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Towards sustainable landscapes: Implementing participatory approaches in contract design for biodiversity preservation and ecosystem services in Europe

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ABSTRACT

Agricultural landscapes are the result of the long-term, complex, and intermingled interfaces between nature and culture. Among the stakeholders involved in the production of agri-environmental and climate services, farmers play a crucial role, and their contribution should be duly acknowledged to promote sustainable land management. Therefore, this research aims to contribute to the participatory design of agri-environmental contracts to incentivize landscape and biodiversity practices. To achieve this goal, 13 innovation labs with multi-actor perspective were established across nine different European countries. These groups envisioned a future sustainable landscape characterized by diversity and balance of economic, socio-cultural, and environmental components. Trust-based networks and effective communication channels emerge as vital components for the success of sustainable local production systems. Practitioners emphasize the significance of European-level policies in effecting transformative change and influencing farmers' willingness to contribute to both food production and environmental public goods. They defined concrete contract features such as public funding, hybrid payments, and the presence of intermediaries for the potential of agri-environmental measures. Notably, practitioners perceive a wide range of benefits associated with the implementation of agri-environmental measures, extending beyond economic compensation. Gaining a deeper understanding of practitioners' perceptions of their territories and agri-environmental measures is crucial for policymakers to design tailored and appealing programs that resonate with practitioners' needs.

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1. Introduction

Agricultural landscapes are complex heterogeneous systems that not only produce food for society but also ensure key ecological processes and ecosystem services, as well as a landscape multifunctionality (EME, 2011; IPBES, 2016). Landscapes are a socially constructed result of the long-term, complex, and intermingled interfaces between nature and culture (Plieninger et al., 2014; Tieskens et al., 2017). Agricultural landscapes are thus understood as spaces that preserve and implement local ecological knowledge, maintain cultural and historical values, and are transformed as a result and adaptation of social dynamics and conditions (Martín-López et al., 2017; Oteros-Rozas et al., 2019).

In the late 20th century, there has been a deterioration in the quality of environmental provisions within agricultural landscapes due to industrialization, the modernization of farming systems and globalization of the food market (Bommarco et al., 2013; Moss, 2008; Tilman et al., 2011). Intensification and mechanization resulted in land concentration, ecosystem service decline and biodiversity loss (Matson et al., 1997; Power, 2010; Tscharntke et al., 2005). This degradation extends beyond the environment, impacting rural livelihoods (Camarero and Oliva, 2019; Péer et al., 2017). However, these populations are decisive for transforming the current system and conserving local ecological knowledge (Berkes and Turner, 2006). Additionally, this situation is exacerbated by the current market system, which promote the maximization of production while often undervaluing the benefits provided by farmers (Power, 2010; Swinton et al., 2007; Zhang et al., 2007).

To mitigate or reverse this situation, environmental policy integration has been designed within the Europeans Uniońs Common Agricultural Policy (CAP) (Bazzan, Daugbjerg, et al., 2022). The most recent CAP reform in June 2021 brought a significant change in Pillar 1 by introducing eco-scheme payments. Member states are now tasked with developing context-specific eco-schemes (European Comission, 2021). It is too early to describe the effectiveness of these new measures, but the process has resulted in a wide diversity of measures across EU countries (Runge et al., 2022). Historically, Pillar II under the rural development programme was responsible for payments related to the adoption of agri-environmental and climatic measures (AECMs) tailored to various scales and EU contexts (Bazzan, Candel, et al., 2022; Hasler et al., 2022). So far, these measures have been the main tool to conserve agricultural landscapes and conserve biodiversity of European farmland (Batáry et al., 2015; Pe'er et al., 2014; Uthes and Matzdorf, 2013). Numerous studies have found positive effects on biodiversity (Batáry et al., 2015). Nevertheless, several scientific studies also question whether these measures are effective enough to achieve these goals (Gamero et al., 2017; Kleijn et al., 2006; Pardo et al., 2020; Péer et al., 2014; Chabé-Ferret and Subervie, 2013; Polman and Slangen, 2008). In concrete terms, AECMs are questioned not only for being insufficient and underfunded to adequately reach ambitious environmental goals but also for being ineffective in addressing social and economic challenges (Péer et al., 2014; Péer and Lakner et al., 2017; Péer et al., 2017; Tyllianakis and Martin-Ortega, 2021; Hasler et al., 2022).

In addition to the institutional efforts, there are also alternative approaches involving governance arrangements initiated by non-state actors that have been less investigated (Runhaar and Polman, 2018). These initiatives have similar goals with AECMs but have been developed by different entities, such as environmental NGOs, business in the food chain or agri-environmental cooperatives, among others (Polman and Slangen, 2008; Runhaar et al., 2018; Runhaar and Polman, 2018). These agreements typically operate on a voluntary basis and are characterized by non-hierarchical relationship between the partners. In this study, we refer to all kind of agri-environmental measures, including those promoted by public institutions (which constitute the majority) as well as the agreements for nature conservation between the farmers and other private initiatives.

There are several proposals from agri-environmental governance studies on how to design successful measures (Bazzan, Daugbjerg, et al., 2022; Bazzan et al., 2023; Mettepenningen et al., 2013; Meyer et al., 2015, 2018; Olivieri et al., 2021a; Todorova and Nikolov, 2023; Westerink et al., 2017). Their effectiveness is often attributed to the institutional setup (Mettepenningen et al., 2013), and thus, to the contract features such as the flexibility in implementation, type of payments or contract length (Engel, 2016; Matzdorf et al., 2013; Schroeder et al., 2013; Westerink et al., 2017). In addition to these contract features, it is crucial to consider the context, which determines the process from the time a measure is designed until it is implemented and there are observable outcomes (Pattyn et al., 2022). Another important factor that has been widely acknowledge is the implementation of participatory approaches to enhance stakeholders' engagement and promote knowledge exchange (Bazzan, Candel, et al., 2022; Hardy et al., 2020; Westerink et al., 2017). According to Beckmann et al., (2009), a participatory decision-making process within the design of AECMs is crucial because it affects the environmental effectiveness, economic efficiency, and acceptance by farmers. The inclusion of knowledge from different stakeholder (such as farmers, advisors, land managers, scientist, environmental NGOs etc) can enrich the results and their successful implementation (Runhaar et al., 2018; Tarrasón et al., 2016; Toderi et al., 2017). Some of these stakeholders act as intermediaries between the policy administration and the farmers, so they are key local stakeholders who facilitate the implementation ensuring measures are adapted to local conditions (Schomers et al., 2021). In general, the co-creation of shared visions between different actors might encourage mutual trust, acceptance, and shared responsibilities, which is thought to create a favourable environment for implementing agri-environmental contracts (Bredemeier et al., 2022).

There is still a significant gap to address in the broad implementation of participatory process of agri-environmental measures (Toderi et al., 2017). To date, co-design and co-learning have rarely been implemented in these measures, even though they have been suggested to increase the possibilities of effectiveness (Olivieri et al., 2021b). Stakeholder participation is still perceived as insufficient, with existing research predominantly focusing on individual stakeholder groups, while only a limited number of studies consider multiple stakeholder groups (Brown et al., 2021). Therefore, the novelty of this study lies in its aim to bridge this gap by gathering a diverse group of influential stakeholders from various European countries, including farmers, environmental NGOs, advisors, policy actors, and scientists. This approach not only emphasizes inclusivity but also recognizes the importance of collaborative efforts across different sectors and regions. This paper is based on the results obtained under the umbrella of the Horizon 2020 Contract project "Co-design of novel contract models for innovative agri-environmental-climate measures and for valorisation of environmental public goods". The main goal of this research is to contribute to participatory design of agri-environmental contracts by providing empirical data from various European cases to align the expectations of diverse stakeholders towards shared vision. Within this goal, we have four research questions (RQ):

RQ1: Which are the key elements of the landscapes designed by local stakeholders?

RQ2: Which are the drivers that could either facilitate or hinder the achievement of those landscapes?

RQ3: Which features of agri-environmental contracts can potentially contribute to realizing the desired landscapes?

RQ4: In what ways do these proposed measures benefit farmers and local communities?

2. Materials and methods

2.1. Case studies: Contract innovation labs (CILs)

Under the umbrella of Contract 2.0 project, so-called Contract Innovation Labs (or CILs) were stablished at the beginning of the project

(Step 1, Fig. 1). These were working groups established with key local practitioners that aim to explore and design contractual solutions tailored to local contexts. In total, 13 CILs were set up in 9 different European countries (Table 1). The countries were chosen according to the partners' project, aiming to represent the plurality and diversity of Europe. Each CIL typically consisted of 9–22 participants depending on local contexts, including a diversity of actors such as farmers, farmer organizations, local rural development groups, agricultural advisors, environmental NGOs, local companies. In addition to the CILs, policy innovation labs (PILs) were also established in the 9 countries, and they focus on collaboration between policy decision-makers, scientists, and practitioners. This paper focuses on the results obtained from the CILs process, see (Kelemen et al., 2023) for a more detailed overview of the work of the PILs.

The CILs were established following the living lab approach (Kareborn and Stahlbrost, 2009; Ståhlbröst, 2012; Hossain et al., 2019; Soini et al., 2023) to create an inclusive and transdisciplinary space of dialogue and action. The multi-actor perspective has been a central strategy to ensure involvement of the farming sector and to stimulate social learning, cocreation of knowledge and creativity in real-life settings (García-Llorente et al., 2019). In this way, a participatory process was envisaged by promoting trustworthiness and respect among diverse stakeholders with different perspectives, interests, and needs. Table 1 shows the location of each CIL, focusing on specific environmental interests and agroecosystem. These cases were selected at the beginning of the project based on the decision of the involved partners and policy supporters in the different territories, aiming to capture the diversity of European situations with different ecological, legal, institutional, and cultural contexts.

2.2. Participatory workshop framework

Project́s approach for data collection is based on participatory workshops conducted at each CIL. This article focuses on workshops designed to draw out stakeholderś visions for their future landscape and formulating strategies to achieving those visions though the design of an agri-environmental measure. We drew inspiration from the future scenario approach, commonly employed to orient decisions based on stakeholders' experiences (Costanza, 2000; Pereira et al., 2020), and innovatively applied it to develop sustainable landscapes. Envisioning positive or desirable situations for their future is a key method in sustainability research that stimulates action and change towards real transformation (Wiek and Iwaniec, 2014). The approach promotes creativity by encouraging thinking without the limits of the present regulations.

From January 2021 to June 2022, 28 workshops engaged 354 participants across 13 CILs. There was at least one facilitator by CIL who managed, structured the workshops, and communicate all relevant project information to them. Due to COVID-19 restrictions, workshops were also conducted virtually. However, participatory methods were implemented for online tools to ensure adequate participation (Sattler et al., 2022). During the initial workshops (Steps 2 and 3, Fig. 1), stakeholders envisioned sustainable landscapes for their territories by 2040, which were called during the project "dream landscapes". By collaboratively envisioning a future scenario with various local stakeholders, a shared understanding was established regarding their aspirations for their territories. The next step was to reflect on the key drivers that could either facilitate of impede the realization of these envisioned scenario (Step 3). In the second round of workshops (structured in steps 4, 5, 6) the focus shifted towards initiating discussions on agri-environmental measures to achieve the identified landscapes. Firstly, participants defined the environmental objective of the proposed agri-environmental contract, outlining associated agricultural practices. Subsequently, they were asked to design concrete features of a measure, encompassing considerations such as involved actors, payment structures and monitoring mechanisms. Finally, participants were prompted to reflect on the anticipated benefits that such measures could yield for farmers and local communities. The CILs used different methods guided by the facilitators; for instance, in Dutch cases, an illustrator was hired to visualize the text describing the agreed-upon desired landscape features

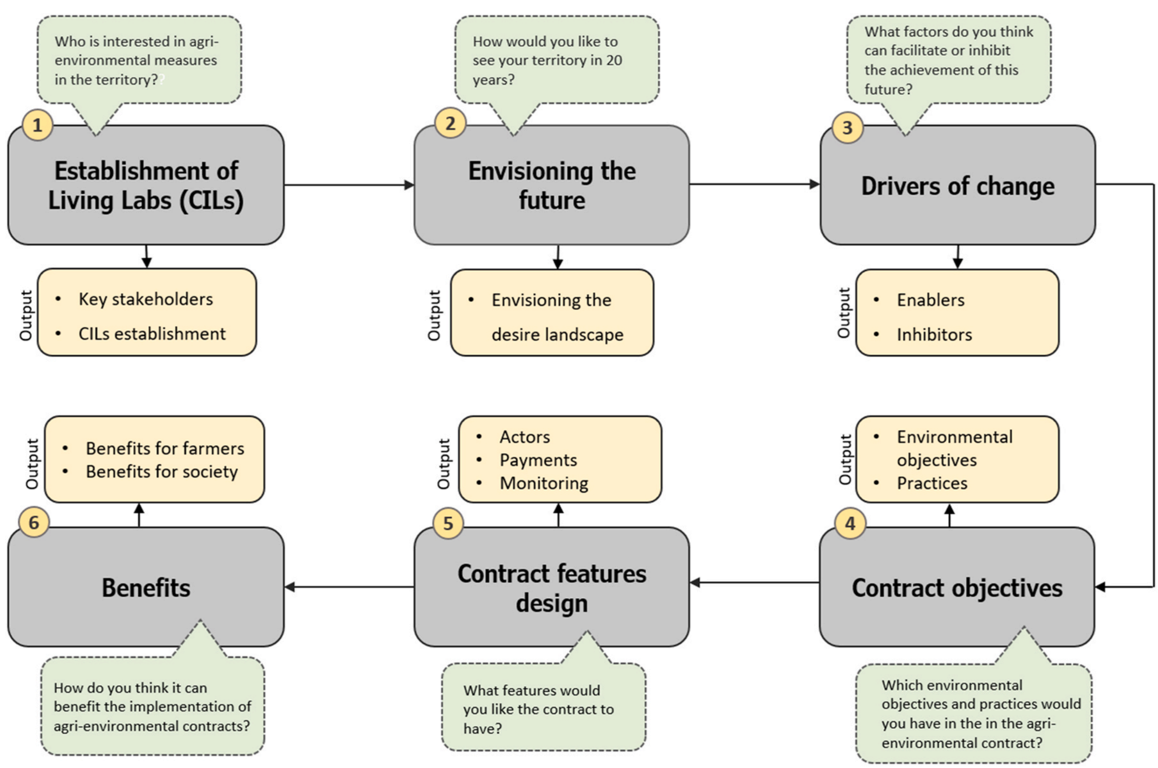

Fig. 1. The framework applied in this study consists of six different steps. Speech bubbles are the questions researchers and CIL mentors had in mind when preparing the workshops for each step. The outputs (highlighted in yellow) from each step constitute the results presented in this research.

Table 1
In total, there are 13 CIL cases set up in 9 different European countries. Each of the cases worked adapted to their local context with diverse agri-environmental climate goals within different agroecosystems. The two cases with an asterisk (*) work in a larger area with a diversity of farmers and not within a specific type of agroecosystem.

CIL cases (N=13)	Region	Stakeholders involved	Agroecosystem	Environmental interests
Limburg (Netherlands)	Large area covered with large open spaces with arable and dairy farming, and tourism activities.	Farmers, employees from the collective, landscape/nature conservation organizations, a representative of the Maastricht municipality.	Arable land	Biodiversity conservation Landscape heterogeneity
Ost Groningen (Netherlands)	Dominated by arable land. Habitat for ground breeding birds.	Farmers, employees from the collective, landscape/nature conservation organizations.	Arable land	Biodiversity conservation
Flanders – Koolstofboeren (Belgium)	High populated region with fodder crops and cereals.	Farmers interested in carbon farming, environmental NGOs, private owners, soil science institute.	Grassland	Biodiversity conservation Climate change mitigation
Flanders- Gulpdal (Belgium)	High populated region with fodder crops and cereals.	Farmers, private owners, intermediary partner (regional landscape organization), private landscape, farming, and hunting organizations.	Grassland	Biodiversity conservation Climate change mitigation
North Rhine Westphalia (Germany)	Densely populated with agricultural land, fertile lowland areas in the north and low mountains in south-east.	Farmers, conservationists, administrations, advisers, and researchers.	*Not applicable	Biodiversity conservation Landscape heterogeneity
HIPP (Germany)	Leading manufacturer of organic baby food operating with organic farmers.	Processors, producers, food manufacturer representative organization, consultants, and food processors.	*Not applicable	Biodiversity conservation Sustainable use of natural resources
Agora Natura (Germany)	German-wide online-marketplace for biodiversity and ecosystem services credits.	Farmers, Landscaping associations, agri-environmental experts from the Leibniz Centre for Agricultural Landscape Research, environmental NGO.	Grassland and arable land	Biodiversity conservation
Bornholm (Denmark)	Danish island with rock formations, forests, and farmland with specialized farms (mainly pig farmers).	Farmers, project partners representing the municipality, advisory service, researchers, environmental NGOs, authorities, and politicians.	Arable land	Climate change mitigation
NorthWest England (United Kingdom)	Region characterized by upland livestock, low population and recognised cultural landscapes.	Farmers, advisors and facilitators, agency staff, National Park Authority staff.	Upland livestock	Biodiversity conservation Landscape heterogeneity Sustainable use of natural resources
Őrseg National Park (Hungary)	National Park with multifunctional landscape with small scale farming.	Farmers, restaurant owners, mayor, guesthouse owners, other local people, Őrseg National Park Directorate.	Grassland	Biodiversity conservation
Unione Comuni Garfagnana (Italy)	Located between two mountain ranges, characterized by low population area but strong cultural identity.	Farmers, custodian farmers, consumers, politicians, local action groups, researchers.	Arable land	Biodiversity conservation Sustainable use of natural resources Conservation of local varieties
Madrid (Spain)	Urbanized area surrounded by a belt of multifunctional landscapes and family farming lands.	Farmers, environmental NGOs, Land stewardship organizations, technicians of agrarian park, agrarian organizations, Representatives of Madrid Regional Government, specifically those implementing the RDP in Madrid.	Arable land	Biodiversity conservation Landscape heterogeneity
Hautés Pyrenees (France)	Mountainous region with livestock farming and transhumance practices. Low population density, but multiple uses (tourism).	Collective land managers, livestock farmers, shepherds, local elected persons, AECM's intermediaries/ facilitators, natural protected areas managers, representatives of administration, environmental NGO's.	Mountain livestock	Biodiversity conservation Landscape heterogeneity

(see Fig. 2), and in France, naturés soundtracks were played to help participants to project themselves in the landscape.

2.3. Data collection and analysis

From the initial workshops, we obtained a template with a narrative text (300 words) illustrating the desired sustainable landscape and a list of enablers and inhibitors (drivers of change) to reach this landscape. In two CIL cases (North Rhine Westphalia and HIPP), it was not possible to focus on a specific landscape because their scale for action was too large, so a total of 11 desired farming landscapes were described.

The narratives were examined for "landscape component", categorized into environmental, economic, and social aspects, with subgroups (n=12) within each category (see Table A.1, Annex). The coding and counting of the desired landscape components were conducted collaboratively by five researchers who have been coordinating the CIL process. The list of drivers of change (enablers and inhibitors) was inductively coded into five themes: social and cultural aspects; agro-management and land use; economy and market; political, institutional, and legal; and environmental (see Table A.2, Annex). This classification is based on a study analysing the driving forces of landscape change in Europe (Plieninger et al., 2016). The frequency of each theme per CIL case was recorded and analysed using a Mann—Whitney test to see significant differences between enablers and inhibitors mentioned by CILs.

In the subsequent workshops, all information was obtained from the 13 CIL cases. Here, a semi open templates with a list of contract features were provided to CIL facilitators to collect comparable data across cases. The template was structured into four different sections with specific questions about the main contract features. The choice of institutional design features in these sections was based on previous studies examining their role in enhancing the effectiveness of measures (Bazzan,

Fig. 2. Dream sustainable landscape illustration developed at ANOG (Agrarische Natuur Oost Groningen) that describes the landscapes that stakeholders from Oost-Groningen would like to have in the future.

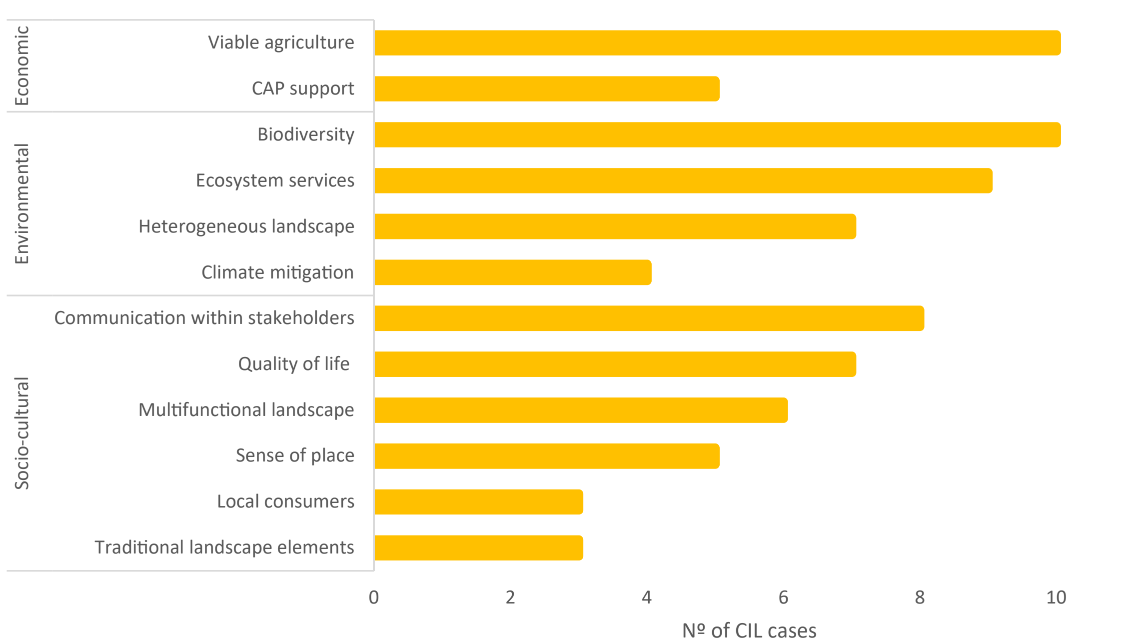

Fig. 3. Components of desired future landscapes according to the CILs (n=11). There are three different categories identified (socio-cultural, environmental, and economic), with different components in each of them.

2021; Bazzan et al., 2023; Mettepenningen et al., 2013; Meyer et al., 2015, 2018; Olivieri et al., 2021a). The first section addressed environmental objectives, specific agroecosystem, and contracted practices. The second section focused on economic viability, including funding sources and payment methods (based on practices, results, or combination). The third section focused on the monitoring process, responsible parties, and frequency. Finally, the fourth section addressed the potential actors involved (e.g., intermediaries). After this, we delved into the benefits that farmers and society are expected to obtain from the implementation of the desired contracts. Benefits perceived from contract implementation were divided into benefits to farmers and benefits for society. Then, both types of benefits were divided into economic, environmental, and social and cultural categories, and we counted the number of benefits mentioned per CIL case.

3. Results

3.1. Envisioning desired sustainable agricultural landscapes for 2040

The CILs identified 12 landscape components categorized into socio-cultural (n=6), environmental (n=4), and economic (n=2) categories. Economic viable agriculture and biodiversity conservation were the most mentioned components, emphasized in ten out of eleven cases. The development of viable agriculture was perceived as determinant for the sustainability of the landscapes. Ensuring profitability in agriculture while exploring sustainable alternatives to conventional practices was deemed essential for landscape sustainability. Stakeholders also highlighted that agricultural production should remain a professional activity for new generations, and access to land should not be a barrier for new farmers. In the economic category, active administrative support, and well-designed payments, such as CAP support, were frequently highlighted across in different CILs (n=5).

In the environmental category we differentiated biodiversity (n=10), ecosystem services (n=9), heterogeneous landscapes (n=9), and climate mitigation (n=4). Biodiversity conservation was a key component for majority of the landscapes, mentioned to be essential for local ecosystem services and agricultural enhancement. CILs advocated for its promotion not only at the farm level but also at the landscape scale, involving various stakeholders like farmers, land managers, environmental organizations, hunters, or hikers. Although climate change mitigation is considered an ecosystem service, it was important to differentiate this, as there were CILs where landscape development was explicitly focused on this (e.g. Bornholm). Heterogeneous landscapes were visualized in seven cases as balanced and connected areas, integrating natural patches and different agricultural land. For instance, in the CIL of Oost-Groningen, the stakeholders argued that "*the landscape is truly mixed because of the success of agricultural nature conservation in that area. This will become a true 'mosaic' landscape*".

In the socio-cultural category, diversity of opinions were observed reflecting the subjective nature of social benefits from agri-environmental schemes. Horizontal communication, dialogue and regional stakeholder support were key components desired in CIĹs landscapes (n=8). Practitioners perceived that social dynamics fostered by good communication will promote a sense of place for their inhabitants (n=5). Quality of life within the landscape was also emphasize (n=7), with a focus on revitalization and supporting rural areas to ensure community sustainability. For example, practitioners from Italy imagined, "*Lively rural life*", and in Spain, people imagined, "*To ensure agricultural activity it is important to ensure rural life and to cover minimum services (education, access to nearby medical system)*". Multifunctional landscapes (n=6) were envisioned to provide diverse services to different stakeholders. Finally, other two components mentioned in the socio-cultural category are the conservation of historical and traditional landscape features (e.g., stone walls or ditches; n=3) and the awareness of active local consumers (n=3).

3.2. Enablers and inhibitors shaping desired sustainable agricultural landscapes

A total of 149 drivers of change were mentioned within the 13 CILs, with an almost equal balance between enablers (n=71) and inhibitors (n=77). These drivers were group into five main themes: institutional, political, and legal issues (29,05 %), socio-cultural aspects (28,37 %), agromanagement and land use (25,67 %), economy and market (11,48 %), and the environmental and biophysical processes (5,40 %) (see Fig. 4).

There are three themes in which inhibitors are outstanding beyond enablers. First, we found a statistically significant difference between enablers and inhibitors in 'political, institutional, and legal issues' (Mann—Whitney; U=2211, p value<0,01), perceived mainly as a barrier to reaching the desired future rather than a pathway facilitating transition. European policies, mainly the CAP, were highlighted as crucial to change the current situation and influence farmers' agricultural activity. The CAP is mainly perceived as a barrier due to reasons like lack of trust in administration or uncertainty about future policies, while in some cases European policies are perceived as an enabler for promoting agri-environmental practices. Similarly, in economy and market, inhibitors surpassed enablers. Global market powers were cited as negatively influence rural dynamics of territories leading to the decline of small-scale farming and land use change. Within the enablers, new market opportunities for sustainable products and an increase in consumer and employee demand in agriculture are perceived. In terms of environmental drivers, climate change emerged as the most frequently mentioned inhibitor, affecting the success of measures, and exacerbating catastrophic events.

Conversely, socio-cultural aspects and agromanagement and land use showed enablers outweighing inhibitors significantly (Mann—Whitney; U= 3215, p value=0030; U= 3282,5, p value=0010, respectively). Social and cultural drivers emphasized communication, trust, and cooperation among stakeholders (e.g., "strong mutual trust", "respectful and long-enduring relationships between individuals and groups" and "farmers' cooperation with other sectors"). Additionally, the changes in attitudes towards consumption, the importance of social recognition of farmers' activities and the environmental education are mentioned as enablers. They also mentioned as an inhibitor the lack of common values and environmental awareness, disconnection with nature and cultural heritage, and lack of trust and cooperation between stakeholders in the territory. Finally, in agromanagement and land use, most enablers referred to action that can be taken by producers. It is perceived that farmers are willing to adopt new farming systems with more sustainable practices. From the barriers identified, land use changes were highlighted as a strong cause modifying territories and negatively influencing access to land for current and new farmers.

3.3. Agri-environmental contract design

3.3.1. Designing contract features: Environmental objectives and practices implied

For the development of novel contracts, each CIL focused on a specific land use type or a combination, including grasslands (n=12), arable land (n=10) and permanent crop land (n=7) covered with vineyards, orchards, and forested areas. For these land uses, the CILs targeted an agri-environmental goal in their respective regions (Table 1). The most selected goal was biodiversity conservation (n=12), followed by landscape heterogeneity (n=5), sustainable use of natural resources (n=3), climate change mitigation (n=3) and conservation of local varieties (n=1). Most cases selected a combination of goals to achieve in their landscape.

The CILs discussed which ecosystem services would be enhanced in the landscapes if environmental objectives were achieved through the implementation of novel contracts. Cultural and regulating services were the most frequently mentioned (both 36,50 %), followed by

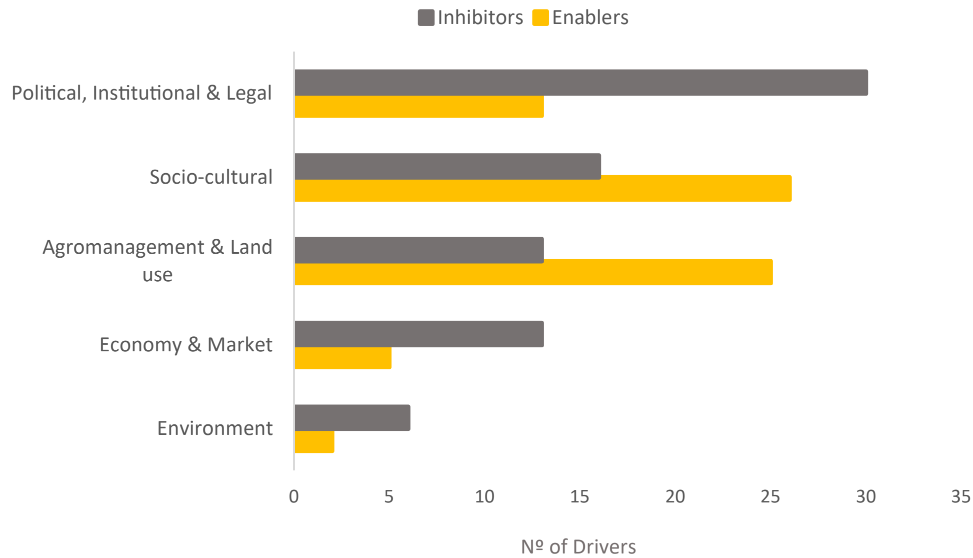

Fig. 4. Enablers and inhibitors shaping the desired agricultural farming system split into political, institutional, and legal issues, socio-cultural issues, land use issues, economy and market issues and environmental issues.

provisioning services (27,00 %). Regulating services focused on water, soil health and climate adaptation, pollination, and erosion control. Cultural services included recreational activities such as tourism or local enjoyment are also to be fostered. Indeed, the evidence emphasized that the implementation of novel contracts should also promote a sense of place and the cultural identity of local stakeholders and enhance the aesthetic value of the landscape where possible. Two other cultural services mentioned were the promotion of mental health and local and ecological knowledge. In provisioning services, food production was mentioned by all cases, followed by genetic diversity to promote biodiversity and the production of biotic materials.

In relation with the practices they want to implement in the contracts, some were specific to certain land type, such as mowing control in grasslands, while others can be applied to various land types, such as organic farming (Table 2). CILs managing arable land express their interest in crop diversification, extended crop rotation, local seed production to promote local varieties, reduced tillage or non-tillage and the production of high protein crops. In grassland, more practices have been mentioned (n=7), some directly related to livestock management (low intensity grazing, grazing days' control, or holistic grazing), while others are more related to the management of the biophysical setting (control mowing regimes, rush cutting, reseeding of wildflowers and permanent grassland).

3.3.2. *Designing contract features: actors and payments*

In the first section, CILs reflected on the presence of actors in agri-environmental contracts. All cases mentioned their willingness to have an intermediary organization to be involved in the contract. Between intermediaries mentioned, 11 out of 13 cases a farmer group or collective was mentioned to play an important role (Fig. 5A). The different roles mentioned that farmers group could have been advisors to administration, knowledge exchange, coordinating, monitoring, managing payments, and building social cohesion (Fig. 5B). Regarding other actors, all CIL cases expressed the desire for intermediary actors or organization between the contracting party and farmers. Possible intermediaries mentioned include environmental NGOs, land stewardship entities, voluntary groups, local authorities, natural area managers or certification bodies (Fig. 5C). Practitioners highlighted that facilitated participation by intermediaries can effectively reduce transaction costs for both farmers and policymakers, with intermediaries often assuming various responsibilities such as monitoring and payments. Moreover, these Intermediaries can act as a link between public bodies and farmers, facilitating cooperation, promoting social cohesion, and enhancing communication channels. Additionally, they can provide valuable assistance in advising farmers, managing payments, or facilitating knowledge exchange.

The preferred source of financial compensation for agri-environmental contracts was mostly public (n=8), which means the preference of funding from agricultural policies. However, in some cases the preference was private (n=3) or a combination of public and private funding (n=3). This compensation was preferred to be paid directly between the two parties of the contract, the administration or private entity and the farmer. In four cases, however, it was preferred that the payment is made to a collective of farmers by having individual contracts between the collectives and farmers. CIL participants were asked whether they prefer farmers to receive payments for adopting specific agri-environmental practices (action-based payments) or for achieving environmental results (result-based payments) by giving them freedom to choose agrarian practices. Eight cases preferred a combination of both schemes where farmers would benefit from the practices adopted but also from the environmental results obtained. Three cases chose pure action-based payments, and two of them preferred result-based payments (Fig. 5E).

Practitioners have also emphasized the importance of monitoring the results of agri-environmental contracts to assess their performance and effectiveness. This requires the use of robust indicators that encompass both local and expert knowledge, along with cost-effective monitoring tools. Such an approach would not only incentivize farmers to implement these measures but also enable their active participation. In this

Table 2
List of agricultural practices to be incentivized in specific agroecosystems.

Type of agroecosystem	Agricultural practices contracted
Arable land	Conservation of landscape elements (n=4), crop rotation (n=1), crop diversification (n=2), local seed production (n=1), organic production (n=1), reduce tillage or non-tillage (n=1)
Grassland	Control mowing regimes (n=5), conservation of landscape elements (n=4), reseeding of wildflowers (n=2), controlling grazing days (n=3), permanent grassland (n=1)
Combination of agroecosystems	Conservation of landscape elements (n=4), organic farming (n=4), flower strips (n=2), organic matter incorporation (n=1), cover crops (n=1)

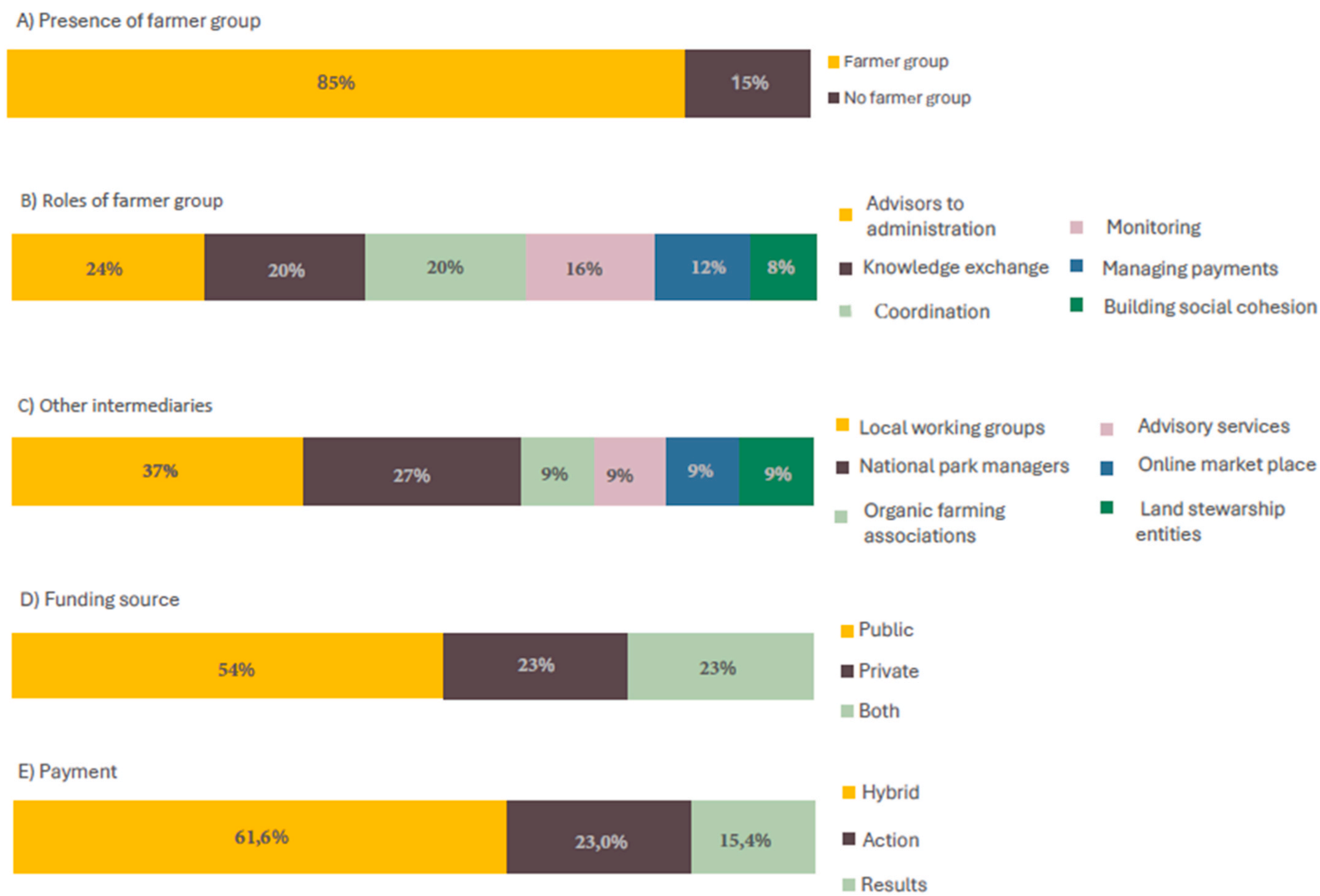

Fig. 5. Different contract features designed and the percentage of CILs that selected each feature.

regard, practitioners recommended involving farmers or farmers 'collectives in the monitoring process. This engagement would empower farmers and enhance their knowledge of their local environment and ecological systems.

3.4. Benefits of agri-environmental contracts

A total of 104 benefits were perceived from the potential implementation of future agri-environmental contracts (Fig. 6). Most benefits (63.47 % of total mentions) were perceived to be more relevant for farmers and their production system, while the remaining benefits (36,53 %) were provided for society, local territories, and nature. This division would sometimes overlap since the benefits that are directly related to farmers are also benefits for society and nature and vice versa (e.g. water management, aesthetic value). In both cases, we differentiated economic, environmental, and social and cultural benefits (Fig. 6).

We identified three main economic benefits for farmers (25,00 %): economic compensation, product added value and cost savings. Economic compensation was mentioned most frequently, which is payments to farmers for the adoption of environmental practices or for the achievement of environmental results, such as those in pillar 2 of the CAP. As cost-saving benefits, farmers achieve economic savings by the reduction of external inputs (e.g., fertilizers, pesticides), by the administrative and technical support of the local administration, and by collective access to infrastructure or machinery. Product added value benefits include financial benefits related to a higher price for their products due to product differentiation, environmental certificates, and the growing market for this kind of product.

The other two groups of benefits for farmers, environmental benefits (13,46 %) and social and cultural values (25,01 %), are not directly linked to economic bonuses (although they may have indirect financial benefits). Environment-related benefits are those that can improve the farmer's ecosystem quality and enhance the resilience of their food production system (incl. biodiversity and ecosystem services, soil quality and climate adaptability). Regarding socio-cultural benefits, there are strong incentives for farmers to continue with farm activity. Social recognition is the most relevant category for CIL members, emphasizing the importance of the self-esteem of farmers, of enhancing the reputation of the farming sector among the local community, and of the importance of giving farmers a voice in designing new measures. There are also benefits related to the knowledge of farmers including technical support and advice to farmers in the fields of ecology, species composition, or natural resources management. Networking between farmers, which is perceived to increase the capacity for collective action and new possibilities for maintaining participation in agri-environmental measure designs, was also mentioned. The long-term viability of the farming sector was the third category of perceived benefits for farmers by a potential implementation of the desired contracts.

Another 37 benefits (36,53 %) were identified that corresponded to broader societal aspects. These could be categorized into cultural and social values (14,42 %), environmental benefits (12,50 %) and economic benefits (9,61 %). They can have positive impacts on various scales, directly influencing the local landscape (e.g., aesthetic value, environmental parameters), as well as regional or national scales (e.g., carbon storage, climate change mitigation). Regarding social values, the most frequently mentioned benefit was the aesthetic and recreational value of the landscape, followed by improvements in quality of life, which encompasses public health and good habits, and benefits for

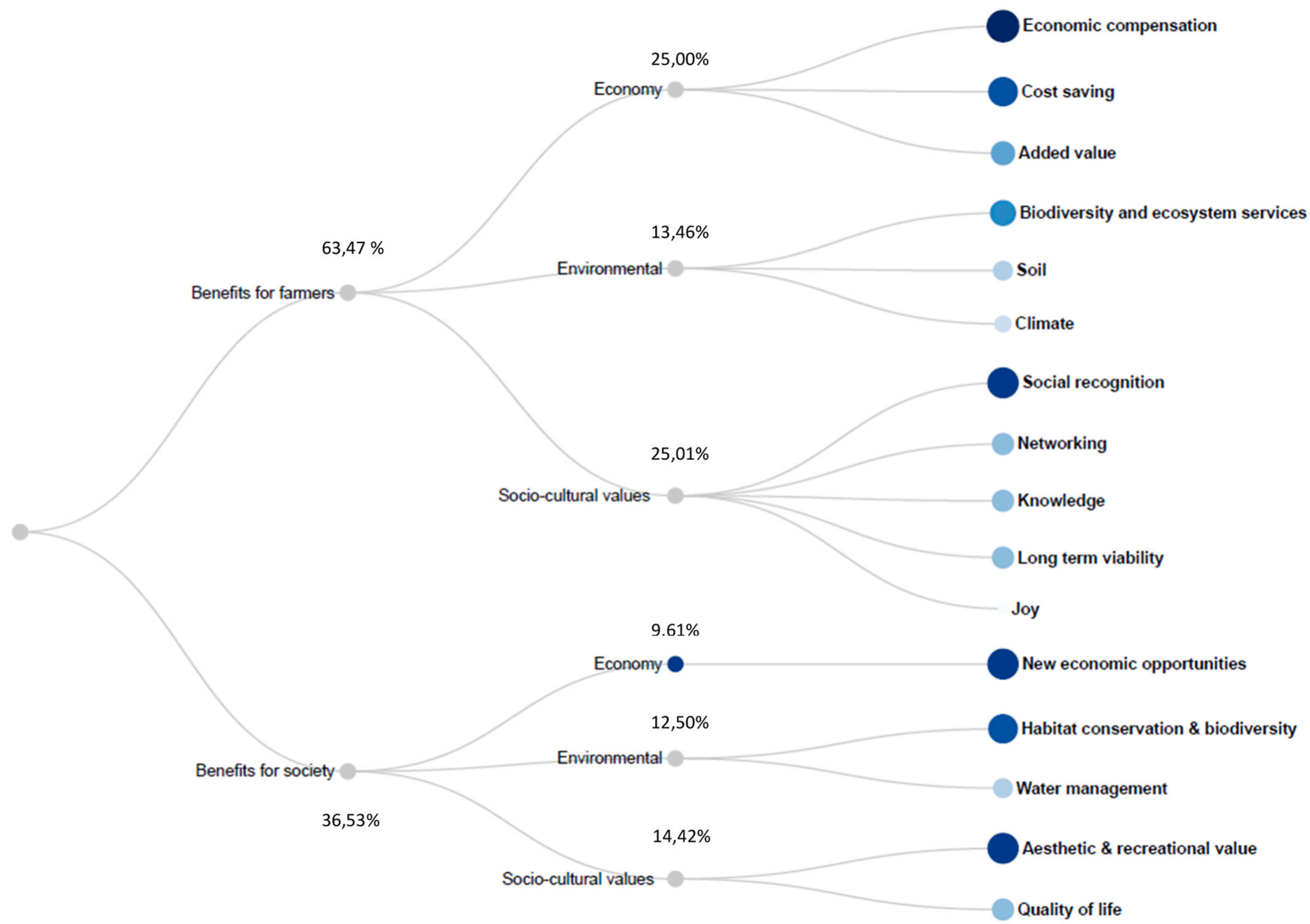

Fig. 6. The benefits that accrue from the implementation of agri-environmental contracts are divided into benefits for farmers and benefits for society (both divided in economic, environmental, and socio-cultural benefits). The colours and sizes of the circles represent the frequency, with the darkest being the most frequent.

consumers. Local environmental benefits included enhancements in environmental parameters and ecosystem services, such as improved erosion control, water and soil quality, pest control or pollination. This creates a more favourable habitat for biodiversity, thereby enhancing landscape quality. Landscape benefits were considered to have a direct effect on people living in the farmer's area or near the region. As a result of environmental improvement, landscape heterogeneity is promoted in the area, leading to an improvement in the aesthetic and cultural values of the region. This in turn creates multifunctional landscapes, generating a range of possibilities for other sectors. Finally, the economic benefits are those linked to the economic prosperity of the region, business opportunities and benefits for value chain intermediaries (e.g., local restaurants, local markets).

4. Discussion

4.1. Importance of agroecosystem living labs in contract design

In recent decades, there has been an increased number of studies working with agroecosystem living labs for the transition towards sustainable farming systems (McPhee et al., 2021; Zavratnik et al., 2019). Most studies have employed this approach to address the complexities of food systems and to bolster the potential for innovation and social change by providing collective solutions (Luján Soto et al., 2020; Zavratnik et al., 2019). In our study cases, this methodology has enabled the formation of new networks and the strengthening of existing ones, as well as the promotion of communication channels between local stakeholders across various European territories. Combining this participatory approach and future scenarios have enabled collective reflections and discussions about future agricultural landscapes and agri-environmental contracts of the various regions. This methodology has encouraged active engagement from stakeholders, leading to a greater sense of equity and legitimacy and giving them importance to their role in making decisions about their territories. Other case studies assure that thinking about the future in a way that involves participatory processes promotes action and produces innovative outputs (Oteros-Rozas et al., 2015; Plieninger et al., 2013). These processes lead to cohesion and an increased sense of connection to the territory (Pérez-Ramírez et al., 2021; Wiek and Iwaniec, 2014). Indeed, the inclusion of the agricultural sector in the design of agri-environmental measures is important to reduce asymmetric information, which is one of the main causes of failure in agri-environmental contract implementation (Ferraro, 2008; Gómez-Limón et al., 2019). Our results are based on practitioners who already had a pro-environmental attitude, which has been studied to have a positive correlation with participation in biodiversity schemes (Espinosa-Goded et al., 2013; Micha et al., 2015). So, future work should be done to approach those farmers who are still not interest on agri-environmental measures, as different studies suggest that the presence of a participatory process, in which farmers are involved from the beginning, makes the measures more efficient and attractive to the sector (Busse et al., 2023).

4.2. Insights for agricultural policies design to achieve the desired futures

The first step in a transition process is to imagine it is possible. Therefore, letting people imagine their desired future landscape is the first step to be able to change it. With our analysis, we identified how people perceive their landscape and territory, which is key information for developing appropriate territorial management and therefore, adapted agri-environmental measures. We found that practitioners desire agricultural landscapes characterized by a rich array of economic, social, and environmental components (Fig. 3), thus fostering the emergence of a multifunctional landscape. In other studies, multifunctional landscapes have also been considered more suitable for maintaining the territory and its identity (García-Llorente et al., 2012; Larcher et al., 2013). Following our findings, two components clearly stand out from the others: the establishment of a viable economic future for local agricultural production, coupled with the need for biodiversity conservation territories. It is intriguing to observe how the synergy between these two components forms the cornerstone of sustainability (de Olde et al., 2017; Latruffe et al., 2016). Moreover, they represent the primary objectives of agri-environmental measures. For policy design, it would be advisable to analyse the economic implications of different environmental optimization measures on farms to stimulate the most cost-effective implementation strategies (Pacini et al., 2015). Additionally, exploring local perceptions of specific agricultural practices in relation to their economic and ecological performance would provide valuable insights.

One of the drivers of change in European agricultural ecosystems is the CAP, which has demonstrated the ability to transform rural landscapes and livelihoods in various ways across different financial programming periods (Lefebvre et al., 2012). In this study, participants perceived that political, legal and institutions aspects would hinder the path towards their desired agricultural landscapes (Fig. 4). Here, participants mainly described inhibitors related to the current European policy framework, which is external to local stakeholders and usually driven by political decisions at non-local scales (national or European levels) (Kristensen, 2016). This observation may suggest a lack of confidence in the potential positive transformations that agricultural policies can bring. The role of trust in government institutions has been recognized as a prerequisite in the success of the implementation of new measures (Koutsou et al., 2014; Shortall, 2008). Other European studies have identified policy complexity and the current market system as important barriers for the agricultural sector (Brown et al., 2021; Ruto and Garrod, 2009; Zinngrebe et al., 2017). This suggests that barriers should be broken down by focusing on building trust and enhancing communication with local communities. Once this trust is established, institutions should create an enabling context in which local communities can carry out their activities to reach their desired landscapes.

On the other hand, our practitioners perceived that social and cultural drivers would act as facilitators to achieve their desired landscapes. This driver encompassed values related to communication, trust, and cooperation between different stakeholders, which is called “social capital” by various scientific studies (Putnam, 1993). Social capital is the social structure or the network of relations of a community, which express the ability of members to cooperate for common goals (Finsveen and Oorschot, 2017; Portes, 1998). Coinciding with the perspective of our practitioners, building strong bonds between individuals (bonding social capital) is an important component for the success of sustainable local production systems (Koutsou et al., 2014). Communication and networks based on trust enable collective action that can impact the development of territory. Trust-based networks not only provide a platform for collaboration but can also act as catalysts to bring about development in both the short term and long term (Claridge, 2018). Through these networks, individuals and organizations can leverage collective power to generate meaningful outcomes. As the trust-based network grows, the collective action taken within it will also grow, resulting in more opportunities for positive change (Lehtonen, 2004). Based on our results, stakeholders perceived that the path towards their desired landscapes will be driven easily by people from the region – or their social capital – rather than driven by institutional or political decisions (Ostrom, 1990).

4.3. Features and motivations when designing an agri-environmental contract

The design of contract features should be tailored to suit each local context and type of agroecosystem. Based on this, different aspects are important to highlight from our results, such as the presence of intermediaries between the farmers and the contracting party. Intermediaries (e.g. farmers collectives, advisory services, local associations) are perceived as an important element for the development, continuity, and facilitation of agri-environmental contracts. Their active involvement can bridge different governance levels and reduce transaction costs for policy-makers and farmers, a barrier frequently cited as significant in developing these approaches (Schomers et al., 2021). Another key finding of our results is the preference of farmer groups or collectives taking on different roles depending on the context and contract type. Introducing a collective dimension in agri-environmental contracts can enhance farmer participation and positively influence their willingness to adopt the scheme (Kuhfuss et al., 2016; Šumrada et al., 2022; Tyllianakis and Martin-Ortega, 2021), reducing public transaction costs and increasing environmental effectiveness (Villanueva et al., 2015). While some studies indicate that farmers prefer individual contracts over collective enrolments, they respond positively to collective actions if they are compensated with an additional payment (Barghusen et al., 2021; Šumrada et al., 2022). However, it is crucial to consider the challenges associated with collective action, such as potential higher transaction costs, the need for higher payments or the governance complications (Kuhfuss et al., 2016; Villamayor-Tomas et al., 2019; Westerink et al., 2017).

Another important preference is the transition from the current action-based payment system to a hybrid payment system. This approach involves compensating farmers not only for completing specific practices but also based on the results achieved through those practices. Result based payments have been widely debated, as they offer substantial benefits such as incentivizing better environmental outcomes, higher cost-effectiveness, and higher flexibility among others (Burton and Schwarz, 2013; Vainio et al., 2021). However, they also come with barriers, including challenges in measurement, monitoring, and the inherent uncertainties in achieving certain results (Burton and Schwarz, 2013; Tanaka et al., 2022). Farmers ́preferences regarding the type of payment depend on various factors, including the environmental objectives, indicators, type of monitoring, practices involved, associated risks, and transactions costs (Burton and Schwarz, 2013; Herzon et al., 2018; Tanaka et al., 2022; Tyllianakis et al., 2021). For instance, Granado-Díaz et al. (2024) and Villanueva et al. (2024) concluded that farmers are more willing to participate in results-based schemes targeting carbon sequestration rather than biodiversity due to the uncertainty related to its provision. The use of hybrid contracts can handle the uncertainties linked to result-based payments (Herzon et al., 2018), and still keep their advantages (Chaplin et al., 2021). Recent studies have contradictory findings on the acceptance of hybrid payment systems. Salazar-Ordóñez et al., (2021)., found that farmers are less open to mixed result-based and action-based schemes, but more recent studies found that hybrid systems are more attractive to farmers with higher environmental commitments (Kelemen et al., 2023; Bartkowski et al., 2021). An interesting solution could be that farmers receive a base payment for adopting certain practices and progressively larger payment according to the results achieved, as proposed in Colombo and Rocamora-Montiel (2018). These novel approaches can empower farmers by giving them flexibility to use their knowledge and create measures that are better adapted to local contexts and circumstances, resulting in better environmental outcomes. It is therefore essential to consider the limitations, effectiveness, and farmers’ preferences when implementing hybrid models to ensure their successful adoption and sustainability.

Appropriate economic compensation is perceived as essential for farmers to contract uptake success. However, we have also found diverse motivations that farmers perceive go beyond financial incentives (see Fig. 6). Even if the rationale of these subsidies is to compensate for lost income and additional costs, which has been identified as key motivation for farmers (Alló et al., 2015; Bock et al., 2013; Brown et al., 2021), and which is still the bases for calculation of AECM payments in the CAP, other studies suggest that farmer decision-making is more diverse than only economic cost—benefit considerations (Bartkowski et al., 2021; Bartkowski and Bartke, 2018; Brown et al., 2019; Brown, Kovács, et al., 2021; Lastra-Bravo et al., 2015; Prager and Posthumus, 2010). A narrow focus on economic payment for farmers can provoke a lower uptake of agri-environmental measures. We have also identified different social and cultural values (social recognition, networking, knowledge, etc.) as important benefits for farmers to enrol in these measures. These non-monetary benefits have been widely recognized in the scientific literature to improve the sustainable development of a region (Brown et al., 2021). There is also an association between farmers having strong social networks and social trust and their willingness to adopt concrete management practices (Alló et al., 2015). An important benefit for farmers is social recognition, which increases attention on farmers and better visualizes farmers' contributions to society. Regarding all the benefits provided by these approaches, it is important to not simplify farmers' motivation for participating in agri-environmental contracts if we do not want to undermine the environmental potential of the CAP. Hence, to ensure effective policy design and the successful adoption of agri-environmental measures, it is important to consider the benefits that have the potential to capture the interest and participation of farmers. By recognizing and incorporating these multifaceted benefits into policy frameworks, policymakers can create incentives that resonate with farmers, encouraging their active engagement in sustainable agricultural practices. This holistic approach not only enhances the likelihood of widespread adoption but also maximizes the positive impact of agri-environmental initiatives on both agricultural productivity and environmental sustainability.

4.4. Limitations of the study

This study is subject to different limitations that should also be acknowledged. Firstly, the shift from in-person to online meetings due to Covid-19 pandemic altered the dynamic of collaboration, potentially affecting the depth of discussions and interactions among participants. This shift may have impacted the richness of information exchange and the development of ideas and strategies. Secondly, the diversity of agroecosystems across regions necessitates tailored agri-environmental contracts, complicating efforts to draw generalizable conclusions and comparisons across cases. In the context of this study, the duration of the living labs was associated with the Contracts 2.0 project. However, it should be noted that the positive effects of these participatory processes do not manifest immediately. Sustained continuity in these spaces is crucial for realizing anticipated benefits. The presence of institutions or entities that actively foster these dynamics is fundamental to achieving this continuity. By fostering ongoing and collaboration and embracing a long-term vision, we can generate more effective and enduring solutions to the social, economic, and environmental challenges we currently face.

However, despite these challenges, the study's focus on European cases governed by a common agricultural policy framework offers a unique opportunity for comparative analysis across-case synthesis. By examining diverse European contexts, the research endeavours to provide valuable insights into the practical implications and effectiveness of agri-environmental contracts within a unified policy framework. This comparative approach enables the identification of common trends, challenges, and best practices that can inform policy-making and enhance the implementation of agri-environmental measures across Europe.

5. Conclusions

Stimulating the use of agroecosystem living labs and participatory process has emerged as a valuable approach for facilitating the transition to sustainable farming systems. By combining this approach with exploration of desired future scenarios, collective reflections, and discussions regarding agricultural landscapes and agri-environmental contracts, fruitful outcomes have been observed at the different case studies.

Understanding how people perceived their landscapes and territories yields valuable insights for developing appropriate territorial management strategies and tailored agri-environmental measures. The desire for multifunctional landscapes, encompassing viable economic futures for agriculture and biodiversity conservation, emerges as a common objective among stakeholders. Furthermore, understanding local perceptions of specific agricultural practices in terms of their economic and ecological performance is crucial for gaining valuable insights. Institutions should highlight the necessity of understanding and working on the connections between productive sectors and public policies to foster confidence in the transformative potential of agricultural policies. Building social capital through strong bonds and trust-based networks enables collective action and can significantly impact the development of territories. An important conclusion from this study is that while adequate economic compensation remains essential for farmers 'uptake of the measures, there is a diverse range of motivations that extend beyond financial incentives. Focusing solely on economic compensation may hinder the uptake of agri-environmental measures. By incorporating multifaceted benefits into policy frameworks and recognizing the interests of farmers, policymakers can design incentives that resonate with agricultural stakeholders, thereby promoting their active engagement in sustainable practices. The preferred contract features (such as public funding, hybrid payments and presence of intermediaries) identified by farmers bridge governance levels and might reduce transaction costs. Fostering the presence of intermediary bodies can facilitate communication between different governance levels and reduce transaction costs, thus overcoming barriers to the development of effective agri-environmental approaches.

CRediT authorship contribution statement

Jennifer Dodsworth: Writing – review & editing, Methodology. **Birte Bredemeier:** Writing – review & editing, Validation, Methodology. **Carolina Yacamán Ochoa:** Writing – review & editing, Supervision, Methodology. **Saskia Wanner:** Validation, Methodology, Formal analysis, Conceptualization. **Corinne Eychenne:** Methodology. **Dieter Mortelmans:** Writing – review & editing, Methodology, Formal analysis, Conceptualization. **Anne Siegert:** Methodology. **Sven Defrijn:** Writing – review & editing, Validation, Methodology, Formal analysis, Conceptualization. **Erling Andersen:** Writing – review & editing, Validation, Methodology. **Marina García-Llorente:** Writing – review & editing, Validation, Supervision, Methodology, Formal analysis, Conceptualization. **Didier Buffière:** Methodology. **Francis Turkelboom:** Writing – review & editing, Validation, Methodology, Formal analysis, Conceptualization. **Eszter Kelemen:** Writing – review & editing, Validation, Methodology. **Boldizsár Megyesi:** Writing – review & editing, Validation, Methodology. **Inés Gutiérrez Briceño:** Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Formal analysis, Conceptualization. **Céline Dutilly:** Writing – review & editing, Validation, Methodology.

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

Data will be made available on request.

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Declaration of Competing Interest

The authors declare no conflict of interest regarding this manuscript.

Appendix A. Information and coding included in the analysis

Table A.1
Landscape elements were obtained from the descriptions of the landscapes provided by CILs. In this table a description of each element is presented, and the type of information coded at each element.

Landscape elements	Description of elements	Coded information
Economic elements		
Institutional support	Elements that are fostered by institutions and that promote the sustainable development of agroecosystems.	CAP payments for Ecosystem services delivery, contracts with municipalities, institutional solutions, adapted measures to local contexts.
Viable farming	Elements of the agroecosystem that make farming viable in a sustainable way.	Profitable farming activities, resilient economies, appropriate prices, access to land, appropriate working conditions, innovative farming business.
Environmental elements		
Biodiversity conservation	Conservation and protection of wild flora and fauna	Birds' conservation, butterflies' protection, local flora and fauna, biodiversity restoration
Climate mitigation	Factors that give importance to climate change mitigation.	Promotion of crops to mitigate climate change, adaptation of agriculture to extreme weather conditions, climate change practices
Ecosystem services	Regulating and provisioning ecosystem services	Food production, water quality conservation, reducing risk flood damage, soil protection, soil fertility, agrodiversity, conservation of the gene pool of traditional varieties
Heterogeneous landscape	Promoting landscapes that strike a balance between natural and agricultural areas, fostering a combination of ecosystems	Combination of natural elements within agricultural land, mosaic of landscape, synergies between farming systems, intensive and extensive grassland
Socio-cultural elements		
Communication within stakeholders and collective action	Exchange of information or ideas among individuals or organizations within the region and collective efforts undertaken by these local people to address common challenges	Social cohesion between diversity of stakeholders, voluntary actions from local people, farmers cooperation, consumers participation in decisions
Conservation of traditional landscape elements	Conservation of historical landscapes elements.	Little canals, stone walls, settlement structures, conservation of historical landscape elements
Values and sense of place	It encompasses intangible aspects of a place that contribute to this identity and significance of the landscape.	Promotion of agricultural local values, conservation of sense of place, maintenance of traditions, working on common values, heritage conservation
Local consumers	Supporting local agriculture by offering the production in the region.	Markets with local food, quality food stays in the region, school canteens consuming local products.
Multifunctional landscape	Landscapes designed or managed to fulfil different needs and objectives, often including ecological, social, economic, and cultural consideration.	Different land uses and land users (locals, breeders, walkers, hunters), balance between different activities such as family farms and ecotourism, recreational use,
Quality of life	Diversity of factors that contribute to rural quality of life	Lively and cultural rural life, rural development, preserving quality of life, facilities the renewal of generations, nutritious diet.

Table A.2
CILs provided a list of enablers and inhibitors to reach the desire landscape. These drivers of change were inductively coded into 5 categories: Political and institutional and legal, socio-cultural, agromanagement and land use, economy and market and environment. The information included in these categories is presented in the table.

Categories of drivers	Enablers - Inhibitors	Information included
Political, Institutional and Legal	Enablers	Real policy adaptation to local contexts, Biodiversity investments tax-free, support for pastoral activities, official trainings, inclusion of measures to horticultural production, rewards for land managers, dialogue between governmental administrations, improve EU political interest, promotion of intermediate organizations, new variety of AECMS measures, real revision of the current measures
	Inhibitors	Time consuming in bureaucracy, costs of implementation decrease payments for farmers, uncertainty of the future CAP, current CAP, lack of flexibility in the measures, lack of technical knowledge about ecology in the institutions, lack of transfer the information to the farmers, high costs for monitoring, institutional fragmentation, high technical requirements for farmers, contradictory policies, lack of long-term vision in governments, top-downs measures
Socio-Cultural	Enablers	Increase media attention, social trust, collective action, collective infrastructures, improve communication within different groups of stakeholders, increase farmers and sheepers recognition, improvement of the current social networks, improvement of

(*continued on next page*)

Table A.2 (*continued*)

Categories of drivers	Enablers - Inhibitors	Information included
		social awareness on sustainability, social appreciation of aesthetic and natural values, increase demand for local products, fix rural population,
	Inhibitors	Lack of public trust in certificates, lack of social awareness, lack of common values in retailers and consumers, difficulties in communicate environmental services, lack of consumers' willingness to pay real prices, lack of farmers cooperation, lack to human resources, no education about farming, different expectations among actors in territories, cooperation between farmers and other sectors.
Agromanagement & Land use	Enablers	Promotion of local demonstration farms, new farming systems, larger areas with legumes, farming practices to protect soil, promotion of small -medium farms, better use of the water, regenerative agriculture, combination of nature and agricultural elements, diversity of grazing animals, multifunctional agriculture (foresters, farmers, tourism.).
	Inhibitors	Agriculture intensification, uncertainty of farming practices, abandonment of rural land, lack of reference model, difficulties in finding traditional and local seeds, increasing land pressure, lack of agricultural land.
Economy & Market	Enablers	Increase consumer demand, increase prices for farmers, new markets of water and carbon, promotion of local business, big companies invest money in local production.
	Inhibitors	Complex supply changes, calculation of fair remuneration is complex and costly, market dominance, not fixed prices, price and costs fluctuations, foreign investors, economic incentives to convert agricultural land, competitive market, limited budget in agri-environmental measures, nor profitable activity.
Environment	Enablers	Impacts on biodiversity becomes more noticeable, climate resilience systems
	Inhibitors	Climate change and lack of water in the south, unclear environmental risks, extreme weather conditions, high predation rates for breeders.

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