effective path towards sustainable biodiversity conservation.

4.3. Turning towards an ethical pluralism

Interviews with farmers provided valuable insights into both utilitarian and deontological perspectives, which considerably influenced the farmers' attitudes and actions towards biodiversity conservation. This dichotomy creates a fundamental divide (Norton, 2000). The question of whether nature should be conserved for its own sake does not lie on a gradual spectrum; instead, it's a binary consideration. Yet, these values often need to be weighed against other moral principles (Randall, 1991), such as considerations related to community or societal well-being, resulting in complex webs of interconnected moral values, i.e. pluralistic values.

Calls have arisen for embracing multiple ethical values in the implementation of biodiversity conservation strategies (e.g., Arias-Arévalo et al., 2017; Cortés-Capano et al., 2022; Himes and Muraca, 2018; Pascual et al., 2021; Pascual et al., 2023). Advocates argue for the emergence of an alternative value system – one that acknowledges a spectrum of ways humans value nature, prioritises natural processes over specific entities, and underscores the value of biodiversity within its natural context (Norton, 2000). This shift aims for ethical pluralism instead of seeking an ultimate theory, promoting diversity in ethical approaches as a common source of potential solutions (Cortés-Capano et al., 2022), which could reshape power dynamics that currently determine biodiversity conservation research and policy paradigms (Arias-Arévalo et al., 2023).

An alternative perspective is seen in the Nature's Contributions to People (NCP) rationale (Muradian and Gómez-Baggethun, 2021), defined as the contributions of living nature to the quality of life for people (Díaz et al., 2018). Grounded in the IPBES[4] Conceptual Framework, the NCP rationale builds upon the ecosystem service concept while paying particular attention to indigenous and local knowledge (IPBES, 2015, 2022). NCP serves as a fundamental part of the IPBES strategy for valuing nature and its benefits for people, with the goal of achieving a "good quality of life" that varies across social groups and cultures (Díaz et al., 2018). According to this perspective, "NCP can embody symbolic relationships with natural entities to the extent that such relationships are inextricably linked to people's sense of identity and spirituality, to a meaningful life" (Pascual et al., 2017, 11). This intertwined aspect of identity and spirituality corresponds to relational values, encompassing preferences, principles, and virtues concerning human-nature relationships (Chan et al., 2016; Chan et al., 2018), bridging instrumental and intrinsic environmental values (Chapman and Deplazes-Zemp, 2023; Deplazes-Zemp and Chapman, 2021).

While the concepts of NCP and relational values adopt a more integrative perspective than the ecosystem services concept and place significant emphasis on non-instrumental relational values, their focus remains anthropocentric (Himes and Muraca, 2018; IPBES, 2015; Taylor et al., 2020). However, our findings underscore the important role of intrinsic values in implementing comprehensive conservation strategies. To respond to farmers' intrinsic biodiversity values, social and political contexts may seek to expand their support of these values. More biodiversity-favouring regulatory and cultural conditions can shift social dependencies for farmers' implementations. Horizontal and vertical alliances of social movements, including food sovereignty and environmental justice, that have catalysed a call to promote the rights of nature have gained some strength in civil society and international organisations such as the FAO and UN (Bjork-James et al., 2022). Furthermore, some modes of organic farming align with the inherent value of nature (van Bueren and Struik, 2005), including not just elimination of chemical inputs, but agroecological and holistic approaches (Verhoog et al., 2007). Implementing these at a landscape scale requires an understanding of biodiversity patterns, biological interactions, and ecosystem functioning by farmers (Jeanneret et al., 2021).

Recognising the plurality of values among stakeholders might be mirrored in process-oriented policy development approaches that incorporate regionalisation, stakeholder participation, and knowledge creation. This involves adapting to regional socio-cultural conditions (Cortés-Capano et al., 2022) by fostering effective dialogue, potentially in workshops, to tease out context-relevant values and integrate them into biodiversity conservation planning. One example of such an approach is seen in programmes targeting environmentally and socially sustainable traditional farming systems, such as those defined as Globally Important Agricultural Heritage Systems (GIAHS) by the FAO (Agnoletti and Santoro, 2022; Koohafkan and Altieri, 2011). Drawing on traditional knowledge and the profound connection between people and their land, these systems deliver multiple ecosystem functions and services (Agnoletti and Santoro, 2022). An instance of reviving such systems involves efforts to restore dense networks of hedges at the landscape level in Brittany, France (Burel and Baudry, 1995; Thenail et al., 2017). The interviews here revealed that intrinsically motivated farmers invest more effort in achieving a positive impact on overall biodiversity, opting for short-term investments for long-term cost effectiveness.

Other key aspects of shifting the focus to policy and programme development include co-design and participation. Co-design processes offer promising means to achieve conservation targets in agricultural landscapes, particularly considering major changes at the landscape scale such as establishing ecological corridors or reducing field sizes (Hölting et al., 2022). Direct stakeholder participation can increase implementation, improve measure outcomes, and stimulate cooperation. A successful example describes a process of implementing a new mode of governance in the Swedish forest sector aiming to enhance inclusion, participation, consultation, and mutual respect between stakeholders as they developed common frames of reference to achieve environmental goals (Appelstrand, 2012). Such an approach could be adopted by agri-food policies and programmes that seek a shift from dominant norms of food production to those addressing social dimensions, largely embodied by agroecology.

5. Conclusions

Biodiversity conservation strategies are based on values and norms. It is crucial to reflect upon and acknowledge these as they shape the principles underlying conservation initiatives. In turn, our results confirm that farmers' decisions regarding the implementation of conservation measures are closely aligned with their individual norms and perceptions. The interplay between these norms and farmers' perspectives significantly influences the practical aspects of biodiversity conservation on the ground. Harmonising the norms underlying conservation programmes, farmers' perceptions, and on-the-ground decision-making is integral to the success of such programmes.

However, farmers' perceptions of biodiversity are diverse and complex. While some include intricate interrelations of species within ecosystems, others rely on what can be observed and experienced first-hand to conceptualise and assess biodiversity on their farms. This feeds into their valuation of biodiversity, ranging from perceiving biodiversity as a service primarily for human needs to viewing all living species as possessing inherent value. These varying perceptions influence farmers' attitudes and actions towards biodiversity conservation.

Farmers holding utilitarian, anthropocentric ethics based on instrumental values of biodiversity tend to focus on specific species or ecosystem services that directly benefit human well-being. This selective

[4] Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.

approach may overlook the broader ecological context. In contrast, those following deontological, ecocentric ethics often adopt holistic conservation strategies, driven by a moral duty to protect biodiversity and ecosystems, regardless of immediate human utility.

To achieve effective biodiversity conservation widely accepted by farmers, it is crucial to recognise the diverse values held by relevant stakeholders in agricultural landscapes. While addressing instrumental values can be a pragmatic choice for certain measures, such as sowing cover crops, our findings emphasise that changes at the landscape level require a consideration of intrinsic and relational values. This underscores the need for a process-oriented policy approach embracing the variety of farmers' perceptions and values related to biodiversity, facilitating mutual understanding and fruitful collaboration at the landscape level.

Our findings also suggest that a profound understanding of biodiversity and ecosystem functioning, along with holding intrinsic and relational values, can enhance farmers' biodiversity measure outcomes. We advocate for increased efforts in regionally adapted programmes that promote these values, such as agricultural heritage initiatives, based on dialogue, co-design, and participation. How exactly this can be realised requires further exploration in a more policy-driven study.

Glossary

Anthropocentrism perspective that places human needs above those of other species and the environment

contextualism philosophical viewpoint emphasising that meaning and truth are dependent on a specific context

critical realism philosophical viewpoint asserting the existence of an external reality while recognising the significance of perception and interpretation in understanding that reality

deontological ethics assumption that the morality of an action is determined by moral principles

ecocentrism perspective recognising an inherent value of all life and ecosystems

epistemology philosophical branch concerned with the nature of knowledge and knowledge generation

intrinsic values values acknowledging an inherent value of non-human nature

Nature's Contributions to People (NCP) concept focusing on the contributions of living nature to peoples' quality of life

ontology philosophical branch concerned with the nature of reality and being

reflexivity self-reflection of the researchers' influence and biases affecting the outcome

relational values values referring to preferences, principles, and virtues concerning human-nature relationships (Chan et al., 2016)

thematic analysis (TA) qualitative research method to analyse patterns of shared meanings within a dataset

utilitarian ethics assumption that the morality of an action is determined by its contribution to overall human well-being

Appendix A. Appendix

Declaration of funding

The study has received funding from the project SHOWCASE (SHOWCASing synergies between agriculture, biodiversity and Ecosystem services to help farmers capitalising on native biodiversity) within the European Union's Horizon 2020 Research and Innovation Programme (grant agreement No 862480). This publication reflects only the author's view and the European Commission is not responsible for any use that may be made of the information it contains.

CRediT authorship contribution statement

Fabian Klebl: Conceptualization, Data curation, Formal analysis, Methodology, Visualization, Writing – original draft, Writing – review & editing. **Anton Parisi:** Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. **Kati Häfner:** Data curation, Writing – original draft, Writing – review & editing. **Anneli Adler:** Data curation, Investigation. **Sílvia Barreiro:** Data curation, Investigation. **Flaviu Valentin Bodea:** Data curation, Investigation. **Viviane Brönnimann:** Data curation, Investigation. **Jan Peter Reinier de Vries:** Data curation, Investigation. **Alice Dos Santos:** Data curation, Investigation. **Amelia S.C. Hood:** Data curation, Investigation, Writing – original draft. **Indrek Melts:** Data curation, Investigation. **Răzvan Popa:** Data curation, Investigation. **Flóra Vajna:** Data curation, Investigation. **Elena Velado-Alonso:** Data curation, Investigation. **Maria Lee Kernecker:** Supervision, Writing – original draft, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

Acknowledgements

We particularly thank the farmers who generously devoted their time to share their knowledge and expertise with us. We acknowledge their invaluable contribution to this research project. We would also like to express our thanks to the reviewers for their valuable comments and suggestions, which have helped us to enhance the quality of the article.

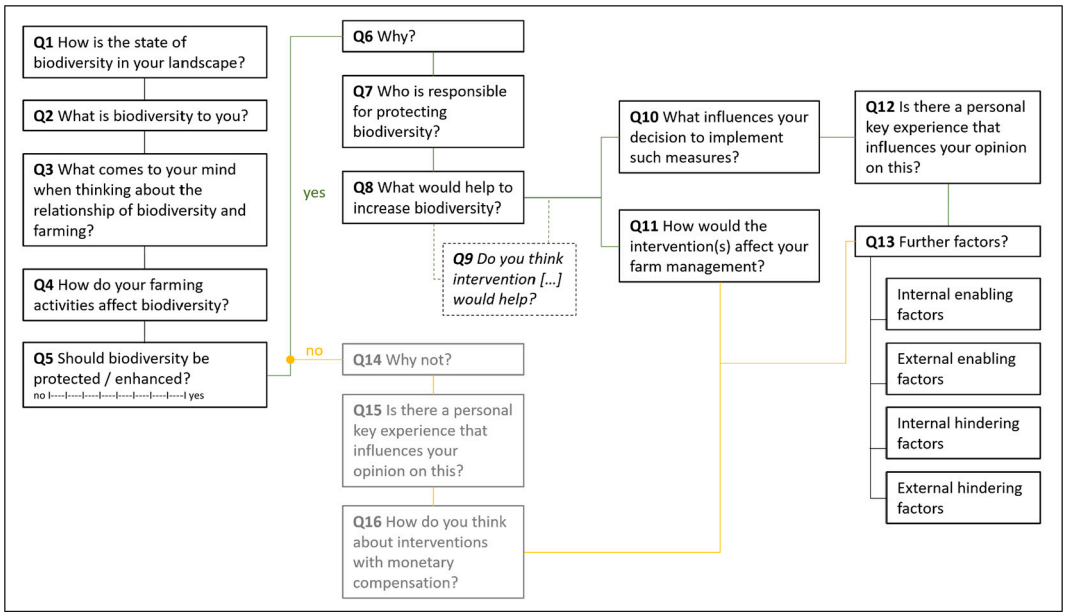


Fig. A1. Schematic illustration summarising the detailed interview guidance.

Table A1
Background information on the farmers interviewed.

	n	Farm type *(n)*				Farm size *(mean in ha)*		Off-farm household income *(n)*					Farming intensity (1–5[a]; mean)	Organic farming *(n)*	Age *(mean)*	Gender *(n)*	
		Arable	Livestock	Mixed	Perennial crops	Owned	Leased	100 %	≥75 %	≥50 %	<50 %	n.s.				Female	Male
CH	5	1	0	4	0	15.0	14.3	3	1	0	1		1.8	0	47.8	1	4
EE	5	0	1	4	0	85.0	242.0	1	4	0	0		1.2	4	51.4	2	3
ES	5	0	0	0	5	76.9	0.0	4	0	0	1		3.8	2	53.8	0	5
FR	4	4	0	0	0	110.5	116.6	0	0	0	0	4	2.5	2	49.3	0	4
HU	5	0	5	0	0	96.4	68.0	2	0	2	1		1.6	1	47.8	0	5
NL	5	3	1	1	0	35.4	45.6	3	0	1	1		1.6	1	41.4	0	5
PT	5	0	0	1	4	n.s.	n.s.	4	0	0	0	1	2.6	2	43.6	1	4
RO	4	1	2	1	0	11.7	59.7	2	0	0	0	2	1.5	1	48.0	0	4
SE	5	1	0	4	0	123.4	71.4	3	0	1	1		2.0	3	56.0	0	5
UK	5	1	0	4	0	466.0	240.0	2	1		2		2.4	1	51.0	0	5
Sum	48	11	9	19	9			24	6	4	7	7		17		4	44
Mean						113.4	95.3						2.1	1.7	49.0		
Share		0.23	0.19	0.40	0.19	0.54	0.46	0.50	0.13	0.08	0.15	0.15				0.08	0.92

[a] Self-reported farming intensity ranging from extensive (1) to moderately extensive (2), moderate (3), moderately intensive (4), and intensive (5).

References

Agnoletti, M., Santoro, A., 2022. Agricultural heritage systems and agrobiodiversity. Biodivers. Conserv. 31, 2231–2241. https://doi.org/10.1007/s10531-022-02460-3.

Alexander, L., Moore, M., 2021. Deontological ethics. https://plato.stanford.edu/archives/sum2021/entries/ethics-deontological/.

Appelstrand, M., 2012. Developments in Swedish forest policy and administration – from a "policy of restriction" toward a "policy of cooperation". Scand. J. For. Res. 27, 186–199. https://doi.org/10.1080/02827581.2011.635069.

Arias-Arévalo, P., Martín-López, B., Gómez-Baggethun, E., 2017. Exploring intrinsic, instrumental, and relational values for sustainable management of social-ecological systems. Ecol. Soc. 22. https://www.jstor.org/stable/26799016.

Arias-Arévalo, P., Lazos-Chavero, E., Monroy-Sais, A.S., Nelson, S.H., Pawlowska-Mainville, A., Vatn, A., Cantú-Fernández, M., Murali, R., Muraca, B., Pascual, U., 2023. The role of power in leveraging the diverse values of nature for transformative change. Curr. Opin. Environ. Sustain. 64, 101352 https://doi.org/10.1016/j.cosust.2023.101352.

Balvanera, P., Pascual, U., Christie, M., Baptiste, B., Guibrunet, L., Lliso, B., Monroy-Sais, A.S., Anderson, C., Athayde, S., Barton, D.N., Chaplin-Kramer, R., Jacobs, S., Kelemen, E., Kumar, R., Lazos, E., Martin, A., Mwampamba, T.H., Nakangu, B., O'Farrell, P., Raymond, C.M., Subramanian, S.M., Termansen, M., van Noordwijk, M., Vatn, A., Contreras, V., González-Jiménez, D., 2022. Chapter 1: The role of the values of nature and valuation for addressing the biodiversity crisis and navigating towards more just and sustainable futures. In: Balvanera, P., Pascual, U., Christie, M., Baptiste, B., González-Jiménez, D. (Eds.), Methodological Assessment Report on the Diverse Values and Valuation of Nature of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. IPBES Secretariat, Bonn, Germany. https://doi.org/10.5281/zenodo.6418971.

Bartkowski, B., 2017. Economic Valuation of Biodiversity: An Interdisciplinary Conceptual Perspective. Routledge, London, UK.

Bartkowski, B., Lienhoop, N., Hansjürgens, B., 2015. Capturing the complexity of biodiversity: a critical review of economic valuation studies of biological diversity. Ecol. Econ. 113, 1–14. https://doi.org/10.1016/j.ecolecon.2015.02.023.

Barton, D.N., Chaplin-Kramer, R., Lazos, E., van Noordwijk, M., Engel, S., Girvan, A., Hahn, T., Leimona, B., Lele, S., Niamir, A., Özkaynak, B., Pawlowska-Mainville, A., Muradian, R., Ungar, P., Aydin, C., Iranah, P., Nelson, S., Cantú-Fernández, M., González-Jiménez, D., 2022. Chapter 4: Value expression in decision-making. In: Balvanera, P., Pascual, U., Christie, M., Baptiste, B., González-Jiménez, D. (Eds.), Methodological Assessment Report on the Diverse Values and Valuation of Nature of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. IPBES Secretariat, Bonn, Germany. https://doi.org/10.5281/zenodo.6418971.

Batavia, C., Nelson, M.P., 2017. For goodness sake! What is intrinsic value and why should we care? Biol. Conserv. 209, 366–376. https://doi.org/10.1016/j.biocon.2017.03.003.

Bentham, J., 1780. Of the Principle of Utility. T. Payne and Sons, London, UK.

Bhaskar, R., 2007. Theorising ontology. In: Lawson, C., Latsis, J.S., Martins, N. (Eds.), Contributions to Social Ontology. Routledge, Abingdon, UK, pp. 192–204.

Bhaskar, R., 2010. Contexts of interdisciplinarity: Interdisciplinarity and climate change. In: Bhaskar, R., Frank, C., Høyer, K.G., Næss, P., Parker, J. (Eds.), Interdisciplinarity and Climate Change: Transforming Knowledge and Practice for our Global Future. Routledge, Abingdon, UK, pp. 15–38.
Bjork-James, C., Checker, M., Edelman, M., 2022. Transnational social movements: environmentalist, indigenous, and agrarian visions for planetary futures. Annu. Rev. Environ. Resour. 47, 583–608. https://doi.org/10.1146/annurev-environ-112320-084822.
Blaauw, B.R., Isaacs, R., 2014. Flower plantings increase wild bee abundance and the pollination services provided to a pollination-dependent crop. J. Appl. Ecol. 51, 890–898. https://doi.org/10.1111/1365-2664.12257.
Boetzl, F.A., Krauss, J., Heinze, J., Hoffmann, H., Juffa, J., König, S., Krimmer, E., Prante, M., Martin, E.A., Holzschuh, A., Steffan-Dewenter, I., 2021. A multitaxa assessment of the effectiveness of Agri-environmental schemes for biodiversity management. Proc. Natl. Acad. Sci. 118, e2016038118 https://doi.org/10.1073/pnas.2016038118.
Braun, V., Clarke, V., 2006. Using thematic analysis in psychology. Qual. Res. Psychol. 3, 77–101. https://doi.org/10.1191/1478088706qp063oa.
Braun, V., Clarke, V., 2012. Thematic analysis. In: Cooper, H.E., Camic, P.M., Long, D.L., Panter, A.T., Rindskopf, D.E., Sher, K.J. (Eds.), APA Handbook of Research Methods in Psychology, Research Designs: Quantitative, Qualitative, Neuropsychological, and Biological, 2. American Psychological Association, Washington, DC, pp. 57–71.
Braun, V., Clarke, V., 2022a. Conceptual and design thinking for thematic analysis. Qual. Psychol. 9, 3. https://psycnet.apa.org/doi/10.1037/qup0000196.
Braun, V., Clarke, V., 2022b. Thematic Analysis: A Practical Guide. Sage, London.
Burel, F., Baudry, J., 1995. Social, aesthetic and ecological aspects of hedgerows in rural landscapes as a framework for greenways. Landsc. Urban Plan. 33, 327–340. https://doi.org/10.1016/0169-2046(94)02026-C.
Busse, M., Zoll, F., Siebert, R., Bartels, A., Bokelmann, A., Scharschmidt, P., 2021. How farmers think about insects: perceptions of biodiversity, biodiversity loss and attitudes towards insect-friendly farming practices. Biodivers. Conserv. 30, 3045. https://doi.org/10.1007/s10531-021-02235-2.
Chan, K.M., Goldstein, J., Satterfield, T., Hannahs, N., Kikiloi, K., Naidoo, R., Vadeboncoeur, N., Woodside, U., 2011. Cultural services and non-use services. In: Tallis, H., Ricketts, T.H., Daily, G.C., Polasky, S. (Eds.), Natural Capital: Theory and Practice of Mapping Ecosystem Services. Oxford University Press, Oxford, UK, pp. 206–228.
Chan, K.M.A., Balvanera, P., Benessaiah, K., Chapman, M., Díaz, S., Gómez-Baggethun, E., Gould, R., Hannahs, N., Jax, K., Klain, S., 2016. Why protect nature? Rethinking values and the environ- ment. Proc. Natl. Acad. Sci. 113, 1462–1465. https://doi.org/10.1073/pnas.1525002113.
Chan, K.M.A., Gould, R.K., Pascual, U., 2018. Editorial overview: relational values: what are they, and what's the fuss about? Curr. Opin. Environ. Sustain. 35, A1–A7. https://doi.org/10.1016/j.cosust.2018.11.003.
Chapman, M., Deplazes-Zemp, A., 2023. 'I owe it to the animals': the bidirectionality of Swiss alpine farmers' relational values. People and Nature 5, 147–161. https://doi.org/10.1002/pan3.10415.
Cortés-Capano, G., Hausmann, A., Di Minin, E., Kortetmäki, T., 2022. Ethics in biodiversity conservation: the meaning and importance of pluralism. Biol. Conserv. 275, 109759 https://doi.org/10.1016/j.biocon.2022.109759.
De Souza, D.E., 2014. Culture, context and society – the underexplored potential of critical realism as a philosophical framework for theory and practice. Asian J. Soc. Psychol. 17, 141–151. https://doi.org/10.1111/ajsp.12052.
Deplazes-Zemp, A., Chapman, M., 2021. The ABCs of relational values: environmental values that include aspects of both intrinsic and instrumental valuing. Environmental Values 30, 669–693. https://doi.org/10.3197/096327120X15973379803726.
Díaz, S., Demissew, S., Carabias, J., Joly, C., Lonsdale, M., Ash, N., Larigauderie, A., Adhikari, J.R., Arico, S., Báldi, A., 2015. The IPBES conceptual framework—connecting nature and people. Curr. Opin. Environ. Sustain. 14, 1–16. https://doi.org/10.1016/j.cosust.2014.11.002.
Díaz, S., Pascual, U., Stenseke, M., Martín-López, B., Watson, R.T., Molnár, Z., Hill, R., Chan, K.M.A., Baste, I.A., Brauman, K.A., 2018. Assessing nature's contributions to people. Science 359, 270–272. https://doi.org/10.1126/science.aap8826.
Etzioni, A., 1989. Toward deontological social sciences. Philos. Soc. Sci. 19, 145–156. https://doi.org/10.1177/004839318901900201.
Fairclough, N., Jessop, B., Sayer, A., 2004. Critical realism and semiosis. In: Joseph, J., Roberts, J.M. (Eds.), Realism Discourse and Deconstruction. Routledge, London, UK, pp. 23–42.
Fish, R., Burgess, J., Church, A., Turner, K., 2011. Shared values for the contributions ecosystem services make to human well-being. UK National Ecosystem Assessment: Technical Report, UNEP-WCMC, Cambridge, UK. http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=OrzPtSfQ5ng%3d&tabid=82.
Flint, C.G., Kunze, I., Muhar, A., Yoshida, Y., Penker, M., 2013. Exploring empirical typologies of human–nature relationships and linkages to the ecosystem services concept. Landsc. Urban Plan. 120, 208–217. https://doi.org/10.1016/j.landurbplan.2013.09.002.
Frankena, W.K., 1973. Ethics, 2. ed. Prentice-Hall, Englewood Cliffs, USA.
Fraser, M.D., Moorby, J.M., Vale, J.E., Evans, D.M., 2014. Mixed grazing systems benefit both upland biodiversity and livestock production. PLoS One 9, e89054. https://doi.org/10.1371/journal.pone.0089054.
Freeman, S., 1994. Utilitarianism, deontology, and the priority of right. Philos Public Aff 23, 313–349. https://doi.org/10.1111/j.1088-4963.1994.tb00017.x.
Gaus, G.F., 2001. What is deontology? Part one: orthodox views. J. Value Inq. 35, 27–42. https://doi.org/10.1023/A:1010359613871.
Gawronski, B., Beer, J.S., 2017. What makes moral dilemma judgments "utilitarian" or "deontological"? Soc. Neurosci. 12, 626–632. https://doi.org/10.1080/17470919.2016.1248787.
Gómez-Baggethun, E., de Groot, R., Lomas, P.L., Montes, C., 2010. The history of ecosystem services in economic theory and practice: from early notions to markets and payment schemes. Ecol. Econ. 69, 1209–1218. https://doi.org/10.1016/j.ecolecon.2009.11.007.
Griffin, A.S., Callen, A., Klop-Toker, K., Scanlon, R.J., Hayward, M.W., 2020. Compassionate conservation clashes with conservation biology: should empathy, compassion, and deontological moral principles drive conservation practice? Front. Psychol. 11, 1139. https://doi.org/10.3389/fpsyg.2020.01139.
Herzon, I., Mikk, M., 2007. Farmers' perceptions of biodiversity and their willingness to enhance it through Agri-environment schemes: a comparative study from Estonia and Finland. J. Nat. Conserv. 15, 10–25. https://doi.org/10.1016/j.jnc.2006.08.001.
Himes, A., Muraca, B., 2018. Relational values: the key to pluralistic valuation of ecosystem services. Curr. Opin. Environ. Sustain. 35, 1–7. https://doi.org/10.1016/j.cosust.2018.09.005.
Hölting, L., Busse, M., Bülow, S., Engler, J.O., Hagemann, N., Joormann, I., Kernecker, M.L., Larondelle, N., Sturm, A., Turkelboom, F., 2022. Co-design: working with farmers in Europe to halt the loss of biological diversity. Ecol. Solut. Evid.nce 3, e12169. https://doi.org/10.1002/2688-8319.12169.
IPBES, 2015. Preliminary guide regarding diverse conceptualization of multiple values of nature and its benefits, including biodiversity and ecosystem functions and services (deliverable 3(d)). IPBES/4/INF/1. https://www.ipbes.net/sites/default/files/downloads/IPBES-4-INF-13_EN.pdf.
IPBES, 2022. Methodological assessment report on the diverse values and valuation of nature of the intergovernmental science-policy platform on biodiversity and ecosystem services. Bonn, Germany. https://doi.org/10.5281/zenodo.6522522.
James, S.P., 2015. Cultural ecosystem services: a critical assessment. Ethics, Policy Environ. 18, 338–350. https://doi.org/10.1080/21550085.2015.1111616.
Jax, K., Barton, D.N., Chan, K.M.A., de Groot, R., Doyle, U., Eser, U., Görg, C., Gómez-Baggethun, E., Griewald, Y., Haber, W., 2013. Ecosystem services and ethics. Ecol. Econ. 93, 260–268. https://doi.org/10.1016/j.ecolecon.2013.06.008.
Jeanneret, P., Aviron, S., Alignier, A., Lavigne, C., Helfenstein, J., Herzog, F., Kay, S., Petit, S., 2021. Agroecology landscapes. Landsc. Ecol. 36, 2235–2257. https://doi.org/10.1007/s10980-021-01248-0.
Justus, J., Colyvan, M., Regan, H., Maguire, L., 2009. Buying into conservation: intrinsic versus instrumental value. Trends Ecol. Evol. 24, 187–191. https://doi.org/10.1016/j.tree.2008.11.011.
Kant, I., 1785. Grundlegung Zur Metaphysik der Sitten [Groundwork of the Metaphysics of Morals]. JF Hartknoch, Riga, Latvia.
Karlsson, M., Edvardsson Björnberg, K., 2021. Ethics and biodiversity offsetting. Conserv. Biol. 35, 578–586. https://doi.org/10.1111/cobi.13603.
Kelemen, E., Nguyen, G., Gomiero, T., Kovács, E., Choisis, J.-P., Choisis, N., Paoletti, M.G., Podmaniczky, L., Ryschawy, J., Sarthou, J.-P., 2013. Farmers' perceptions of biodiversity: lessons from a discourse-based deliberative valuation study. Land Use Policy 35, 318–328. https://doi.org/10.1016/j.landusepol.2013.06.005.
Klebl, F., Feindt, P.H., Piorr, A., 2023. Farmers' behavioural determinants of on-farm biodiversity management in Europe: a systematic review. Agric. Hum. Values. https://doi.org/10.1007/s10460-023-10505-8.
Koohafkan, P., Altieri, M.A., 2011. Globally important agricultural heritage systems: A legacy for the future. In: Food and Agriculture Organization of the United Nations, Rome, Italy. https://www.fao.org/3/i2232e/i2232e.pdf.
Loreau, M., 2014. Reconciling utilitarian and non-utilitarian approaches to biodiversity conservation. Ethics Sci. Environ. Polit. 14, 27–32. https://doi.org/10.3354/esep00149.
Madill, A., Jordan, A., Shirley, C., 2000. Objectivity and reliability in qualitative analysis: realist, contextualist and radical constructionist epistemologies. Br. J. Psychol. 91, 1–20. https://doi.org/10.1348/000712600161646.
Mauthner, N.S., Doucet, A., 2003. Reflexive accounts and accounts of reflexivity in qualitative data analysis. Sociology 37, 413–431. https://doi.org/10.1177/00380385030373002.
McCauley, D.J., 2006. Selling out on nature. Nature 443, 27–28. https://doi.org/10.1038/443027a.
McDonald, H.P., 2014. Toward a deontological environmental ethics. In: McDonald, H.P. (Ed.), Environmental Philosophy: A Revaluation of Cosmopolitan Ethics from an Ecocentric Standpoint. BRILL, Athens, Greece, pp. 17–50.
Mill, J.S., 1863. Utilitarianism. In: Parker, Son, and Bourn. West, Strand, London, UK.
Muradian, R., Gómez-Baggethun, E., 2021. Beyond ecosystem services and nature's contributions: is it time to leave utilitarian environmentalism behind? Ecol. Econ. 185, 107038 https://doi.org/10.1016/j.ecolecon.2021.107038.
Norton, B.G., 2000. Biodiversity and environmental values: in search of a universal earth ethic. Biodivers. Conserv. 9, 1029–1044. https://doi.org/10.1023/A:1008966400817.
Oksanen, M., 1997. The moral value of biodiversity. Ambio 541–545. https://www.jstor.org/stable/4314663.
Palinkas, L.A., Horwitz, S.M., Green, C.A., Wisdom, J.P., Duan, N., Hoagwood, K., 2015. Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. Adm. Policy Ment. Health Ment. Health Serv. Res. 42, 533–544. https://doi.org/10.1007/s10488-013-0528-y.
Pascual, U., Balvanera, P., Díaz, S., Pataki, G., Roth, E., Stenseke, M., Watson, R.T., Dessane, E.B., Islar, M., Kelemen, E., 2017. Valuing nature's contributions to people: the IPBES approach. Curr. Opin. Environ. Sustain. 26, 7–16. https://doi.org/10.1016/j.cosust.2016.12.006.

Pascual, U., Adams, W.M., Díaz, S., Lele, S., Mace, G.M., Turnhout, E., 2021. Biodiversity and the challenge of pluralism. Natur. Sustain. 4, 567–572. https://doi.org/10.1038/s41893-021-00694-7.

Pascual, U., Balvanera, P., Anderson, C.B., Chaplin-Kramer, R., Christie, M., González-Jiménez, D., Martin, A., Raymond, C.M., Termansen, M., Vatn, A., 2023. Diverse values of nature for sustainability. Nature 1–11. https://doi.org/10.1038/s41586-023-06406-9.

Patton, M.Q., 2002. Qualitative Research & Evaluation Methods: Integrating Theory and Practice, 3rd. Sage publications, Thousand Oaks, CA.

Randall, A., 1991. The value of biodiversity. Ambio 64–68. https://www.jstor.org/stable/4313778.

Sukhdev, P., Wittmer, H., Schröter-Schlaack, C., Nesshöver, C., Bishop, J., ten Brink, P., Gundimeda, H., Kumar, P., Simmons, B., 2010. The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A Synthesis of the Approach, Conclusions and Recommendations of TEEB. UNEP, Geneva, Switzerland. https://wedocs.unep.org/bitstream/handle/20.500.11822/7851/-The%20TEEB%20Synthesis%20Report-2010982.pdf?sequence=5&amp%3BisAllowed=y%2C%20French%7C%7Chttps%3A//wedoc.

Taylor, B., Chapron, G., Kopnina, H., Orlikowska, E., Gray, J., Piccolo, J.J., 2020. The need for ecocentrism in biodiversity conservation. Conserv. Biol. 34, 1089–1096. https://doi.org/10.1111/cobi.13541.

Termansen, M., Jacobs, S., Mwampamba, T.H., Ahn, S., Castro, A., Dendoncker, N., Ghazi, H., Gundimeda, H., Huambachano, M., Lee, H., Mukherjee, N., Nemogá, G.R., Palomo, I., Pandit, R., Schaafsma, M., Ngouhouo, J., Choi, A., Filyushkina, A., Hernández-Blanco, M., Contreras, V., González-Jiménez, D., 2022. Chapter 3: The potential of valuation. In: Balvanera, P., Pascual, U., Christie, M., Baptiste, B., González-Jiménez, D. (Eds.), Methodological Assessment Report on the Diverse Values and Valuation of Nature of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. IPBES Secretariat, Bonn, Germany. https://doi.org/10.5281/zenodo.6418971.

Thenail, C., Aviron, S., Viaud, V., Guehenneuc, T., Menguy, C., 2017. Multi-functional hedgerows in the Bocage systems of France: rejuvenating a traditional system through farmer-led innovation. HAL. https://hal.inrae.fr/hal-02788988.

Turner, R.K., Daily, G.C., 2008. The ecosystem services framework and natural capital conservation. Environ. Resour. Econ. 39, 25–35. https://doi.org/10.1007/s10640-007-9176-6.

van Bueren, E.T.L., Struik, P.C., 2005. Integrity and rights of plants: ethical notions in organic plant breeding and propagation. J. Agric. Environ. Ethics 18, 479–493. https://doi.org/10.1007/s10806-005-0903-0.

Verhoog, H., van Bueren, E.L., Matze, M., Baars, T., 2007. The value of 'naturalness' in organic agriculture. NJAS-Wageningen J. Life Sci. 54, 333–345. https://doi.org/10.1016/S1573-5214(07)80007-8.

Washington, W., Taylor, B., Kopnina, H.N., Cryer, P., Piccolo, J.J., 2017. Why ecocentrism is the key pathway to sustainability. Ecological Citizen 1, 35–41. https://www.ecologicalcitizen.net/pdfs/v01n1-08.pdf.

Weibull, A.-C., Östman, Ö., Granqvist, Å., 2003. Species richness in agroecosystems: the effect of landscape, habitat and farm management. Biodivers. Conserv. 12, 1335–1355. https://doi.org/10.1023/A:1023617117780.

White, M.D., 2009. Deontology. In: Peil, J., van Staveren, I. (Eds.), Handbook of Economics and Ethics. Edward Elgar Publishing, Cheltenham, UK, Northampton, USA, pp. 77–83.