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Research Paper

# Dynamic trajectories and maturity of farmer collaboration for biodiversity sensitive farming – Insights from the FRAMEwork Farmer Clusters

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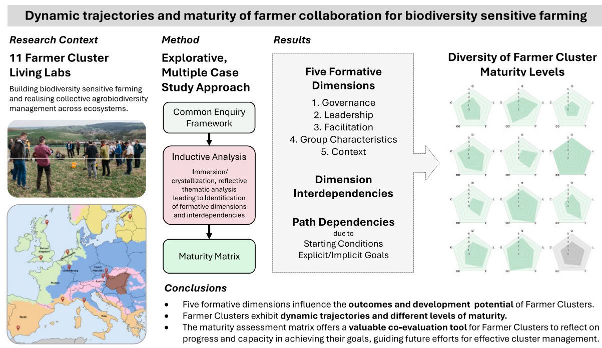
## HIGHLIGHTS

- Farmer Clusters (FC) can address biodiversity loss at the landscape scale.
- The FRAMEwork project established eleven FCs across Europe to test the concept.
- FCs exhibit dynamic trajectories and levels of maturity in achieving their goals.
- The maturity assessment matrix offers a tool to reflect on FC progress.

## GRAPHICAL ABSTRACT

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## ABSTRACT

*CONTEXT:* Building on the Farmer Cluster approach, which has evolved over the past decade in England to address ecosystem degradation and biodiversity loss at the landscape scale, FRAMEwork (Farmer clusters for Realising Agrobiodiversity Management across Ecosystems), a Horizon 2020 project, established a network of eleven Farmer Clusters across Europe.
*OBJECTIVE:* To test the effectiveness of the FRAMEwork Farmer Clusters, a new level of technological and scientific support was offered to the clusters providing opportunities for collaboration, co-production of knowledge, co-innovation, peer-to-peer learning, and monitoring.
*METHODS:* We provide an overview of the eleven clusters and an in-depth comparative multiple case study analysis to understand the dynamic trajectories and levels of maturity shaping the development and outcomes of each of the Farmer Clusters.
*RESULTS AND CONCLUSIONS:* We identified five formative dimensions – governance, leadership, facilitation, group characteristics and context – all of which are interdependent and dynamic, affecting the functioning of the Farmer Clusters, and leading to different levels of maturity. Comparing the situation of each cluster regarding the five dimensions and the level of maturity, we found that the clusters started in distinct contexts with diverse initial conditions across Europe – from favourable to unfavourable. This led to different dynamic trajectories on a pathway to biodiversity sensitive farming.
*SIGNIFICANCE:* The maturity assessment matrix offers a valuable tool for Farmer Clusters to reflect on their progress and capacity in achieving their goals, guiding future efforts for effective cluster management.

## 1. Introduction

Agricultural intensification and landscape homogenisation have been identified as major drivers of biodiversity loss in agricultural landscapes (IPBES, 2019; Stoate et al., 2009). To address this problem, the European Union (EU) adapted its Common Agricultural Policy (CAP) over the last three decades and introduced various instruments to reduce the negative environmental impacts of agriculture and to achieve higher agricultural sustainability across Europe. Although instruments such as the voluntary agri-environment and climate schemes (AECS) have yielded some positive environmental effects (Batáry et al., 2015; Zingg et al., 2019), biodiversity is still declining in many agricultural landscapes (Concepción et al., 2008; Lawton et al., 2010; Pe'er et al., 2014) and it is widely recognised that further improvements are needed to support farmers in transitioning towards biodiversity sensitive farming (Kleijn et al., 2011; Pe'er et al., 2020, 2022).

Biodiversity sensitive farming is an approach to agricultural management that actively considers and responds to the ecological impacts of farming practices on biodiversity. It promotes the integration of biodiversity-enhancing measures, such as habitat creation, reduced chemical inputs, and diversified cropping systems, while acknowledging and managing the potential trade-offs these actions may pose to farm productivity and profitability.

A landscape-scale approach to biodiversity sensitive farming that matches the spatial scale of habitats and landscape structures, such as hedgerows and water systems, has been identified as critical to ensure the survival of many species (Dutton et al., 2008; Kleijn et al., 2006). A landscape-scale approach considers landscapes, as small as 50 ha in size to large areas of thousands of hectares, as connected units (in contrast to individual farm holdings), managed by farmers following similar farming regimes (e.g., growing similar crops) within a shared agro-environmental and socio-economic context (Forman and Godron, 1986; Sayer et al., 2013). Furthermore, the success of such an approach depends on effective collaboration between farmers and land managers to deliver spatially coherent agroecosystem management (Franks, 2011, 2019; Prager et al., 2012; Prager, 2015a, 2015b, 2022; Westerink et al., 2015, 2017).

In England, triggered by the seminal Lawton report “Making Space for Nature” (Lawton et al., 2010), the Farmer Cluster concept was piloted in 2013 (Thompson et al., 2015). In brief, a Farmer Cluster is a group of neighbouring farmers who work together, share knowledge, support, and motivate each other to improve biodiversity and the ecological health across their farms, i.e. at the landscape scale (DEFRA, 2020). The need to support “groups of farmers or groups of farmers and other land-managers” (Regulation EU) No 1305/2013, article 28, sub-clause 2) has also been acknowledged at EU level via the CAP, which enables member states to compensate groups of farmers/land-mangers for the delivery of agri-environmental services. From 2015 onwards, the Countryside Stewardship Facilitation Fund (CSFF), co-financed by the European Agricultural Fund for Rural Development, provided support for farmer groups in England via a paid facilitator (Prager, 2022). In the Netherlands, agri-environmental farmer collectives have been established since 2016 and evolved from local environmental co-operatives, which already started in the 1980s in response to agri-environmental policy. In France, Environmental and Economic Interest Groups (GIEE) have grown fast since they were introduced in 2014 to enhance collective action of farmers and to promote agroecological practices and systems (Westerink et al., 2017).

Building on the strength of the early bottom-up approach of Farmer Clusters in England, the 5-year EU Horizon 2020-funded FRAMEwork project[2] extends the Farmer Cluster concept by providing a new level of technological and scientific support, such as the targeted information and expert monitoring, to establish and manage eleven Farmer Clusters across Europe covering a range of farming systems and social-ecological contexts. The overarching aim of FRAMEwork is to support the Farmer Clusters, which operate as living-labs (Fischer et al., 2021), to develop into a self-sustaining and growing network of clusters, linked via facilitators and cluster leaders, across Europe with the potential to improve biodiversity and ecosystem services via tailor-made landscape-scale changes in agri-environmental management. While prior research has examined Farmer Clusters in England (Prager, 2022), evidence on the model's transferability to other European contexts is lacking. We address this gap through an explorative, action-based, comparative multiple case study of Farmer Clusters founded within and outside the UK in one coordinated, EU-funded project.

Our main contributions are twofold. First, we extend the literature on factors affecting the functioning of collaboratives for improved and landscape-scale agri-environmental management (e.g., Prager, 2022; Westerink et al., 2017; Velten et al., 2021) by providing a well-illustrated, mechanism-based explanation of Farmer Cluster development—specifying core dimensions that are important for functioning, adaptive elements shaped by context, as well as capturing development stages and trajectories. Second, we introduce and demonstrate – as our main contribution to practice – a maturity assessment matrix as an analytic tool and associated results at the Farmer Cluster level. This matrix can support Farmer Cluster implementation through enabling joint, reflective cluster monitoring and management.

## 2. Underlying concepts

The following key concepts underpin the action-based, explorative research with eleven FRAMEwork Farmer Clusters. We used these concepts to situate the research in practice and place (Section 2.1) as well as to inform key analytical activities and steps in the iterative and non-linear research process (Sections 2.2 and 2.3). The process itself is described in the methods section.

### 2.1. Conceptualising FRAMEwork Farmer Clusters across Europe

We conceptualise FRAMEwork Farmer Clusters, which were set up as part of a 5-year funded H2020 project, as living labs (Potters et al., 2022; Cascone et al., 2024) to develop voluntary collective, and landscape-scale management approaches for improving biodiversity across a range of European farming systems. Living labs provide real-world platforms that foster applied, place- and action-based research, and engage relevant stakeholders in the adaptive and iterative research process (Lang et al., 2012; Schaepke et al., 2018). FRAMEwork Farmer Clusters can vary in spatial scale depending on the extent of homogeneous agricultural regions and average farm size. Further, building on the core concepts of the English Farmer Clusters, clusters are ideally established from the bottom-up, e.g. via a lead farmer, who reaches out to potential cluster members utilising friendships, business networks and other relationships. Then, cluster members collectively select a facilitator who is responsible for administrative tasks, including the identification of funding opportunities, the organisation of meetings to establish the group's collective biodiversity targets and priorities, and the changes in farming practice to address these (GWCT, 2025). In addition, FRAMEwork clusters are supported by research organisations and/or universities providing technical and scientific input as needed for co-production of knowledge, co-innovation, peer-to-peer learning, and monitoring (Alblas and van Zeben, 2023; Berthet and Hickey, 2018; Mills et al., 2011).

### 2.2. Conceptualising outcomes and 'success' of Farmer Clusters

Trying to understand the functioning of Farmer Clusters towards desirable outcomes and ultimately 'success' requires conceptualisation or definition of what could constitute 'success' in such a context. To do so, we took inspiration from Velten et al.'s (2021) success criteria[3] of collaboratives for sustainable agriculture, which help operationalise how success materialises. For the FRAMEwork Farmer Clusters, we used environmental, social and economic measures, as well as durability and acceptance as such 'proxies for succuss'. For example, habitat improvements, such as sowing of new flower margins, species-rich meadows, planting of new hedgerows, putting up bat boxes and bird nesting boxes, could be considered environmental measures contributing to 'success' directly aimed at improving biodiversity. In terms of social and economic measures, we considered the creation of a biodiversity path, public events, joint funding applications and collaborations along the value chain, among others, as contributing to Farmer Cluster 'success'. Lastly, measures contributing to durability and acceptance of a Farmer Cluster include collaborations with local actors such as government, businesses, conservation groups, youth and the interested public.

### 2.3. Maturity levels

We conceptualise Farmer Cluster maturity as a state of development, aligned with existing group and community maturity models (Boughzala, 2014; Pretty and Ward, 2001; Westermann et al., 2005), which argue that communities mature as in-group norms and practices deepen and out-group contexts become more enabling. Furthermore, they assume that maturity can be assessed in stages, providing a practical outlook to strengthen collective action and achieve shared goals. Related to Farmer Clusters, maturity considerations include, among others, the degree to which structures, processes, and coordination mechanisms are developed and implemented, as well as the capacity for sustained performance. In this regard, maturity levels help assess how far clusters have developed, where further development potential can be identified for the benefit of the cluster and to support the cluster's collaborative work, as well as where challenges may inhibit development.

## 3. Methods

We used an explorative, multiple case study approach (Yin, 2014), which is ideal when complex issues need to be explored from a holistic social-ecological systems perspective and when the context in which the case studies are embedded is important. It allows the examination of several comparable cases in parallel to see which patterns hold across them and which differ by context. By comparing findings across cases, common aspects and context-specific adaptations can be identified. Eventually, stronger and more general insights can be drawn than from a single case. The eleven FRAMEwork Farmer Clusters provided a unique

[2] The FRAMEwork project started in October 2020 and ends in September 2025 (https://www.framework-biodiversity.eu/).

[3] Velten et al. (2021) also outline *success factors* which denote aspects that determine a collaborative's success. In other words, *success factors* describe inputs or drivers, whereas *success criteria* conceptualise the outcomes.

opportunity to follow such an approach to reveal and synthesise the diverse ways in which the Farmer Clusters were established and have evolved across nine European countries (between October 2020 and June 2025). It allowed us to identify patterns that repeat across contexts (formative dimensions) and to understand where they differ (context-specific formulations). This cross-case comparison enabled us to draw transferable insights and also directly informed the usability of the maturity assessment matrix for practitioners.

Fig. 1 illustrates the explorative research process in more detail, which was inherently iterative and rooted in real-world action. We deliberately present this process as part of the normality of action-based research and to acknowledge its non-linearity. Shifts in the research strategy occurred due to its multi-actor, multi-researcher, and action-based nature. Initially, the research team aimed to better understand differences in Farmer Cluster outcomes and success. At the same time, the clusters' learning and development needs evolved in response to practical challenges encountered during implementation. Comparing success based only on outcome measures became less valuable for understanding and informing actions in the Farmer Clusters. Consequently, the focus shifted towards examining the formative and influencing aspects of cluster dynamics, particularly because some clusters faced greater challenges than others. This step then led to identifying differences in cluster maturity and related development opportunities.

### 3.1. Farmer Cluster case studies

Eleven Farmer Clusters were established across Europe as part of the FRAMEwork project to investigate the potential of Farmer Clusters to

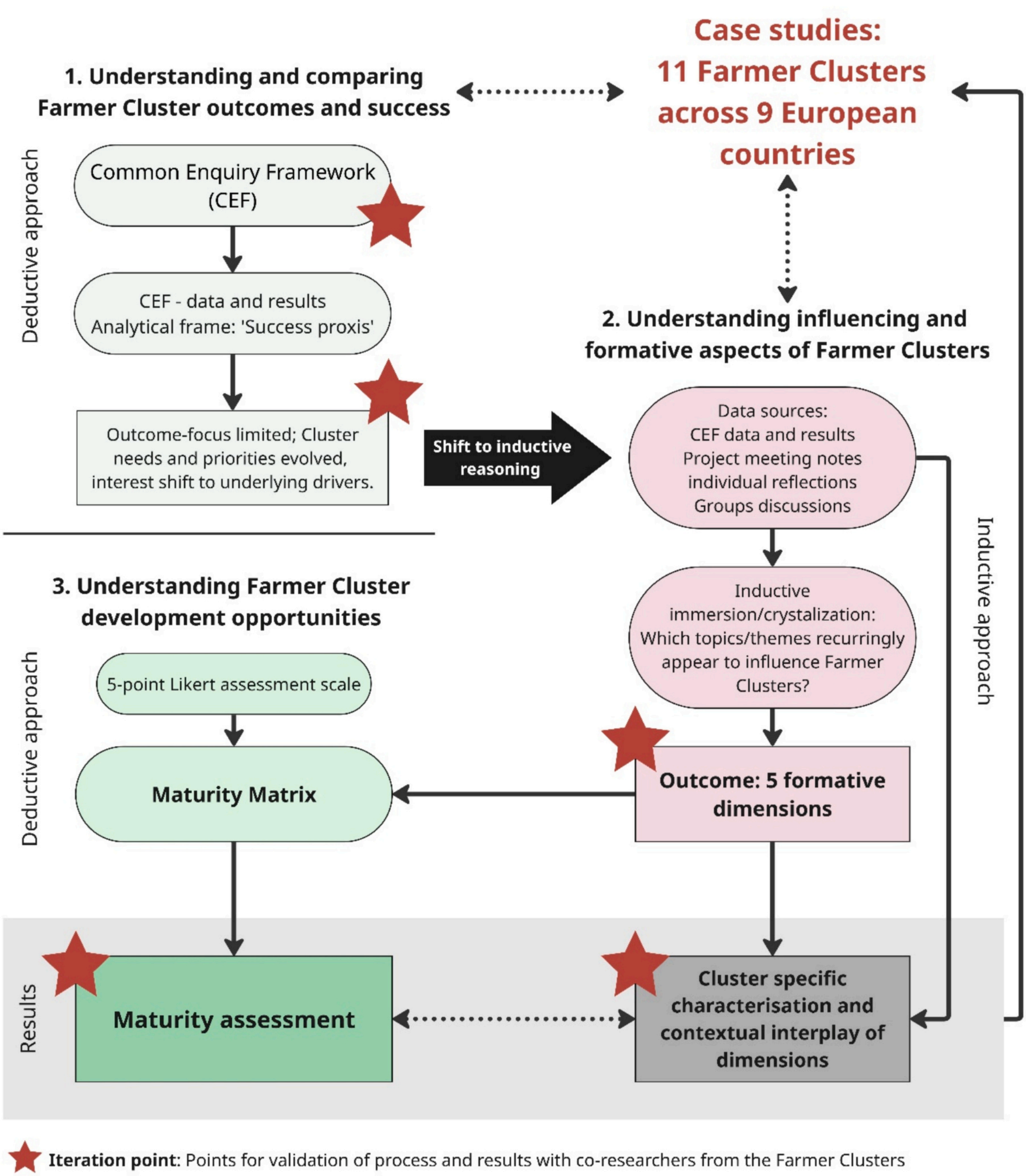


**Fig. 1.** Diagram illustrating the explorative research process, acknowledging shifts in research strategy and iteration and validation points with co-researchers from the Farmer Clusters.

promote biodiversity friendly farming across Europe. The overall process for establishing the clusters was initially based on the best practices from the English Farmer Cluster approach (GWCT, 2025), although it was altered in most instances to adapt to local conditions and constraints (Nichols et al., 2025). For example, FRAMEwork partner organisations used previous farmer or farmer group contacts to identify potential lead farmers or organisations, who were interested and willing to start a cluster in their respective countries (ibid.)

The FRAMEwork Farmer Clusters cover several biogeographical regions, farming systems, and socio-political contexts (Fig. 2). This diversity was intentional to maximise variation, gain a deeper understanding of the commonalities and differences between the clusters, and inform policy and best practice. A brief overview of the clusters and some of their characteristics is provided in Table 1.

### 3.2. Data sources

This research draws from four primary data sources: (1) a Common Enquiry Framework (CEF) consisting of open ended questions that was completed by facilitators/lead partners; (2) semi-structured discussions with facilitators and lead partners and respective discussion notes or meeting transcripts; (3) project documents (e.g., meeting minutes, progress reports); and (4) researcher notes from related FRAMEwork activities, such as facilitator knowledge exchange and mutual learning sessions. The initial data source, the CEF, was answered once by all cluster teams between September and October 2023 to provide a baseline for analysis of all clusters. It consisted of open-ended questions and prompts with no word limit on answers, yielding qualitative data (cf. S1). The CEF was based on (i) relevant guidelines for how to create and manage a Farmer Cluster (GWCT, 2025; McHugh, 2023a, 2023b), (ii) a literature review of factors influencing the success of collaborative resource management, including characteristics of the managing group, the resource system, or supporting institutional arrangements (e.g., Agrawal, 2003; Plummer et al., 2012; Reed, 2008), and (iii) observations from activities in the Farmer Clusters as part of the action-based research. The CEF is available in the supplementary materials (S1). Co-authors working with the clusters, mainly facilitators and researchers, answered the questions for their respective cluster in writing, drawing on first-hand experiences and reflections from practice.

### 3.3. Data analysis

#### 3.3.1. Identification of formative dimensions

In a first step, the first four co-authors explored outcome-related answers provided in the CEF following a deductive approach (Fig. 1). We used ‘proxies of success’ based on Velten et al. (2021) as an analytical guide. This initial step allowed a first validation of perceptions and interpretation of each of the clusters' success trajectories, following a case-oriented approach (i.e., exploring each cluster as a whole entity) (Ragin, 1987). However, from an action-based perspective, it became more important to understand how the Farmer Clusters were unfolding and to identify critical drivers influencing their development. This led us to shift the focus from outcomes and ‘success’ to engage a broader framing of cluster development in terms of more formative aspects, i.e., what affects the functioning and progress of a cluster, following a variable-oriented approach (i.e., investigating themes that cut across cases) (Miles et al., 2019). Hence, following this first step, an inductive analysis was done individually by the first four co-authors before results were compared and discussed in the same core group. The inductive analysis was team-based drawing on immersion/crystallization (Borkan, 2022; Crabtree and Miller, 2022) and reflexive thematic analysis (Braun and Clarke, 2008, 2019). In these approaches researchers immerse themselves in the data, reflect individually, then crystallise shared themes through iterative group discussion, without using a priori codes, or a fixed codebook. Group discussions were documented and through further joint deliberations, five formative dimensions were identified to be critical for Farmer Clusters to develop, function and ultimately achieve success – Governance, Leadership, Facilitation, Group Characteristics and Context.

#### 3.3.2. Maturity assessment

We then introduced levels of maturity to capture each cluster's

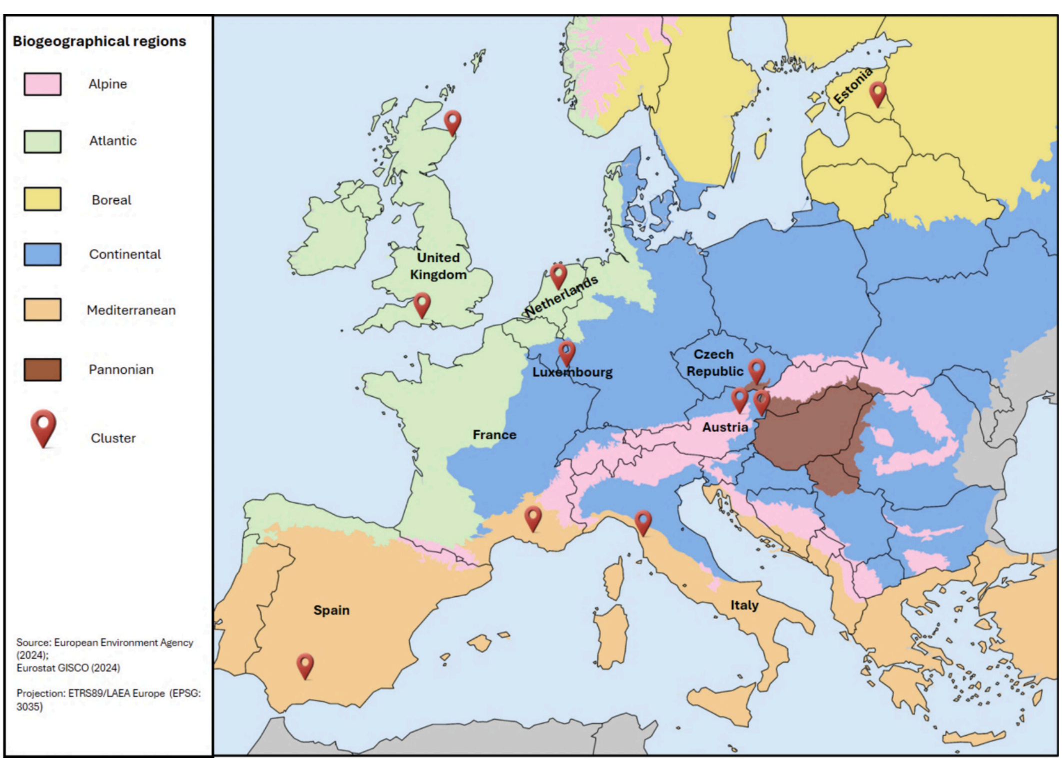


**Fig. 2.** Biogeographical location of the eleven FRAMEwork Farmer Clusters across Europe.

**Table 1**
Characteristics of the eleven Farmer Clusters established across Europe as part of the FRAMEwork project (adapted from Nichols et al., 2025; Recodo, 2025).

| Farmer Cluster, location / broad climate zone based on biogeographical region | Farming system / Main crops, livestock | No. of farms | Range of farm sizes (ha); Total cluster area (ha) | Cluster structure* | Main biodiversity focus | Preexisting structures and groups | Lead Farmer Cluster partner organisation; Facilitator organisation |
|---|---|---|---|---|---|---|---|
| Basse-Durance, France / mediterranean climate | Partly organic / Apple, pear orchards | 9 | 20–135; 440 | Adjoined | Pest natural enemies, birds, bats, arthropod predators, and *Hymenopteran parasitoids* | Based on an initial GIEE project, including 9 neighbouring farmers, which are members of the GRCETA (Groupement Régional des Centres d'Etudes Techniques Agricoles) association | National Research Institute for Agriculture, Food and Environment (INRAE), Organic Agriculture Research Group (GRAB); INRAE facilitator for first 16-month, since then GRCETA |
| Born, Luxembourg / continental climate | Partly organic / Apple, pear orchards | 8 | 10–200; 480 | Partially dispersed | Farmland birds, wild pollinators, vegetation | Link between local cider producer Ramborn and individual farmers | Luxembourg Institute of Science and Technology (LIST); LIST facilitator |
| Buchan, Scotland / atlantic climate | Conventional / Arable crops, cattle, sheep | 5 | 80–364; 2205 | Partially dispersed | Soil health, pollinators, farmland birds | Link between facilitator and individual farmers | James Hutton Institute (Hutton); HUTTON facilitator |
| Burgenland, Austria / continental and pannonian climate | Mostly organic / Arable crops, cattle, poultry | 11 | 15–500; 2870 | Dispersed | Farmland birds, pollinators, vegetation | Link between facilitator and individual farmers | University of Natural Resources and Life Sciences, Vienna (BOKU); BOKU facilitating team |
| Cazadores de Aguilar, Spain / mediterranean climate | Conventional / Olive groves | 11 | <1–45; 160 | Partially dispersed | Establishment of ground vegetation cover for erosion control, birds, pollinators and red-legged partridge | Link between hunting association and individual farmers | Fundacion Artemisan (ARTEMISAN); ARTEMISAN facilitator |
| Cranborne Chase, England / atlantic climate | Partly organic / Arable crops, cattle, sheep | 22 | 92–1300; 10,000 | Adjoined | Farmland birds, aquatic invertebrates | National history of Farmer Clusters in England, large network of Farmer Cluster facilitators, other clusters in the area preceding FRAMEwork cluster | Game and Wildlife Conservation Trust (GWCT); Independent Advisor/ facilitator |
| Kanepi kihlkund, Estonia / boreal climate | Partly organic / Arable crops, permanent grassland and mixed farming with sheep and cattle | 10 | 300–600; 3170 | Adjoined | Wild pollinators, natural enemies, native plants (*Trollius europaeus, Primula farinosa*) | Link between facilitator and individual farmers | Estonian University of Life Sciences (EMU); EMU facilitator |
| Mostviertel, Austria / alpine climate | Organic / Permaculture Permanent grassland, orchards, dairy cattle, sheep, some arable crops, | 12 | 2–60; 300 | Dispersed | Grassland plant diversity and wildflowers, farmland birds | Link between researcher and individual farmers | Raumberg-Gumpenstein Center for Education and Research (AREC); AREC facilitator |
| Val Graziosa, Italy / mediterranean climate | Partly organic / Olive groves | 15 | <1–12; 54 | Adjoined | Bees, butterflies, birds, ground-dwelling natural enemies and parasitoids for olive fruit fly control, soil biological quality, and spontaneous vegetation. | Link between researcher and individual farmers | Sant' Anna School of Advanced Studies, Pisa (SSSA); SSSA facilitator |
| Velké Hostèrádky, Czech Republic / continental/ pannonian climate | Organic / Arable crops, vineyards, vegetables, fruit | 9 | 3–1271; 2822 | Partially dispersed | Birds (for pest control), pollinators (via wildflower strips and habitat creation), soil health (via cover crops and crop rotation) | Link between facilitator and small group of organic farmers who collaborated on business matters | Czech University of Life Sciences Prague (CZU); Czech Organics facilitator |
| Zeeasterweg, Netherlands / atlantic climate | Partly organic / Potato, Wheat, Onion, sugar beet, Carrot, Bulbs | 10 | 30–90; 600 | Adjoined | Farmland birds, natural enemies, wild pollinators | Zeeasterweg Farmer Cluster (established in 2014 by regional farmer collective BoerenNatuur Flevoland for accessing collective agri-environmental funding | University of Amsterdam (UvA); Farmer collective BoerenNatuur Flevoland facilitator |

* Cluster structure means whether cluster farms are boundary-joined farms or dispersed in the landscape.

situation at a specific point in time on their dynamic trajectories in the cluster evolution, with each level entailing a specific development potential as well as inherent challenges. We based the five maturity levels on a 5-point Likert scale ranging from 1 – a low level of maturity where major challenges persist and the learning and development potential for the cluster is highest, to 5 - a high level of maturity where the cluster appears to live up to its full potential yet faces the challenge of having to maintain such a high level of maturity. A description of the assessment matrix, including descriptions of the five formative dimensions and the maturity levels, can be found in the supplementary materials (S2). Each cluster was assessed individually. Then, assessments were aligned across clusters and a final assessment agreed. More details about the related triangulation process can be found in the following section 3.3.3.

### 3.3.3. Triangulation procedures

To address potential challenges of bias, limited validity, and partial understanding associated with this type of research, we employed several triangulation steps, including data source triangulation, researcher triangulation, and consensus/discrepancy rules. We triangulated across four main data sources for each Farmer Cluster (see 3.2). Additionally, research data from other project tasks (e.g. in-depth interviews with facilitators) were occasionally considered for cross-checks as secondary data. We created a case-level matrix contrasting assessments and emerging themes across sources. An assessment or emerging theme was treated as overall corroborated when at least two sources aligned; discrepancies triggered targeted follow-ups and were resolved by returning to the data (e.g., the CEF answers and document checks) or consultations with co-researchers. Rationales were documented in decision notes and through meeting transcripts. The core team comprised four researchers external to day-to-day cluster operations. The team of co-researchers was larger, consisting of at least two co-researcher per cluster embedded in cluster activities (facilitator and facilitating team), aiming at a reflexive approach to involve all relevant team members in knowledge creation and consolidation (Mauthner and Doucet, 2008). The core group held monthly deliberation and consensus meetings (~12 in total; 60–90 min). Initial exploration of survey results, documents and notes was conducted independently by the core researchers. Once the five formative dimensions were agreed through crystallization, co-researchers reviewed case-specific summaries linked with the dimensions for factual accuracy and contextual nuance. The maturity assessment for each cluster was done individually by the first four co-authors, considering data as outlined in Section 3.2. Results were then compared, discussed and aligned until consensus was reached in the same core group. Each consolidated maturity assessment was then shared, discussed and finally agreed with the respective co-researchers of each of the eleven clusters. Only after these validation meetings, the individual results of maturity assessments were combined in one shared overview (i.e., Fig. 3).

## 4. Results

First, we provide a synthesis of the five formative dimensions that play a pivotal role in enabling or inhibiting the development and functioning of a cluster, including its capacity to reach goals and achieve success. The outline of the five formative dimensions is followed by the results of mapping each cluster's level of maturity against each of the five dimensions to capture where the different clusters stand on a potential development trajectory after about four years of inception.

### 4.1. Five formative dimensions

The five dimensions identified are (G) governance, (L) leadership, (F) facilitation, (GC) group characteristics, and (C) context.

#### 4.1.1. Governance

In the context of this study, we understand governance as the decision-making structures and processes set up to support and shape cluster activities and actions towards desirable outcomes in the Farmer Clusters (Table 2). These may include means and processes of farmer involvement in defining cluster activities, the establishment of a joint communication channel for decision-making or processes to deliberate joint biodiversity targets. We identified three broad governance approaches across the eleven clusters: explicitly agreed, implicitly agreed based on lived experience, and no agreed governance structures and processes (neither explicit nor implicit). For example, some clusters have an explicit, formal mode of operation and a shared commitment to making decisions together. The Cranborne Chase cluster in England elected a chairman and a steering group of seven members to guide cluster activities. These formalised means of Farmer Cluster governance aid collective decision-making in this largest cluster, having 22 members (Tables 1, 2). The Zeeasterweg cluster in the Netherlands utilises formalised processes for collective action linked to the collective Dutch AECS administration. The cluster holds two dedicated meetings annually to collectively decide which agri-environmental measures to implement over the next year under AECS contracts and to assess whether last year's measures and contracts went according to plan (Table 2). Collective decision-making in the Dutch cluster is thus, at least regarding the implementation of measures under AECS funding, institutionalised by the collective nature of AECS administration (Boonstra et al., 2021). The Mostviertel cluster in Austria, on the other hand, is largely based on implicit agreements. Here, actions are discussed, and decisions are made together via a lived, collaborative culture rather than as the result of an agreed procedure. Each member can propose cluster activities, which are then discussed and decided upon in the group. There is no assignment of decision-making roles, and the cluster partly relies on farmers stepping up in areas where they are interested and/or knowledgeable. In some other clusters, no governance structures and processes are agreed upon or are part of the common culture, and thus, they largely depend on ad-hoc deliberations and decision-making (Table 2).

#### 4.1.2. Leadership

In this study, we consider leadership as the presence of a person or organisation in the cluster who provides clear direction and momentum to advance cluster activities. In this regard, the Cranborne Chase cluster in England aligns closest with the GWCT guidelines for establishing and managing a Farmer Cluster (GWCT, 2025; McHugh, 2023a, 2023b). One farmer took the initiative by inviting neighbouring farmers and a neighbouring cluster to come together to share experiences about the benefits of establishing a cluster. Under the lead of the farmer, the farmer group then decided to start their own cluster and jointly selected a facilitator to support them. Today, the cluster's leadership is shared and formalised as part of its governance structure. The lead farmer, who initiated the cluster, is still acting as its chairperson. The facilitator provides leadership support by organising cluster meetings and leading specific efforts, such as the identification of potential funding. The FRAMEwork lead partner organisation (GWCT) of the Cranborne Chase cluster proactively contributes expert advice and leadership on domain-specific topics such as farmland birds (Table 2).

Other clusters across Europe were established by FRAMEwork partner organisations (mainly universities and research institutions), tasked to establish a cluster in their respective countries, building on preexisting structures and groups (Table 1). A range of leadership types characterises these clusters. Besides the approach of shared leadership as part of a formalised governance structure, three additional manifestations of leadership were identified in the clusters: First, local actors can take on important roles of leadership. For example, in the Born cluster in Luxembourg, business partner Ramborn Cider Co, a fruit processor, not only buys fruit from cluster farmers, but also supports direction-setting, co-organises cluster activities, and provides meeting facilities for the cluster (Table 2). In the Cazadores de Aguilar cluster in Spain, the local hunters' society has taken a leading role by championing the recovery of permanent vegetation cover in olive groves, motivated by the habitat needs of small-game populations. Second, in the absence of a shared leadership structure supported by a lead farmer, cluster leadership can fall towards cluster facilitators, as is the case in the French, both Austrian, and Dutch clusters (Table 2). Whether facilitators can fully assume a leadership role depends on farmers' acceptance of the facilitator as a leader and a setter of direction, and on the availability of required resources (particularly time) to support this additional role. For example, the Zeeasterweg cluster relies on an intermediary organisation and facilitator (BoerenNatuur Flevoland) to lead farmers in setting and reaching their common goals or participating in any facultative activities. Third, cluster leadership is provided by one individual lead farmer


(caption on next page)

**Fig. 3.** Kite diagram of all eleven FRAMEwork Farmer Clusters in alphabetical order showing the levels of maturity (dark green), and development potential (light green) in terms of the five formative dimensions: (G) governance, (L) leadership, (F) facilitation, (GC) group characteristics, and (C) context. Levels of maturity (horizontal) range from 1: low maturity to 5: full maturity. The last diagram (grey, bottom right corner) shows the average maturity reached across the eleven clusters. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

or farming business, supported by the facilitator. For example, the Velke Hosteradky cluster in the Czech Republic largely depends on the lead farmer and his farming business that connects several farms via sharing of knowledge and experience. Likewise, in the Val Graziosa cluster in Italy, one farmer is considered the lead farmer because he holds a substantial share of land in the cluster and has been very active in the local community for years, including year-long collaborations with local researchers. However, towards the end of the FRAMEwork project, another cluster landowner decided to invest in the area and has been buying or renting land from others, providing a significant boost to the recovery of abandoned olive groves in the cluster. Strongly dominant leadership may also have some adverse effects. In the Czech cluster, for example, some farmers reportedly stay in a comfortable 'wait and see' stance, observing the results of their leading peers. Or, when successful collective management depends on the lead farmer contributing a significant share of the cluster area, as in Val Graziosa, the lead farmer may have disproportionate influence over determining cluster activities.

In summary, leadership manifests in multiple ways: being shared and formalised, falling upon actors outside the immediate members of the Farmer Cluster, such as facilitators, or relying solely on individual actors, e.g. lead farmers, in the cluster (Table 2).

#### 4.1.3. Facilitation

For this study, facilitation is framed as the functioning and role of the cluster facilitator in enabling, supporting, and shaping group activities and outcomes (Table 2). Effective facilitation can help clusters to co-develop ideas and solutions, maintain momentum as a group, manage conflict, access funding or expert knowledge, and lower the administrative burden for farmers for engaging in collective efforts (e.g., by organising group meetings, or organising resources related to land management, including speciality seeds, hedge plantings, bird feeders, etc.). Similar to the variation in leadership constellations, two types of facilitation were identified in the clusters (Table 2). On the one hand, facilitation is largely managed by one person, the facilitator, and on the other hand, by a facilitating team comprising people from one or several organisations who provide different support functions and expertise. For example, the Austrian Burgenland cluster is facilitated by a team, where one person has close pre-existing relations with the farmers and is well-suited to coordinate their collective efforts, whereas another person provides more technical support in specific activities such as biodiversity monitoring. Some facilitators are being perceived as scientific experts supporting biodiversity monitoring in the cluster rather than supporting group activities, as is the case in the Born cluster in Luxembourg, the Scottish Buchan, and the Estonian Kanepi kihlkund cluster. Supportive conditions to enable effective facilitation include sufficient time and funding for facilitation, the spatial proximity of the facilitator's residence and the cluster area, and a well-suited professional background of the facilitator, at best, providing the skills or expertise needed to support the cluster to reach its objectives, such as in the French Basse Durance cluster where the facilitator has changed after 16 months (Table 2). In addition to the two types of facilitation, two modes of facilitation can be observed: an ad-hoc and opportunistic mode, and a deliberate mode with planned and recurring activities. The structured mode supports notions of working as a formalised group and 'functioning as a cluster', whereas the ad-hoc mode results in discrete and occasional events supporting a much looser notion of working together with less emphasis on group coherence.

#### 4.1.4. Group characteristics

We define group characteristics as the in-group characteristics of the clusters that may support or challenge collaboration (Table 2). For example, farmers who are located close to one another and share similar farming views and values are more likely to collaborate effectively. Hence, place-based proximity, shared values, and motivation to cooperate can create beneficial and enabling in-group conditions for a Farmer Cluster, as in the English Cranborne Chase cluster. On the contrary, conflicting views, values, and power asymmetries among farmers may lead to conflict and/or farmer disengagement as observed in several FRAMEwork clusters. Considering the group characteristics across the FRAMEwork clusters, three observations stand out. First, certain group characteristics may turn out to be conflicting, creating trade-off situations. For example, in the Val Graziosa cluster in Italy, the expectation of having adjoining land parcels in the cluster to support landscape-scale management led to the development of a locally proximate, yet heterogeneous cluster that includes both hobby and commercial olive farmers, who tend to hold contradictory views on the management of olive groves. Consequently, the cluster struggled to find common ground for implementing joint measures (Table 2). The Mostviertel cluster in Austria, on the other hand, focused on a specific region but did not impose additional spatial requirements on new cluster members. Importance was placed on farmers' intrinsic motivation to collaborate on biodiversity enhancing measures. This led to the formation of a spatially dispersed cluster across 130 km (Tables 1, 2) that cannot jointly implement landscape-scale connected measures but is composed of like-minded farmers who individually implement similar measures. Second, some group characteristics appear crucial for enabling farmer collaboration, whereas others can be considered supporting conditions. Among the critical characteristics are (i) a general motivation and willingness to engage in collaborative efforts and (ii) the perception of being part of a group. Clusters in which a large share of farmers are not motivated to engage or do not consider themselves being part of a group tend to lack active participation. Cluster members remain passive and participate in group activities only upon deliberate request. Hence, the prioritisation of a minimum level of intrinsic farmer motivation is required when establishing a new cluster. Group characteristics such as spatial proximity, pre-existing social links, and homogeneity in farming systems and views are supporting conditions that have been shown to ease active collaboration and collective decision-making. However, the lack thereof may be overcome or compensated for by high motivation levels as well as time and resources available to invest, for example, in social capital building. Third, farmer motivations are not fixed and can vary greatly within and across clusters, working in favour of the cluster if aligned with shared cluster objectives. Motivations also change over time and as a result of engaging in cluster activities. For example, farmers joined a group preceding the Zeeasterweg Farmer Cluster mainly to access AECS funding opportunities under the Dutch system, reflecting primarily economic motivations at the start. Other activities, such as voluntary biodiversity monitoring or social capital-building in the group, were not considered important. However, due to involvement in such activities over time during the FRAMEwork project, farmers' awareness about the interlinkages between economic and environmental benefits increased, also affecting their motivation to further participate and develop as a cluster.

#### 4.1.5. Context

All Farmer Clusters were initiated and operate in a European context (Table 2). Nevertheless, they evolved in multi-layered national and regional settings with diverse historical, political, legal, cultural, social, environmental, and other influences, such as national policy frameworks, funding schemes, and support networks of (local) actors. These

**Table 2**
Synthesis of how the five formative dimensions take shape in the Farmer Clusters.

| Farmer Cluster, location | Governance (structures and processes to support cluster decision making):<br>- Explicitly agreed<br>- Implicitly agreed<br>- Not agreed | Leadership formalised, or shared by:<br>- Local actors, e.g. business partners, NGOs, facilitator,<br>- Facilitator (in the absence of a lead farmer) and experts<br>- Lead farmer, facilitator | Facilitation (supporting group activities and outcomes):<br>- By one person<br>- Facilitation-team<br>Mode of facilitation:<br>- planned<br>- ad-hoc | Group characteristics (in-group characteristics that may support or challenge collaboration) | Context (multi-layered national and regional settings) can:<br>- ease collaboration, or<br>- present a barrier |
|---|---|---|---|---|---|
| Basse-Durance, France | No agreed structure | Facilitator with support of experts from lead partner organisation (INRAE, GRAB) | INRAE facilitator for first 16 months (FRAMEwork funded); GRCETA (self-funded)<br>From ad-hoc to more planned facilitation | Group of organic and non-organic commercial apple and pear producers, dispersed across the cluster area but with joined orchard boundaries. | Lack of funding for group activities, lack of support network for facilitators |
| Born, Luxembourg | No agreed structure | Local business partner Ramborn Cider Co (fruit processor buying fruit from local farmers and supporting maintenance of heritage fruit orchards), lead farmer | LIST facilitator (FRAMEwork funded)<br>Ad-hoc facilitation supported by lead partner organisation (LIST) | Likeminded local farmers and landholders making use of heritage orchards for fruit production and as grazing area. | Local business buying fruit from local farmers and raising public awareness of the value of heritage orchards. |
| Buchan, Scotland | No agreed structure | Lead farmer, facilitator and experts from lead partner organisation (Hutton) | Hutton facilitator (FRAMEwork funded)<br>Ad-hoc facilitation | Small group of farmers who are friends of the lead farmer working across cluster area. | Lack of funding for group activities, lack of support network for facilitators. |
| Burgenland, Austria | No agreed structure | Facilitator with support of experts from lead partner organisation (BOKU) | BOKU facilitating team (FRAMEwork funded)<br>Planned facilitation | Diverse group of farmers dispersed across cluster area (around Lake Neusiedl). | Diverse funding opportunities supporting biodiversity friendly farming and farmer monitoring. |
| Cazadores de Aguilar, Spain | No agreed structure | President of the local hunters' association and lead farmer (promoting recovery of permanent vegetation cover to support habitat needs of small game populations), facilitator | Fundación Artemisan facilitator (FRAMEwork funded)<br>Ad-hoc facilitation | Commercial olive growers holding diverse views and values regarding olive grove management, in particular management of ground cover. | Entrenched cultural norms of what constitutes 'good olive grove management'. There is no added value in this more environmentally friendly produced crop. Production from different origins is mixed together. The market does not value it. |
| Cranborne Chase, England | Explicitly agreed with elected chairperson and steering group, agreed voting procedure | Formalised structure: Lead farmer (chairperson of the cluster), steering group (responsible for direction setting), facilitator, experts from lead partner organisation (GWCT) | Independent farming and wildlife advisor (FRAMEwork funded)<br>Planned facilitation | Likeminded, motivated neighbouring farmers holding similar values and having a shared vision on what they want to achieve as a group. | Clusters can receive funding for a facilitator and can apply for group funding. |
| Kanepi kihlkund, Estonia | No agreed structure | Lead farmer and facilitator | EMU facilitator (FRAMEwork funded)<br>From ad-hoc to planned facilitation | Lack of trust between individual farmers hinders cluster from working together as a group, despite having joined farm boundaries | Post-socialist culture resulting in reluctance to collaborate with neighbouring farmers. |
| Mostviertel, Austria | Implicitly agreed, e.g. informal communication via WhatsApp Farmer Cluster Group, moderated by facilitator | Facilitator with support of expert from lead partner organisation (AREC) | AREC facilitator (FRAMEwork funded)<br>Planned facilitation | Likeminded, motivated farmers, spatially dispersed across region (130 km) | Diverse funding opportunities supporting biodiversity friendly farming and farmer monitoring. |
| Val Graziosa, Italy | No agreed structure | Lead farmer (leadership challenged by power asymmetries) | SSSA facilitator (FRAMEwork funded)<br>Planned facilitation supported by experts from lead partner organisation (SSSA) | Hobby and commercial olive growers holding different views and values regarding olive grove management (particularly pest management) and economic goals, joined farm boundaries. | Lack of funding for hobby farmers, lack of support network for facilitators. |
| Velké Hostèrádky, Czech Republic | Implicitly agreed by facilitator and lead farmer | Lead farmer (who manages demonstration farm), facilitator | Independent organic farming advisor (partly FRAMEwork funded)<br>Planned facilitation supported by experts from lead partner organisation (CZU) | Likeminded organic farmers holding similar values; however, some members disengage and leave the group. | Post-socialist culture resulting in reluctance to collaborate with neighbouring farmers. |
| Zeeasterweg, Netherlands | Explicitly agreed for accessing collective agri-environmental funding, | Formalised structure for accessing collective agri-environmental funding: | Facilitator from BoerenNatuur Flevoland | Likeminded farmers living and working along the same road with joined farm boundaries. | Diverse funding opportunities supporting biodiversity friendly |

(*continued on next page*)

**Table 2** (*continued*)

| Farmer Cluster, location | Governance (structures and processes to support cluster decision making):<br>- Explicitly agreed<br>- Implicitly agreed<br>- Not agreed | Leadership formalised, or shared by:<br>- Local actors, e.g. business partners, NGOs, facilitator,<br>- Facilitator (in the absence of a lead farmer) and experts<br>- Lead farmer, facilitator | Facilitation (supporting group activities and outcomes):<br>- By one person<br>- Facilitation-team<br>Mode of facilitation:<br>- planned<br>- ad-hoc | Group characteristics (in-group characteristics that may support or challenge collaboration) | Context (multi-layered national and regional settings) can:<br>- ease collaboration, or<br>- present a barrier |
|---|---|---|---|---|---|
| | two dedicated meetings per year | Facilitator (from farmer collective BoerenNatuur Flevoland) | (FRAMEwork funded)<br>Planned facilitation supported by experts from lead partner organisation (UvA) | | farming based on collective applications. |

multi-layered contexts can ease collaborative agri-environmental management but also present a barrier to it. Hence, understanding context is critical to understanding cluster development trajectories and their potential to fully achieve effective collaboration, also beyond the end of the FRAMEwork project.[4] It is also important to consider the additional effort required if contexts are inhibiting, rather than enabling farmer collaboration. An example of a favourable context is England, where clusters can receive funding for a facilitator via the CSFF, and some AECS are open for group applications (Table 2). Furthermore, given that collaborative farmer groups have been established across England, an extensive knowledge base and support network is available. This is in vast contrast to Scotland, where no funds are available for group facilitation and no support network exists. Other contexts also pose challenges for farmer collaboration and finding common ground within a cluster. For example, entrenched agri-cultural norms, e.g., of what is considered 'good farming', may slow down the implementation of biodiversity sensitive farming measures. Establishing and leaving groundcover vegetation in olive groves is debated controversially in the Spanish cluster, and it is potentially dividing farmer groups, despite being an accepted measure to reduce soil erosion and run-off, increasing water retention and soil moisture, and potentially delivering economic benefit, helping to alleviate some of the farmers' greatest agricultural challenges. Likewise, in post-socialist countries (Estonia, Czech Republic), where clusters were established, the idea of collaborative work met some reluctance rooted in their 20th-century histories. Additional resources and time may be required to build new social capital and to re-establish trust in collaborative efforts before group activities can be progressed and environmental measures can be jointly implemented. One such example is the joint development and implementation of a biodiversity path across the agricultural landscape in the Velke Hosteradky cluster in the Czech Republic.

### *4.2. Farmer Cluster maturity*

The maturity levels of the clusters on each formative dimension are shown in Fig. 3, visually depicting the diverse setup and conditions of the clusters about four years after their inception. The realisation of the five dimensions across the clusters varies greatly, underscoring the diversity of possible trajectories clusters can take in their development, based on different initial conditions and formative dimensions, some of which can be influenced more directly (e.g., facilitation and governance) than others (e.g., context).

Farmer Clusters' maturity levels reached on the governance, leadership and facilitation dimensions range between 2 and 5. The levels on group characteristics and context spread between 1 and 5, from lowest to highest levels of maturity across the eleven clusters. Set up and managed as part of the FRAMEwork project across nine European countries, clusters were, on average, able to reach medium maturity on all five dimensions, reaching 3.1 on governance, 3.3 on leadership, 3.5 on facilitation, 3 on group characteristics, and 2.9 on context.

### *4.3. Interdependence of formative dimensions*

Using two contrasting examples, we illustrate the interdependence of formative dimensions in the development and functioning of the cluster as a collaborative endeavour to manage agrobiodiversity on a landscape scale. Within the Italian Val Graziosa Farmer Cluster, a combination of group characteristics and contextual aspects hinders the establishment of supportive governance structures or effective leadership. This occurs despite consistent facilitation efforts and the successful realisation of local activities, such as joint pest monitoring of the olive fruit fly and community engagement through an annual citizen science "BioBlitz". Olive groves are extensively and organically managed by both hobby and commercial olive growers. Discrepancies in the size of land owned and associated dominance in the cluster are considerable, and views and values diverge in relation to olive tree management and pest control, reportedly hindering the cluster to define biodiversity targets and activities jointly, or to rally behind a common leadership figure. Additionally, hobby farmers are not economically dependent on the quality and amount of oil they produce, whereas existing agri-environmental schemes are only accessible to commercial farmers. Furthermore, the economic and policy context does not provide incentives for hobby farmers to implement pest management strategies. Hence, the low maturity on the group characteristics dimension (i.e., heterogeneity), the context dimension (i.e., policy frameworks and lack of incentives for hobby farmers), and the leadership dimension hinder the cluster from implementing suitable governance structures and from formulating and realising shared group objectives (Fig. 4).

In contrast, in the Born cluster in Luxembourg, leadership is provided by the local actor and business partner Ramborn Cider Co, together with a lead farmer, who supports the cluster in setting directions, co-organising cluster activities, and providing facilities for cluster meetings. This strong leadership is coupled with a high level of maturity in terms of group characteristics. The cluster is homogeneous with respect to the farming system (fruit orchards with grazing livestock), farm proximity, and the level of farmer motivation (Fig. 4). Furthermore, contextual aspects related to cultural norms of collaboration and local networks of actors can be considered beneficial. In sum, this leads to certain positive outcomes, such as the joint maintenance of the traditional orchards by the farmers, and the interplay of these dimensions can partly compensate for lower levels of maturity in governance and facilitation. As there are no deliberate governance structures agreed upon and the facilitator is considered an expert in monitoring biodiversity rather than support for regular group activities, the cluster would benefit from more regular joint activities and better-defined shared

[4] https://recodo.io/news/farmer-cluster is the platform where more information can be found on the individual clusters, the cluster network, citizen science activities, and more.

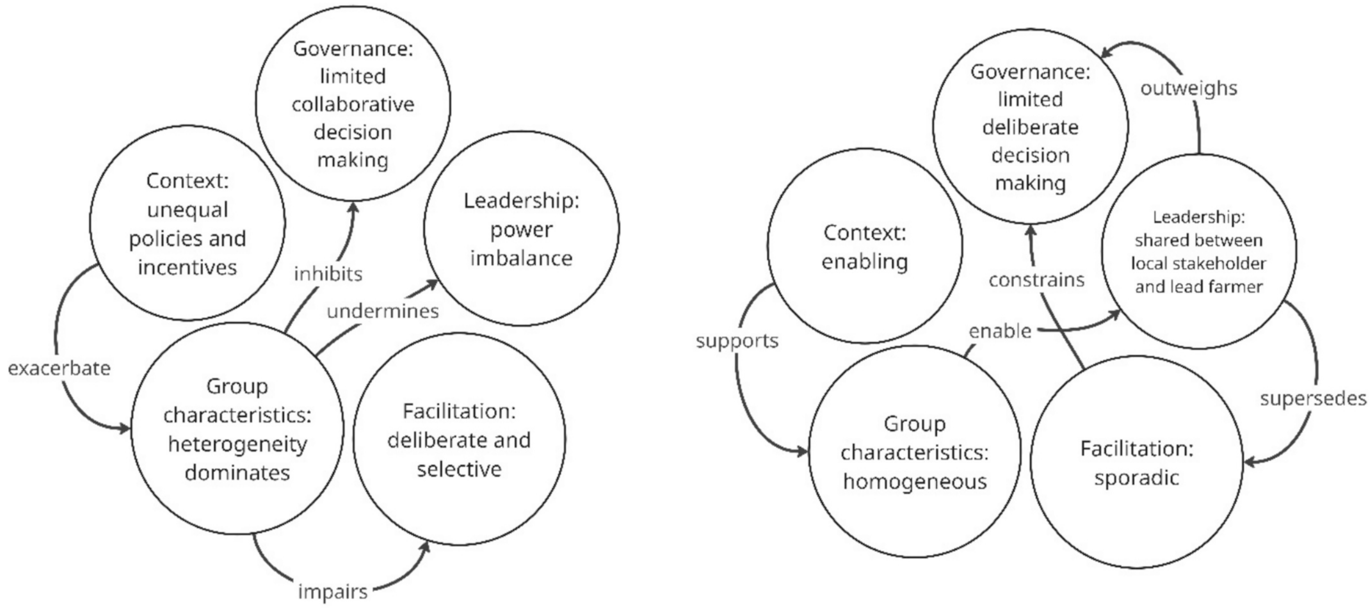


**Fig. 4.** Two illustrative examples of interdependence of formative dimensions in the Val Graziosa cluster in Italy (left) and in the Born cluster in Luxembourg (right).

goals which are championed by the lead farmer together with the farmers and that go beyond pruning, replacing trees, harvest and participation in the City Nature Challenge.

## 5. Discussion

Understanding and supporting both the development of Farmer Clusters and the transferability of the English Farmer Cluster model across Europe required identifying the key dimensions and interactions that shape cluster functioning across locations and cultures. It also involved clarifying what can reasonably be expected in terms of their early development trajectories and their potential to mature over time. Our findings contribute to this understanding by deriving five formative dimensions, which are critical for a Farmer Cluster to function, achieve outcomes and ultimately success – governance, leadership, facilitation, group characteristics, and context. In this section, we first discuss our results before we offer implications for practice and suggestions for future research.

### 5.1. *Reflections on the dynamic trajectories and maturity of farmer collaboration*

The five formative dimensions align with success *factors* identified by Velten et al. (2021). Together, they form converging evidence and triangulation of findings (Creswell and Miller, 2000), underpinning the importance of these dimensions in determining the functioning of farmer collaboratives. Additionally, we provide more nuanced insights into the specific dimensions, their interlinkages, and their implications for the maturity of collaborations. Hence, while Velten et al.'s (2021) model focuses on success factors and related outcomes (success criteria) in a more linear fashion, we propose a complementary framing similar to Emerson et al. (2012) and Ulibarri et al. (2020), which focuses on dependencies of dimensions as well as understanding farmer collaboratives as learning groups, which are constantly evolving on their unique development trajectories linked with time-sensitive maturity levels (Westerink et al., 2017).

Regarding the governance dimension, our results indicate that while Farmer Clusters can have a positive trajectory being built on informal governance structures, deliberate and encompassing structures and processes are preferable. They ensure meaningful farmer involvement and support effective collaboration, especially if the cluster has many members. Likewise, a lack of dedicated structures and processes for self-governance can frequently challenge the progress of group activities and the development of group coherence. This aligns with the work of Dik et al. (2023), who found that collectives with more members and/or greater budgets were more professional and that a simple organisational structure benefited professionalism. However, as Westerink et al. (2020) point out, self-governing groups should not professionalise to the extent that they adopt characteristics of public agencies and compromise the important assets, such as social capital building and peer-to-peer learning, for effective agri-environment management.

Regarding the leadership dimension, while our results highlight its importance for cluster functioning, the direction of insight remains ambivalent. While a strong lead figure (e.g., a lead farmer or local business/interest group) and their resources can benefit Farmer Clusters, they may also create power imbalances that risk undermining the group's purpose and shared goals, especially if farmers are dependent on such partners or interest groups (Akbulut and Soylu, 2012; Reed, 2008). Our results suggest that leadership may also limit other farmers' involvement, e.g., by imposing goals and group activities or by enabling 'wait and see' positions if the leader advances and the rest of the group become passive observers.

Regarding the facilitation dimension, our results indicate that facilitators are crucial to the 'success' of a Farmer Cluster, if they serve multiple roles, from providing one-on-one advice to individual farmers to organising peer-to-peer learning opportunities and applying for group funding for joint conservation measures. This finding is in line with Jones et al. (2023), who report on the key role of facilitators in promoting landholder collaboration in conservation on a landscape scale, while Berthet and Hickey (2018) point out the importance of facilitation of learning processes. Our results also show that a change in the facilitator position can be beneficial if it unlocks valuable expertise or builds upon pre-existing social capital. This contrasts with the work by Nye (2018), who found that a change in facilitation can cause disturbances in group cohesion.

To understand a Farmer Cluster's performance and development trajectory, considerations on group characteristics are critical. While homogeneous groups of likeminded farmers with joined borders between farms work well, spatially determined landscape-scale collaboration can also create socially heterogeneous clusters. These clusters are likely more challenged to collaborate effectively. These findings align with what Prager (2022) refers to as group cohesion vs landscape scale.

Ultimately, we found that more benefits may be gained from socially homogeneous groups with spatially distant farms, including mutual learning, individual implementation of measures and the lighthouse character of individual farms.

Finally, the context within which a cluster is embedded, including cultural norms around farmer collaboration, available funding to support collaboration as well as policies to support transition to biodiversity sensitive farming, can play a deciding enabling or inhibiting role for its development (Nichols et al., 2025). It is hardly directly influenced by individual cluster members or facilitators. Context-dependent barriers almost always inhibit cluster development, while enabling environments do not guarantee success or beneficial development of a cluster. In these cases, other formative dimensions become dominant and require more attention.

Apart from these specific aspects on the five formative dimensions, three additional considerations surfaced from the cross-case analysis. First, Farmer Clusters are shaped by dynamic, evolving processes influenced by both internal characteristics and external conditions. While all clusters broadly aim to establish landscape-scale collaboration for environmental, social, and economic benefit, each cluster operates within a unique farming system, cultural and political context, and landscape setting, departing from a diversity of starting points (Barghusen et al., 2021; Prager, 2022). A starting point may refer to the territory where the cluster was established, including the environmental state of the landscape, the need for joint landscape-scale management, and other types of farmer motivation for joining a cluster. These starting conditions also define a specific direction and path dependency, which may be enabling, or pose a barrier for cluster development from the start.

Second, understanding Farmer Cluster outcomes requires examining how the five dimensions interact, as their interplay—rather than each alone—determines performance. However, the interplay of dimensions and time lags between actions and outcomes make it difficult to pinpoint a single decisive influence on performance but highlights the importance of case-by-case and dynamic understanding of the collaborative processes (Emerson et al., 2012). Collaboration in clusters may shift over time in response to internal and external changes, which further emphasises the importance of adaptive learning, flexible governance, and active collaboration of all involved actors (Ulibarri et al., 2020).

Third, refocusing from success and outcomes to viewing Farmer Clusters as evolving collaborations shaped by key formative dimensions also provides a more realistic and humble view of what can be achieved in different contexts. For example, rather than evaluating progress solely through measurable biodiversity outcomes, considering the maturity of a cluster can be more empowering and revealing of long-term development potential. At the same time, it is essential to acknowledge that a Farmer Cluster does not require high maturity levels in all dimensions to function well or deliver specific outcomes. We use the maturity framework to highlight that clusters, including facilitators and locally involved actors, are constantly navigating a joint learning and development journey. In this regard, lower levels of maturity describe potential challenges and barriers, as well as opportunities for development. Different levels of maturity reflect different achievements but also different types of challenges. Clusters with lower levels of maturity are challenged to address and find solutions to specific barriers. Clusters with high maturity, on the other hand, may be challenged to maintain their level of activities, coherence, and performance as a group, such as retaining farmer interest and motivation over time, securing long-term funding for cluster support, and achieving common goals and defining new ones.

### 5.2. Implications for practice

Based on the above discussion, we put forward several practical guideposts for setting up and running successful farmer collaborations, such as Farmer Clusters.

- A diagnosis of contextual conditions and likely path-dependencies (including policies, incentives, cultural norms, networks, and available funding) should be undertaken prior to launching a Farmer Cluster and periodically reassessed to guide cluster management and implementation trajectories.
- Deliberate, farmer-owned governance processes should be established proportionate to group size, with agreed decision rules, and routine review mechanisms that avoid over-professionalisation and preserve peer learning.
- Distributed leadership should be fostered by combining respected farmer leaders with complementary co-leads, implementing safeguards against dominance (e.g., transparent decision logs and rotating chairs), and planning for leadership succession.
- Facilitation should be specified as a professional role adequately funded, and tasks specified and agreed for each cluster (e.g., encompassing one-to-one advisory support, peer learning support, coordination of biodiversity monitoring, the development of funding applications etc.).
- Group coherence should be pursued by prioritising socially homogeneous groups, where feasible. Where groups are heterogeneous, coherence should be built around a clearly articulated shared ambition, goal, or common problem, and advanced through pragmatic solutions that explicitly include differing views.
- Farmer Clusters should be treated as evolving collaborations; a lightweight, participatory maturity assessment framework (maturity matrix) with joint reviews can be used to adapt governance, leadership, and activities, acknowledging time lags between actions and desirable outcomes.

These recommendations critically extend current practice advice and recommended steps to building and maintaining a Farmer Cluster (GWCT, 2025; McHugh, 2023a, 2023b) with evidenced insights from FRAMEwork Farmer Clusters.

### 5.3. Limitations and future research

The study presented in this paper has several limitations. First, the explorative multiple case study approach, which involved cluster facilitators and lead partners as "inside researchers" (Rabe, 2003) provides a rich picture about how the clusters developed but may be subject to research biases, including insider research bias, self-selection bias and the challenge of managing reflexivity (Wilkinson and Kitzinger, 2013). For example, there may have been potential biases in filling in the CEF by facilitators and lead partners, many of whom have several roles in the project and in the clusters. To address these challenges, we incorporated triangulation in our study approach (Carter et al., 2014; Jonsen and Jehn, 2009), as outlined in the methods section. Second, the results present a snapshot in time in the dynamic evolution of the FRAMEwork Farmer Clusters that have been established across Europe and are, due to delays inherent in the research process, likely, not reflective of the current state of the studied clusters. Nonetheless, this snapshot offers insights relevant to other collaboratives and, together with the maturity assessment matrix, can be used to reflect on Farmer Cluster trajectories, enabling joint action to further advance collaboration. Future research into farmer collaboration could benefit from tracing cluster trajectories over time to clarify how governance, facilitation, group characteristics, and context shape capacities and outcomes, drawing, for example, on impact-pathway and theory-of-change approaches (Douthwaite et al., 2003; Mayne, 2015). This longitudinal lens could reveal critical junctures, explain divergent results across contexts and starting conditions, and further inform adaptive management, scaling and transferability of the Farmer Cluster model.

## 6. Conclusions

Drawing on eleven Farmer Clusters established across nine European countries within the FRAMEwork project, this paper reports on an exploratory, comparative multiple–case study conducted from October 2020 to June 2025. The analysis enabled a detailed assessment of cluster development over time. We identified five formative dimensions—governance, leadership, facilitation, group characteristics, and context—that shape Farmer Cluster development and ultimately influence progress and outcomes. We also present a maturity assessment that illustrates clusters' dynamic trajectories and the varied levels of maturity achieved. Maturity levels differ greatly, reflecting how initial conditions interact with governance processes, facilitation, leadership, and group characteristics. In this light, the maturity assessment matrix serves both as a research tool for comparative analysis and benchmarking and as a facilitation and learning tool to support collaborative evaluation of cluster progress. Facilitators and other cluster leaders can use it as a guiding framework to focus facilitation efforts. Likewise, the matrix enables facilitators and farmers to jointly assess performance and, where appropriate, adapt it to context-specific aspects—aligning with a participatory evaluation approach consistent with shared governance in Farmer Clusters. In doing so, the tool functions not only as an evaluation instrument but also as a mechanism to strengthen collaboration, cohesion, and shared ownership within existing clusters. To promote policies that create an enabling context for such practice, we conclude with the following considerations. Policymakers should promote Farmer Clusters as landscape-level collaborations with flexible spatial boundaries that can be linked to, for example, water and habitat directives. Policies and support services can encourage partnerships with businesses and interest groups, while providing mediation mechanisms to prevent power imbalances and promoting transparent governance structures. Investment should prioritise professional facilitation and capacity building through training and accreditation for independent facilitators and lead farmers. Finally, stable, multi-year funding should provide operational facilitation support and incentives for collective action, complemented, for example, by results-based bonuses for verified biodiversity outcomes. Taken together, we offer tools and insights for practice and considerations for policy aimed at further supporting adaptive, collaborative, farmer-based initiatives for improved agri-environmental management across Europe.

## CRediT authorship contribution statement

**Iris C. Bohnet:** Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Gerid Hager:** Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Funding acquisition, Formal analysis, Conceptualization. **Thomas Rellensmann:** Writing – review & editing, Writing – original draft, Validation, Methodology, Formal analysis, Data curation, Conceptualization. **Claire Hardy:** Writing – review & editing, Validation, Methodology, Formal analysis, Data curation. **Niamh M. McHugh:** Writing – review & editing, Validation, Investigation, Funding acquisition. **Daniela Ablinger:** Writing – review & editing, Validation. **Virginia Bagnoni:** Writing – review & editing, Validation. **Gillian Banks:** Writing – review & editing, Validation. **Marco Beyer:** Writing – review & editing, Writing – original draft, Validation, Formal analysis. **Lennard Duijvestijn:** Writing – review & editing, Validation. **Pierre Franck:** Writing – review & editing, Visualization, Funding acquisition. **Kristina Janeckova:** Writing – review & editing, Validation. **Riina Kaasik:** Writing – review & editing, Validation. **Youri Martin:** Writing – review & editing, Validation. **Anna-Camilla Moonen:** Writing – review & editing, Validation, Funding acquisition. **Aliyeh Salehi:** Writing – review & editing, Validation. **Carlos Sánchez-García:** Writing – review & editing, Validation, Funding acquisition. **Martine Schoone:** Writing – review & editing, Validation. **Clare Scott:** Writing – review & editing, Validation. **Jan Travnicek:** Writing – review & editing, Validation. **Paul van Rijn:** Writing – review & editing, Validation, Funding acquisition. **Gonzalo Varas:** Writing – review & editing, Validation. **Eve Veromann:** Writing – review & editing, Validation, Funding acquisition. **François Warlop:** Writing – review & editing, Validation, Funding acquisition. **Marie-Luise Wohlmuth:** Writing – review & editing, Validation. **Graham S. Begg:** Writing – review & editing, Validation, Project administration, Funding acquisition.

## Declaration of competing interest

On behalf of all authors, I declare that there is not conflict of interest.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.agsy.2026.104644.

## Data availability

Data will be made available on request.

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