Key Factors influencing EU CAP Eco-Schemes uptake in Wallonia

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Abstract

The latest reform of the Common Agricultural Policy enhances subsidiarity by allowing Member States to develop tailored CAP Strategic Plans to address national needs while elevating the CAP's environmental and climate objectives through the introduction of the "Green Architecture." This framework is realised via three key instruments: enhanced conditionality, Eco-Schemes, and agri-environmental and climate measures. Eco-Schemes are designed to support farmers in adopting agricultural practices that benefit the climate, environment, and animal welfare, addressing both new and existing practices, with the objective of balancing environmental protection with income support. However, their adoption by farmers is voluntary, raising questions about the factors influencing their uptake.

This study investigates the determinants affecting the adoption of Eco-Schemes by Walloon farmers. It begins with an analysis of the mandatory nature of Eco-Schemes for Member States compared to their voluntary adoption by farmers, focusing on the balance between environmental ambitions and the incentives provided for adoption. Using a top-down approach, the study examines the EU Commission's proposed measures, positioning Wallonia within the broader EU context of Eco-Schemes. It then explores the specific design of Eco-Schemes in Wallonia and the factors influencing their adoption.

Findings highlight the characteristics of farmers who adopt Eco-Schemes, revealing that compliance is often limited to less productive lands or practices perceived as easy to implement, or is influenced by the windfall effect for those already engaged in similar practices. The study provides insights into the adoption of Eco-Schemes following their first year of implementation and incorporates perspectives from various stakeholders to explain the dynamics of adoption and the associated opportunities and challenges.

Acronym list:

AECM	Agri-environmental and Climate Measures
AKIS	Agricultural Knowledge and Innovation Systems
AL	Arable Land
ANT	Actor-Network Theory
AR	Agricultural region
Ard	Ardenne region
BP	Basic Payment
CAP	Common agricultural policy
CHe	Campine Hennuyère region
Con	Condroz region
CP	Coupled payment
CSP	CAP Strategic Plan
EAFRD	European Agricultural Fund for Rural Development
EAGF	European Agricultural Guarantee Fund
ES	Eco-Scheme
ES-EFC	Eco-Scheme Environment-friendly culture
ES-EN	Eco-Scheme Ecological Network
ES-LGC	Eco-Scheme Long Ground Cover
ES-PE	Eco-Scheme Pasture Extensification
ES-PR	Eco-Scheme Pesticide Reduction
EU	European Union
FADM	Factor Analysis of Mixed Data
Fag	Fagne region
Fam	Famenne region
FWA	Farmers' union
GAEC	Good Agricultural and Environmental Conditions
GL	Grassland region
HAr	Haute Ardenne region
Jur	Jurassic region
Lim	Limey region
LU	Livestock Units
MS	Member State
OPW	Walloon Paying Agency
PC	Permanent Crops
PCA	Principal Component Analysis
PGDA	Walloon Sustainable Nitrogen Management Plan
PMEF	Economic Performance Measurement Plan
RP	Redistributive payment
SCOT	Social Construction of Technology
SLi	Sandy-Limestone region
SMR	Statutory management requirements
SO	Specific Objectif
SPR	Strategic Plan Regulation
SPW	Public service of Wallonia
SWOT	Strengths, weaknesses, opportunities, and threats analysis

TF	Type of Farming
UAA	Utilised Agricultural Area
YF	Young Farmer

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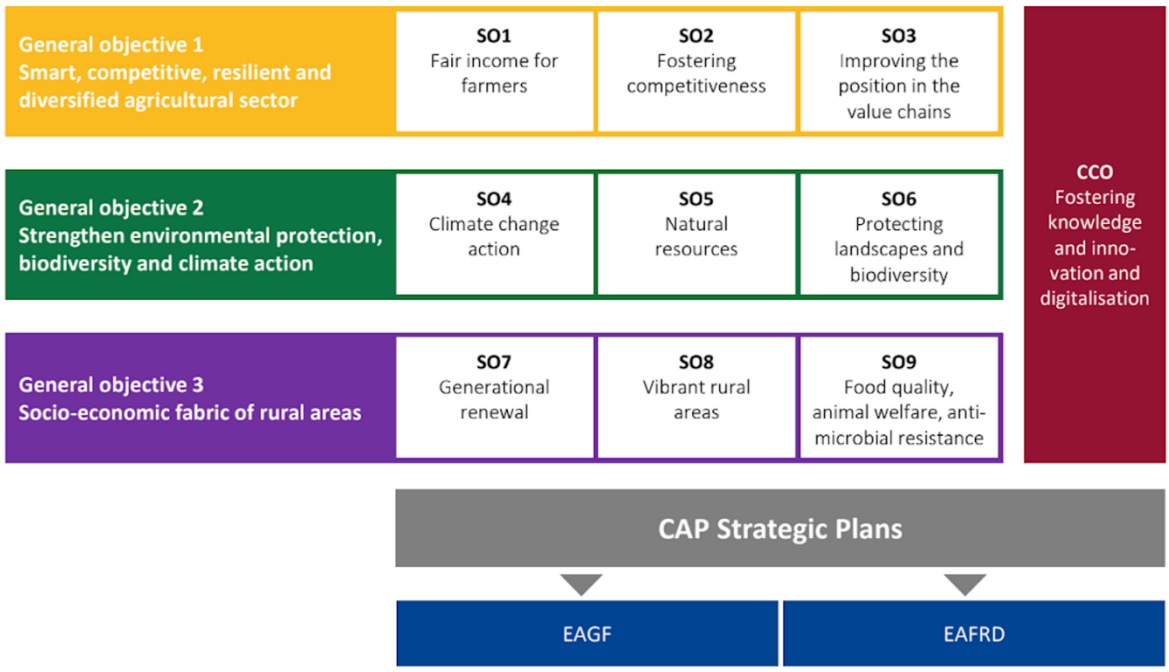
1. Introduction and research context

1.1. The new CAP

Common Agricultural Policy (CAP) undergoes regular reforms, and its current iteration was initially intended to cover the 2021-2027 period. However, due to prolonged negotiations between co-legislators, the current policy period of the CAP spans 5 years, from 2023 to 2027(ECORYS. et al., 2023).

The latest CAP reform enhances subsidiarity by allowing each Member State (MS) to develop its own CAP Strategic Plan (CSP) tailored to national needs. For the first time, the CSP integrates both pillars of the CAP, encompassing the European Agricultural Guarantee Fund (EAGF) and European Agricultural Fund for Rural Development (EAFRD) funds. Including a voluntary aspect related to the adoption of measures within Pillar 1 through the Eco-Schemes. This plan is organised around three overarching general objectives, which are further subdivided into nine Specific Objectives (SOs) and one Cross-Cutting Objective (CCO). The CSPs construction framework, including SOs repartition across the three general objectives and the associated funding sources is illustrated in **Figure 1.**

Figure 1: Diagram representing the intervention logic of the CAP 2023-2027

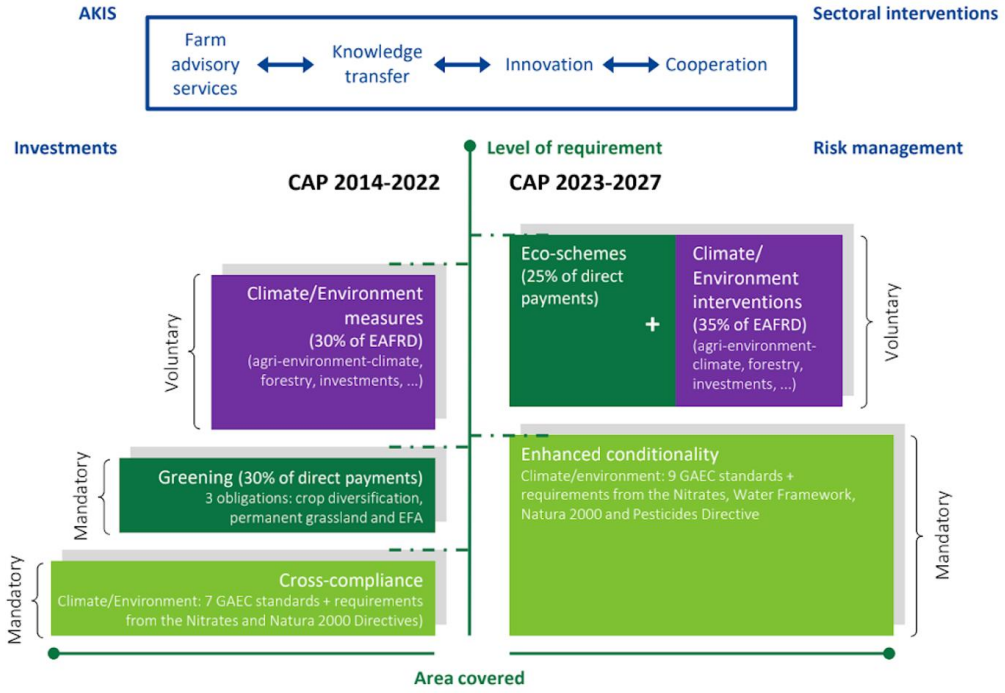


(Münch, A. et al., 2023)

The reform sets higher ambitions for the CAP concerning environmental and climate protection through the introduction of the "Green Architecture". This Green Architecture encompasses a suite of measures within the CAP aimed at fostering sustainable agricultural practices and achieving the environmental and climate goals of the European Green Deal. It is operationalised through three primary instruments: enhanced conditionality, Eco-Schemes (ES), and agri-environmental and climate measures (ECORYS et al., 2023). Through this Green Architecture, a voluntary component is introduced within CAP Pillar 1 via the Eco-Schemes.

The evolution of green architecture elements across both pillars between the previous CAP and the 2023-2027 CAP is highlighted in **Figure2**.

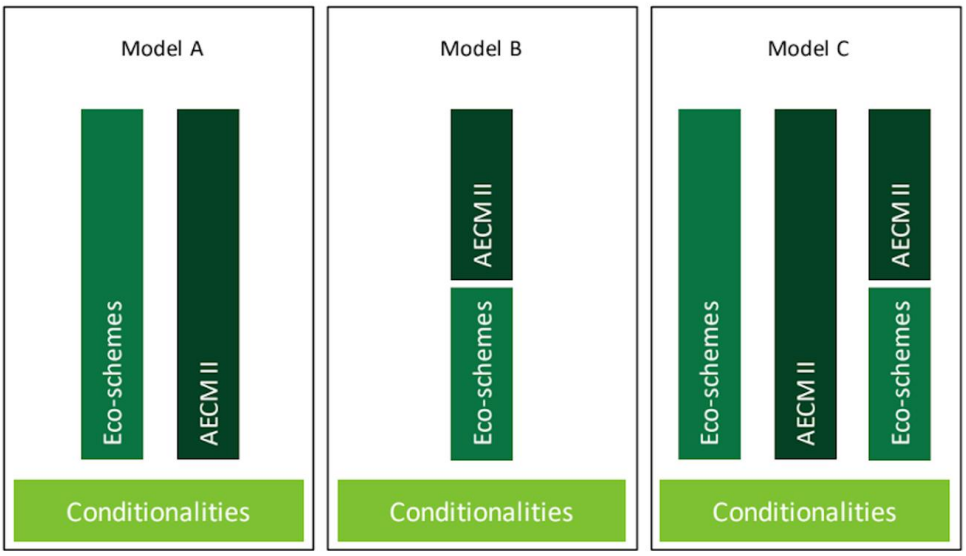
Figure 2: Schematic overview of the CAP pre and post 2022 with the green architecture elements



(Münch, A. et al., 2023)

Eco-schemes and Agri-Environmental and Climate Measures (AECMs) exceed the standards established by Good Agricultural and Environmental Conditions (GAEC). ESs are required to go beyond mere conditionality and can be implemented in conjunction with AECMs, targeting different objectives or groups of farmers. This can be organised in various ways, as illustrated in **Figure 3**: Model A, where Eco-schemes and AECMs are programmed alongside each other; Model B, where Eco-schemes are layered on top of AECMs; or a combination of both strategies as shown in Model C (Münch et al., 2023).

Figure 3: Implementation models of Eco-Schemes



(Münch, A. et al., 2023)

Green architecture implies structural changes in CAP interventions through:

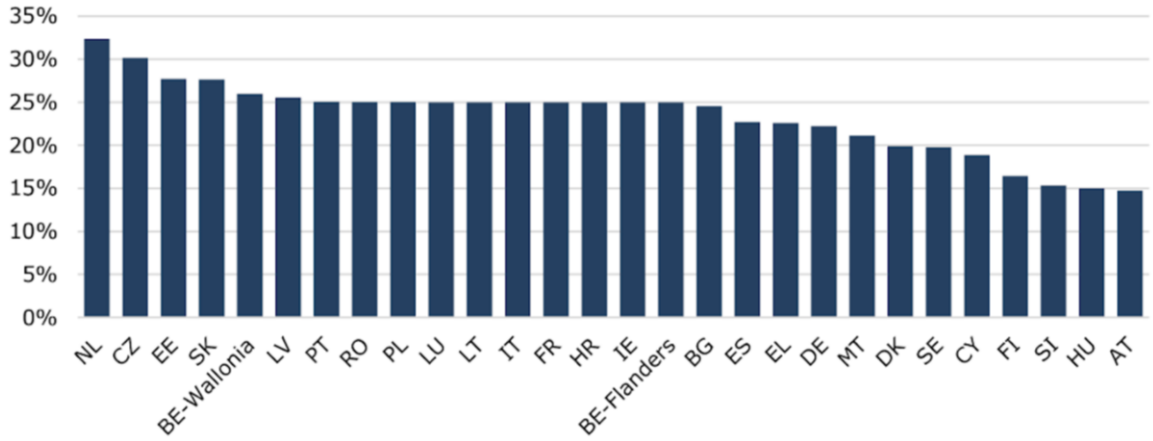
- Enhanced conditionality requirements: farmers must meet these to receive their full direct payments. This includes incorporating a new standard and upgrading the greening requirements from the 2014-2020 programming period into baseline conditions.
- Creation of the ES: interventions under Direct Payments promote the provision of environmental and climate public goods, as well as animal welfare and antimicrobial resistance.
- Additional commitments such as AECM: further supported under Rural Development second pillar (ECORYS. et al., 2023).

1.2. Eco-Schemes

The European directive Regulation (EU) 2021/2115 defines the legal framework for Eco-Schemes. Unlike greening, which was compulsory, ES are voluntary for farmers but mandatory for MS.

ESs provide support for active farmers who implement agricultural practices beneficial for the climate, the environment, and animal welfare. They support both new and existing practices. ES should represent at least 25% of the direct payments under Pillar 1 of the CAP in each MS. However, as illustrated in **Figure 4**, some MS fall below this requirement. Lower allocations for ES are permitted as long as they are compensated for through higher allocations under the European Agricultural Fund for Rural Development (EAFRD) under certain conditions (Regulation (EU) 2021/2115).

Figure 4: Financial allocation to Eco-Schemes as a share of the DP allocation by CSP (2023)



(ECORYS. et al., 2023)

MS are free to design their ES as they see fit within their respective CSPs. However, these ES must exceed the conditionality of GAEC standards, and each ES must address at least two of the following areas: climate mitigation or adaptation, water management, soil management, biodiversity, animal welfare, and antimicrobial resistance (Regulation (EU) 2021/2115).

ES are associated with specific objectives 1, 4, 5, and 6, as well as the cross-cutting objective, aiming to balance environmental protection with income support. However, their adoption by farmers is voluntary. This raises the question of the factors influencing the adoption of ES by Walloon farmers.

2. Conceptual and theoretical framework

The voluntary aspect of adoption plays a crucial role in the success of Eco-Schemes in order to ensure their environmental impact. For these Eco-Schemes to be effective, farmers must actively embrace innovation. This section outlines the principal theories and key factors pertaining to farmers' innovation adoption.

2.1. Principal theories of innovation adoption

The study of innovation adoption encompasses a variety of theoretical frameworks, each offering distinct insights into the process. The most prominent among these is Everett Rogers' *Diffusion of Innovations Theory*, introduced in 1962. This theory defines a five-stage process for the adoption of innovations: awareness of the innovation, persuasion leading to the formation of an opinion, decision to adopt or reject, implementation of the innovation, and confirmation of the decision. He further categorises adopters into five groups: Innovators, who are the first to adopt; Early Adopters, who are influential opinion leaders; Early Majority, a substantial and impactful group; Late Majority, who are sceptical and adopt only after observing results; and Laggards, who adopt last, often due to social pressure (Sahin, 2006).

Another significant theoretical framework is the “Theory of Reasoned Action”, which underscores the influence of attitudes, social norms, and perceived control of adoption behaviour. According to this perspective, an individual is more likely to adopt an innovation if they maintain a positive attitude towards it, believe that their peers approve, and feel confident in their ability to manage it (J.K. Thompson, 2012).

Socio-technical approaches to innovation adoption emphasise the complex interplay between technical and social factors in the adoption process. Michel Callon, a leading figure in Actor-Network Theory (ANT), has significantly contributed to understanding how innovations are translated and integrated within social contexts. Trevor Pinch and Wiebe Bijker’s research on the Social Construction of Technology (SCOT) highlights how social factors’ influence technological development. Additionally, Sherry Ortner’s anthropological work has enriched the understanding of the cultural aspects of technological change. These theories emphasise that adoption of innovations is shaped not only by the inherent characteristics of the innovation but also by the social environment in which it is introduced.

Lastly, institutional Theories focus on the role of institutions—such as rules, norms, and organisations—in the adoption process. Institutions can either facilitate or obstruct adoption by influencing actor behaviours and defining the frameworks within which innovations are developed and disseminated (North, D.C. 1990).

These theories collectively provide a comprehensive understanding of the factors influencing innovation adoption, encompassing individual attitudes, social influences, institutional frameworks, and socio-technical interactions. This integrated perspective supports extensive research on the key determinants affecting the adoption of agricultural innovations.

2.2. Key factors determining farmers' adoption of innovation

Most studies on agricultural innovation adoption employ empirical methodologies and caution against treating agriculture as a homogeneous entity, highlighting the necessity of considering individual perspectives (Montes de Oca Munguia et al., 2021). This recommendation arises from the complexity inherent in the adoption process, which is influenced by various socio-structural constraints (Masi et al., 2022). Evidence shows that socio-structural factors such as age, gender, and education significantly affect the innovation process. For instance, younger individuals generally exhibit higher levels of awareness, knowledge, and adoption (Feder and Umali, 1993). Additionally, adoption behaviour varies across different socioeconomic groups and evolves over time, with some innovations achieving broad acceptance while others are adopted by only a small segment of farmers (Feder et al., 1985).

To facilitate innovation adoption among farmers, the aspect of knowledge and dissemination play a crucial role. The concept of "co-resourcing" underscores the pivotal importance of Agricultural Knowledge and Innovation Systems (AKIS) in enhancing adoption rates, thereby affirming the efficacy of a systemic approach to innovation (Masi et al., 2022). This concept highlights that a collaborative and integrated framework for knowledge exchange and support is essential for promoting widespread adoption of agricultural innovations. Advisory services, which provide access to critical information, are fundamental in this process. Advisors play a significant role by offering targeted guidance and

support that can influence farmers' decision-making process and thereby drive adoption of new practices (Feder and Umali, 1993).

The success of political interventions aimed at fostering technology adoption, such as those implemented through the CAP, varies in effectiveness depending on the type of technology, market structure, and the nature and duration of the intervention (Feder and Umali, 1993). However, the adoption of these practices is impeded by various barriers. Studies have identified and validated barriers to adoption such as farm size, tenure, labour availability, credit constraints, risk and uncertainty, and human capital (Feder et al., 1985).All these factors are synthesised in the review article "Adoption of Innovations by Farmers: Role of Perceptions and Preferences" by Roussy et al., 2015. The research distinguishes two types of determinants: observable determinants, which include endogenous factors (economic, financial, and farmer characteristics) and exogenous factors (pedoclimatic conditions, production context, institutional and regulatory environment, information, communication, and advisory services); and non-observable determinants, which encompass farmers' perceptions and preferences, particularly regarding risk and the characteristics of the innovation (Roussy C. et al., 2015).

3. Methodology and scope of this study

The primary objective of this study is to identify the determinants influencing the adoption of Eco-Schemes (ES) by farmers in Wallonia. This investigation is motivated by the mandatory nature of ESs for Member States, contrasted with their voluntary uptake by farmers. The ES strategy seeks to reconcile ambitious environmental goals with the need to incentivise farmers to participate.

To achieve this objective, the study will employ a key factor derived from a literature review (see Section 2) on the factors affecting the adoption of environmentally beneficial practices. The analysis will be divided into three key sets of factors: regulatory factors, communication factors, and farmer-related factors.

Regulatory factors

The analysis of regulatory determinants occurs at two levels: the design of ES by European Union (EU) MS and the influence of these designs on adoption by farmers. MSs have the flexibility to tailor ESs to their specific needs within the European framework, resulting in considerable variability across the EU. This raises three key questions: 1) Which ES have EU MS adopted ? 2) How is Wallonia positioned within this ES landscape? and 3) What are the unique characteristics of the Walloon ES design?

The objective is to examine the design choices of ES made by Member States, with a particular focus on Wallonia.

Transmission factors

Once these ES are designed by the MS, they must be communicated to Walloon farmers to inform their decision-making regarding adoption. This raises the question: How was this communication organised in Wallonia, and what impact did it have on ES adoption by farmers?

The objective is to understand how the disclosure of ES was executed and to assess its impact on farmers' adoption decisions.

Farmer-specific factors

A key concern is to evaluate whether voluntary ES have achieved success in their first year of implementation in Wallonia. To understand this uptake, it is crucial to explore the adoption factors or barriers. Given the complexity and interconnection of these factors, it is valuable to develop profiles based on variables related to access to ES support. Additionally, non-observable aspects of farmers' intrinsic motivations and perceptions should be considered to provide a comprehensive understanding of the endogenous factors influencing adoption.

The objective is to understand the determinants of adoption related to farmers, with a particular focus on endogenous dimensions, perceptions, and intrinsic motivations.

Based on this objective, the following hypotheses might be formulated:

1. Eco-Schemes do not address the needs of all types of farmers as identified as priorities by Wallonia.
2. Eco-Schemes effectively induce changes in agricultural practices or enhance environmentally friendly methods, thereby addressing the critical environmental challenges faced by Member States.

To comprehensively address these objectives and validate the hypotheses, the methodologies and materials utilised will be detailed in the following sections. To test these hypotheses, a top-down approach will be employed, beginning with an examination of the measures proposed by the EU Commission to understand how each MS has designed their ESs. This will allow for positioning Wallonia within the EU ES landscape. The focus will then shift to the specific design of ES in Wallonia and the factors influencing their adoption by Walloon farmers.

3.1. The European Eco-Scheme design landscape and Wallonia's positioning

The principle of subsidiarity introduced in the new CAP provides Member States with substantial flexibility to design measures tailored to needs identified within the EU-framework. Eco-Schemes design and the intervention logic developed by MS play a crucial role in their adoption by farmers. ESs are particularly significant as they must navigate the dual requirements of adhering to EU regulations while addressing local agricultural needs and the prevailing policy directions.

This section aims to evaluate how Member States have designed ESs and to identify their design characteristics at the EU level through a benchmarking exercise. Additionally, it will assess Wallonia's intervention logic and its positioning within this broader context.

Database composition

To analyse how the EU MS have implemented ES and to identify design characteristics at the EU level, a comprehensive database has been constructed. This database is based on information from the ES

section (31) of each MS's CSPs and planned transactions recorded in the section (6.2) of the financial plan. The database includes three types of information for each ES:

1. Characterisation Information:
    - Application Scale: The scale at which the ES is applied.
    - ES surface Targeted: Specific areas targeted by the ES.
    - Type of Funding: Whether the ES is funded as compensatory payments or basic payment top-ups.
    - Land Target: The type of land targeted by the ES.
2. Calculated Ratios:

    Ratio of Surface Area Covered by ES per Utilised Agricultural Area (UAA) : This ratio facilitates the projection of the UAA that the Member State aims to encompass with the ES. Given the voluntary nature of ESs, the actual area covered may not necessarily align with the projected figures. Nonetheless, this ratio provides critical insights into the Member State's strategic intentions and enhances the understanding of the ES' design in relation to the targeted surface.

$$ES\ Surface\ ratio = \frac{Number\ of\ hectares\ or\ livestock\ units\ under\ ES\ (O.8)}{Total\ UAA\ of\ the\ MS}$$

    This ratio is derived from Output 8 (O.8) of the Economic Performance Measurement Plan (PMEF), representing the number of hectares or livestock units benefiting from the ES.

    Ratio of ES Fund in Total ES Funding: This ratio provides insights into how the Member State plans to allocate its Eco-Scheme budget. Given that ESs are direct payments, their effectiveness is closely linked to the budget allocated. This ratio helps to understand the design of the ES and assess how the intervention logic aligns with its objectives from a funding perspective.

$$ES\ Fund\ ratio = \frac{Allocation\ for\ each\ ES}{Total\ ES\ funding}$$

    This ratio represents the allocation made for each ES relative to the total ES funding, as provided at the end of each section and in the financial plan.

3. Agronomic aspects:
    - Land Scope: indicates the type of land (Arable Land (AL), Grassland (GL), or Permanent Crops (PC)) targeted by the ES. Some ES are specific to one type of land, while others have a broader scope, referred to as "wide".

- Agricultural Practice: describes whether the ES employs specific agricultural practices or multiple methods.

  These agronomic data points are subjective and depend on the interpretation of the person analysing the ES. Therefore, the analysis should be approached with a critical mindset.

Database Interpretation

The database is analysed both qualitatively and quantitatively using descriptive statistics to position the ES based on their design choices. The analysis aims to identify patterns and trends in the adoption and design of ES across the EU, with a focus on understanding Wallonia's specific context and positioning within the broader EU framework.

3.2. Characteristics of the Walloon Eco-Scheme design

The second phase focuses on a specific MS, Wallonia. This section presents the characteristics of the Walloon ES design, examining the choices made and the processes impacting the adoption by Walloon farmers. The analysis centres on four main aspects: the CSP creation process, Walloon stakes and context, the presentation of Walloon's ES and their interrelations, and the dissemination and transmission of information regarding ES.

This section is based on three primary sources of information:

- Bibliographic research: Information from the Walloon CSP, its strategic environmental assessment, The Walloon Strengths, weaknesses, opportunities, and threat analysis (Walloon SWOT) and its ex-ante evaluation, supplemented with online resources.
- Participation in information sessions and farmer meetings discussing ES.
- Conducting (open-ended) interviews with key stakeholders.

3.3. Eco-Scheme adoption by Walloon farmers

Farmers have the option to participate in ES voluntarily. Therefore, the following section examines the actual adoption of Eco-Schemes in Wallonia for 2023. The legend and classification, defined by Wallonia for the Typology of farms, Walloon agricultural regions, and economic dimensions, are provided in Appendix (**A1**. Walloon Agricultural Regions, **A2**. Walloon economic dimension typology, **A3**. Walloon Types of Farming).

3.3.1. Eco-Scheme adoption by Walloon farmers in 2023

To this end, farm adoption ratios will be established to measure the uptake of Eco-Schemes in Wallonia for 2023. These rates will be based on data collected by the Service Public of Wallonia (SPW) paying agency from the 2023 CAP declarations and payments, which covered up to 84.2% as of April. However, ES payments for ecological networks, which were made later in June, will not be included.

This approach will enable ES' success assessment, identification of opportunities for improvement, and characterisation of their uptake.

The adoption rates for each ES by Walloon farms in 2023 will initially be evaluated in relation to the total number of farms across Wallonia, according to agricultural regions. This analysis aims to determine how adoption rates differ among various agricultural regions within Wallonia.

Subsequently, the adoption rate for each ES in 2023 will be analysed within each individual agricultural region to provide insights into the specific adoption rates for each region.

This process will then be repeated according to the Type of Farming, to determine the amount of ES adoption in Wallonia in 2023 according to different Tf. Subsequently, the variation in adoption within each TF will be analysed.

The distribution of ES uptake by economic dimension in Wallonia will also be calculated to assess how different economic dimensions are represented among farms adopting each ES.

Percentage of Farms adopters:

$$Percentage\ of\ farm\ adopters\ by\ ES = \frac{\sum Farm\ adopters}{\sum Farms}$$

Eco-Schemes distribution of farm adopters in Wallonia based on their Agricultural Regions (AR):

$$Percentage\ of\ farms\ adopting\ ES\ in\ Wallonia\ by\ AR = \frac{\sum Farms\ ES\ adopters\ in\ the\ AR}{\sum Farms\ in\ Wallonia}$$

Eco-Schemes distribution of farm adopters in Wallonia based on their Type of Farming (TF):

$$Percentage\ of farms\ adopting\ ES\ in\ Wallonia\ by\ AR = \frac{\sum Farm\ ES\ adopters\ in\ the\ TF}{\sum Farms\ \ in\ Wallonia}$$

Eco-Schemes adoption rate by Agricultural Region:

$$Percentage\ of\ farms\ adopting\ ES\ by\ AR\ = \frac{\sum Farm\ ES\ adopters\ in\ the\ AR}{\sum Farms\ in\ the\ AR}$$

Eco-Schemes adoption rate by Type of Farming:

$$Percentage\ of\ farms\ adopting\ ES\ by\ TF = \frac{\sum Farm\ ES\ adopters\ of\ the\ TF}{\sum Farms\ of\ the\ TF}$$

Eco-Schemes uptake distribution by economic dimension in Wallonia:

$$Percentage\ of\ farms\ adopting\ by\ economic\ dimension = \frac{\sum Farm\ ES\ adopters\ by\ economic\ dimension}{\sum Farm\ adopters\ by\ ES}$$

3.3.2. Analysis of farmer profiles and variables correlated with the receipt of ES-LGC and ES-EFC financial amounts

This section examines farmer profiles and identifies variables that correlate with the amounts received from ES-LGC and ES-EFC. This analysis seeks to understand the relationship between these profiles and the financial support levels.

The variable studied in this section is the amount of ES aid perceived by farms, which serves as a proxy. Farms that did not receive funding are considered not to have adopted the measure, while those receiving aid are seen as having their funding amount aligned with their level of commitment to the ES measure.

Database

The database used in this study includes the 2023 CAP data from the SPW paying agency. The choice of variables is based on the available data, and this study focuses specifically on the ES measures for Long Ground Cover (ES-LGC) and Environment Friendly Crops (ES-EFC). The ES measures for Pesticide Reduction (ES-PR) is excluded because it does not provide useful information, which will be explained further later. The ES measure for Ecological Networking (ES-EN) has not yet been paid out, and the ES for Pasture Extensification (ES-PE) is different from the two selected ES measures. It is aimed specifically at livestock farmers and would require consideration of its interaction with other measures such as coupled payments. Therefore, it will not be included in this study due to time constraints.

The database includes 12,145 Walloon farms that submitted a CAP declaration. After data cleaning, 12,071 farms were retained for analysis. For data with a broad range, a log(10) transformation was used.

Limitations inherent to the data collection not specific to this study:

- The farm manager's identity is not known, so factors such as the influence of young farmers or gender cannot be identified.
- Coupled aid details are combined, including protein crops, milking cows, beef cattle, and mixed types, without separation.
- Organic aid is considered, but not organic certification. It would have been interesting to explore the relationship between organic aid and certification, as well as between coupled aids and ES measures.
- "Cultures" refers to crops declared on April 1st rather than the entire crop rotation. Additionally, various animal species are grouped into the category "other animals".

Method

This analysis is conducted in two parts:

Firstly, the study investigates the linear relationship between each variable and the receipt of ES aid to determine the characteristics of farmers who adopt ES. To achieve this, farmers who do not adopt ES (i.e., those receiving an amount of zero) will be excluded from the analysis.

To examine the specific relationship between the ES and a quantitative variable, linear regression is used (conditions: normality and independence). An analysis of variance is used if the variable is qualitative (conditions: normality and independence), followed by Tukey's post hoc test to identify which specific pairs of groups show significant differences while controlling the overall Type I error rate.

Secondly, a multivariate approach will be used to address the complexity and interactions of variables influencing the adoption of ES measures. This involves performing clustering analysis to establish profiles of farmers based on the perceived ES aid.

Partitioning based on the amounts of ES received (including non-adopters) will be carried out using a clustering method. For each ES measure, three separate cluster analyses will be performed based on different variables. This approach of conducting three distinct clustering analyses with varied variables aims to provide clear, easily interpretable, and actionable information.

- Production Variables: Crop codes (declared as of April 1st), UAA, agricultural region, number of cattle, number of other animals, Type of farming, Economical Dimension (0, 1, 2, 3, 4).
- Structural Variables: Number of farmers, number of women, number of young farmers (<40 years), number of men, and legal form.
- CAPaid Variables: Basic payment, Redistributive payment, Young-Farmer payment, Coupled payment, Organic payment.

For each clustering, a Factor Analysis of Mixed Data (FADM) for mixed qualitative and quantitative data or Principal Component Analysis (PCA) for quantitative data is performed as a pre-processing step to reduce noise and generate better partitioning subsequently.

Hierarchical clustering is performed using Ward's method. It starts with each data point as a separate cluster. At each step, it merges the two clusters whose combination results in the smallest increase in total within-cluster variance, building a hierarchical structure. Descriptive statistics are then calculated for each group (median, mean, coefficient of variation) for quantitative variables, and contingency tables for qualitative variables are generated.

The Kruskal-Wallis test is conducted to evaluate whether the observed groups display similar behaviour concerning their perception of the ES aid amount received. This test assesses whether several independent groups come from the same population or if their distributions differ in non-parametric situations. Dunn's post hoc test follows to identify which specific pairs of groups show significant differences, adjusting for multiple comparisons to control the type I error rate.

Once all profiles are established for each clustering, the comparison of group compositions between different typologies is facilitated by contingency tables. This allows for the examination of similarities and differences in composition between the various profiles created.

Once all profiles are established for each clustering, comparison of group compositions across different typologies is performed using contingency tables. This allows an analysis of the similarities and differences in composition between the various profiles generated.

3.3.3. Exogenous factors and factors related to perception and preferences influence the adoption of Eco-Schemes.

The investigation of exogenous determinants and the perceptions/preferences of farmers will be conducted through semi-structured interviews.

Form development

The form was designed to address themes related to motivations and barriers to the adoption of ES, changes in practices required to secure funding, risk aversion, and understanding of green architecture. A detailed version of the form can be found in the Appendix (A4: Form for farmers: Interview on Walloon Eco-Schemes).

The design of the form draws on insights from several key studies:

- «Adoption of Innovations by Farmers: The Role of Perceptions and Preferences » (Roussy et al., 2015), which identifies factors related to perceptions and motivations, as well as exogenous factors, that influence farmers' adoption of environmental innovations.
- « HET NIEUWE GLB-NSP: INFORMEREN MET IMPACT » (Oevermans, 2022), a study conducted in the Netherlands prior to the implementation of ES, which explores the factors influencing the adoption of ES.
- The Implementation of the New Common Agricultural Policy in France Will Not Be Environmentally Ambitious » (Lassalas et al., 2023), which examines the impact of ES on practice changes in France.

A pilot interview was conducted to refine and adjust the questionnaire.

Farmer selection

To narrow the scope, the geographical focus is restricted to the area north of the “Sambre and Meuse” valleys, which has been identified as sensitive in the Walloon SWOT analysis and prioritised accordingly. This region is classified as a sensitive area, where soil and water protection is significantly compromised by agricultural practices. It is a high-stake area that requires a shift towards more environment-friendly practices. ES are intended to address these critical issues by promoting sustainable practices, particularly in arable land management, which have been identified as having a significant impact on both the environment and overall resilience.

Testimonies were solicited during various meetings, including those held by agricultural unions, information sessions by the SPW external services, and meetings on conventional and organic farming practices, as well as working groups.

To reduce bias from contacting farmers via groups, 25% were contacted through independent networks to ensure a representative sample. The interviews were not limited to ES-LGC and ES-EFC but targeted meetings covering topics relevant to farmers concerned with ES-LGC and ES-EFC, such as the CAP, practices, and crops related to these regulations.

Volunteering farmers were subsequently re-contacted, and 31 interviews were conducted anonymously by phone calls from March 2024 to May 2024. Complete Information on the interviewed farmers (n=31) is available in the Appendix (**A5.** Characteristics of the respondent).

Data Processing

The database will be analysed qualitatively, utilising both horizontal and vertical reading approaches. Key points of study include:

- Understanding of the green architecture
- Motivations and perceptions related to ES adoption
- Changes in practices
- Risk aversion

4. Results

This section presents the results obtained from the study, highlighting the key findings related to the adoption of Eco-Schemes by Walloon farmers.

4.1. The European Eco-Scheme design landscape and Wallonia's positioning

This first section focuses on the landscape design of ES at the EU level and examines the positioning of Wallonia within this framework. The results provide a comparative analysis, highlighting how Wallonia aligns with or diverges from broader EU trends design of ES.

The total number of ES interventions amounts to 158 and can be divided into several units, as illustrated in Appendix (**A6**. Number of Eco-Schemes per CSP). All ES are implemented nationally, except for those in Flanders and Wallonia, which operate at the regional level, and in Portugal (CSPs approved, 2023).

As previously discussed, the ES strategies vary significantly among Member States. Some MS, such as Cyprus, the Czech Republic, Hungary, Ireland, the Netherlands, and Slovakia, have chosen to propose one or two ESs with the aim of reaching all farmers.

In fact, CZ decided to propose only two ES. The reasoning for this decision is that overly specific and targeted measures could make it challenging for some businesses to qualify. Additionally, if the measures are too costly or require advanced technology, farmers may not be motivated to comply (CSPs approved, 2023).

Moreover, Article 31§8 allows for the use of a rating or other appropriate methodologies to ensure the effectiveness and efficiency of ES. The following four countries utilise these specific methodologies:

- Ireland: active farmers must implement at least two of the eight proposed agricultural practices, which are tailored to different farming sectors and intensities, to receive an ES payment.
- Netherlands: The NL points-based system is designed to encourage farmers to adopt more environmentally friendly farming practices.
- France: Farmers can receive ES funds through three approaches: certification, practices, and biodiversity-friendly elements.
- Hungary: HU employs a point system linked to acreage.

Other CSPs do not use the option to implement a rating system or national methodology (approved CSPs, 2023).

Lithuania, Slovenia, and Flanders propose the highest number of interventions, each offering more than 10 ES. Wallonia is at the median with five proposed ES, slightly below average.

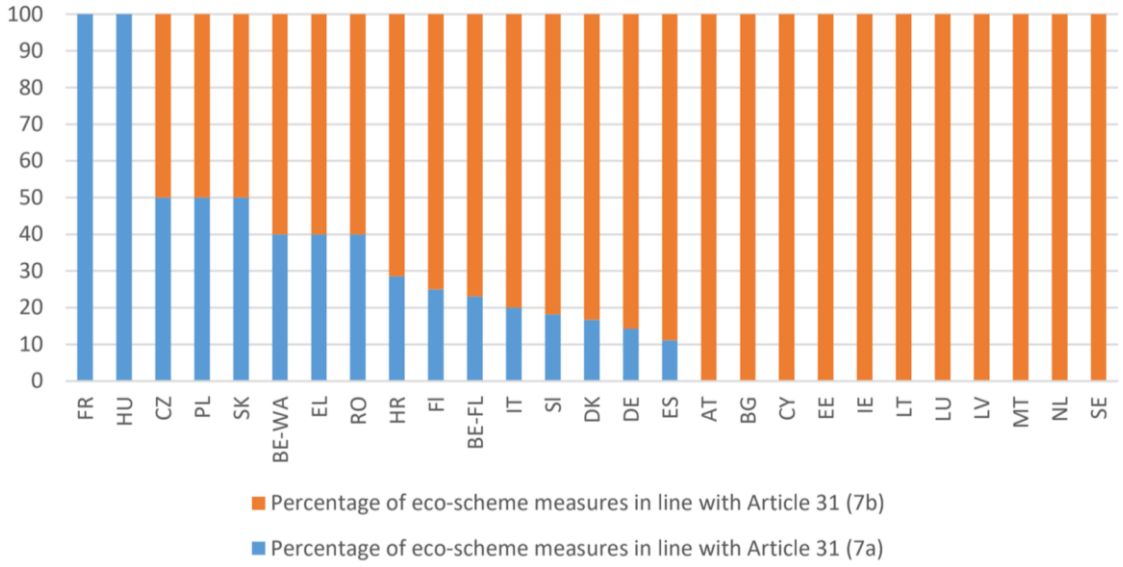
The allocation for ES is proportional to direct aid. Consequently, France, Spain, Germany, and Italy have larger ES budgets than Wallonia. Bulgaria, Spain, Greece, Germany, Malta, Denmark, Sweden, Cyprus, Finland, Slovenia, Hungary, and Austria invest less than 25% of their direct payment budget in ESs. In contrast, Wallonia, along with Latvia, Slovakia, Estonia, the Czech Republic, and the Netherlands, invests more than 25%.

ES may be supported under two different approaches (Article 31 §7 a and b), as shown in **Figure 5**:

- payments additional to the basic income support (a);
- payments compensating active farmers or groups of active farmers for all, or part of the additional costs incurred and income foregone as a result of the commitments made, taking into account the targets for Eco-Schemes; those payments may also cover transaction costs (b).

ES are direct payments, the design regarding the payment structure, impacts farmers' decision-making choices.

Figure 5: Eco-Scheme measures differentiated by type of payment, in relation to the total number of Eco-Scheme measures per approved CSPs



(Münch, A. et al., 2023)

Wallonia, along with BE_FL, CZ, DE, DK, EL, ES, FI, HR, IT, PL, PT, RO, SK and SI, finances its Eco-Schemes by combining both payment methods. In contrast, other Member States use only the compensatory

method (b), except for Hungary and France, which exclusively utilise the basic payment top-up method (a) (see **Figure 5**).

ES target different shares of the UAA per Member State. In fact, 50% of ES target a small share of UAA (less than 4% of national UAA). Meanwhile, 25% of ES with the largest share of the national UAA primarily focus on:

- animal welfare and pastures extensification (12-38% of UAA) (AT, BE_WA, DE, ES, IT, PL, Sl)
- crop rotation (16-68% of UAA) (BG, DE, ES, HR)
- soil protection and management (13-87%) (BE_FL, BE_WE, BG, CY, Fl, PL)
- organic farming (PT, LV and SE) both LV and SE Member States support organic farming almost entirely through ES.

Wallonia invests more funds in ESs related to Water and Soil areas compared to the EU mean and average, while investing less in Climate change and mitigation and adaptation, Biodiversity, Pesticides, and not at all in Animal Welfare (CSPs approved, 2023).

MS with single ES do not necessarily cover the entire UAA of their country. As an example, Hungary targets 50% of its UAA, Ireland targets 85%, and the Netherlands targets 83%. The UAA targeted by ES (O.8) should be considered separately to avoid double counting, as multiple ES might target the same UAA.

50% of ES target less than 4.6% of the UAA. In Wallonia, the share of UAA targeted by ES ranges from 2% to 86%. As shown in Appendix (**A7**. Relative importance of Member States' Eco-Schemes), the median share of UAA targeted by ES in Wallonia is higher than the EU average.

MS with two ES (CY, SK, CZ) implement one broad ES and a more specific one. While CY finances both ES equally, SK and CZ allocate their funding predominantly to the larger one.

There may be some proportionality between the funds and the area covered by the ES. For example, Italy invests 42.7% of its ES budget to cover 49% of its UAA. However, the amount of funding and the acreage covered by ES are not always correlated. Some small areas receive substantial funding; for instance, in Denmark, 31% of the ES budget is allocated to 4.23% of the UAA, while in Luxembourg, 28% of the budget targets 2% of the UAA. The exact numbers are available in Appendix (A7).

The fund ratio for ES in Wallonia is near the EU average of 10% and can go up to 36% (A7).

ES may target specific land types, such as arable land, grassland, or permanent crops, or they may cover a combination of these types. Typically, arable lands are more frequently targeted, followed by grasslands, with permanent crops being the least targeted. The ES financing strategy varies for each MS (A8. Number of Eco-Scheme measures by land targeted and by CSP). In Wallonia, four ES target arable lands, three target grasslands, and two target permanent crops.

About 42.4% of the ES apply to a specific type of land, which includes 14 MS (AT, BE_FL, CZ, DE, DK, EL, ES, FI, IT, LT, MT, RO, SE, SI). Of these 14 countries, six aim for more than 50% of their ES (BE_FL, CZ, EL, ES, FI, SE) with measures that have a specific land scope (CSPs approved, 2023).

Nine MS (DE, DK, IT, SI, BE_FL, EL, ES, FI, SE) invest a significant amount of their ES budget (20.1-91.3%) on measures with a specific land scope. Additionally, seven countries (DE, IT, SI, BE_FL, EL, ES, SE) specifically target certain land types of large areas (20.1-64.3% of UAA).

Moreover, agricultural practices associated with those lands may be varied or specific. In fact, 31.6% of ESs specify a particular agricultural practice. This is the case in Wallonia and 13 other MS (AT, BE_FL, BG, CZ, DE, EL, FI, FR, LT, MT, RO, SE, SI). Among these MS, only three predominantly offer specific ES, whereas Wallonia and 10 Member States (BE_FL, BG, DE, EL, FI, FR, LT, MT, RO, SI) prefer ES with a variety of practices (CSPs approved, 2023).

4.2. Characteristics of the Walloon Eco-Scheme design

This section presents the results related to the implementation of ES in Wallonia. It encompasses the creation and presentation of the developed Eco-Schemes as well as their dissemination and information campaigns.

4.2.1. CSP process of creation

The Walloon CSP was developed by the Walloon government in response to issues identified in the Walloon SWOT analysis and drawing from insights gained through participatory workshops. The creation of the ES entitled consultative meetings with various stakeholders. However, the decision-making power remained within the government's hands (SPW, 2022).

The list of stakeholders summoned to these workshops was provided by the government and included agricultural unions, environmental associations, ministerial cabinets (agriculture and environment), and SPW experts. External experts from advisory organisations and research centres were not invited but were available for consultation. Large meetings were initiated and later became more targeted. The CSP is a compromise between the different interests of the stakeholders and the political issues in Wallonia (SPW Agriculture Policy Directorate agent).

The budget allocated for the first pillar totalled €1.328 billion, with ES accounting for 26% of the first pillar budget, exceeding the minimum set by the EU Commission by 1% (Borsu W., 2024). Wallonia submitted its CSP proposal on 17 March 2022, after comprehensive consultations with stakeholders. Following the receipt of observations from the European Commission on 25 May 2022, a revised proposal was resubmitted on 18 November. The European Commission granted approval for the Wallonia CAP strategic plan on 5 December 2022 (EU Commission, 2024).

4.2.2. Walloon stakes and context

The Walloon SWOT analysis was conducted for each of the nine specific objectives of the CAP. This analysis identified 31 needs, which were subsequently prioritised in collaboration with stakeholders. The prioritisation was based on four criteria: severity (the importance of the need), relevance (effectiveness of interventions), transversality (whether the need spans multiple domains), and scope of the need (geographic coverage and affected populations). Each need's overall score was calculated by multiplying the severity by 2 and adding the other criteria, thereby emphasising needs where the CAP is most effective (SPW, 2022).

These prioritised needs are summarised in **Table 1**.

Table 1: Needs identified in Wallonia and specific objectives linked

Need		Specific Objective
A11	Supporting viable agricultural incomes	SO 1
A12	Combating the instability of farm incomes	
A13	Increasing the economic resilience of farms	
A14	Strengthen human capital through training and advisory services	
D11	Create general conditions enabling the transition of agricultural and forestry holdings	SO 4
D12	Reduce gas emissions from the agricultural sector	
D13	Promote carbon storage	
D14	Increase the resilience of agricultural and forestry holdings to climate change	
E11	Create general conditions enabling the transition of agricultural and forestry holdings	SO 5
E12	Preserve soil quality	
E13	Preserve water quality	
E14	Preserve air quality	
F11	Create general conditions enabling the ecological transition of forestry holdings	SO 6
F12	Support the evolution of agricultural practices towards practices favourable to biodiversity	
F13	Develop a coherent and sufficient ecological network for the conservation and sustainable use of biodiversity	
T11	Foster innovation in line with societal expectations	CCO
T12	Improve the dissemination of knowledge	

(Pieters and Vermeyen, 2022)

4.2.3. Walloon Eco-Schemes presentation

The ES in Wallonia aims to reward environment-friendly practices already in place that are not profitable for the farmer, as well as to encourage changes in practices. Wallonia implemented five ES, which are outlined in **Table 2**.

Table 2: Walloon Eco-Schemes

Eco-Scheme name	Description
Eco-Scheme: Long Ground Cover (LGC)	This ES aims to cover the soil from January 1 to February 15 to enhance water and soil quality, improve soil fertility, and have a positive effect on biodiversity and farmers' resilience against climate change.
Eco-Scheme: Environment Friendly Crops (EFC)	The ES aims to safeguard both surface and groundwater, diversify cultivated plant species, preserve soil quality, enhance food self-sufficiency, protect biodiversity and reduce ammonia emissions.
Eco-Scheme: Ecological Network (EN)	The ES aims to establish dedicated biodiversity zones within the agricultural landscape.
Eco-Scheme: Pesticide Reduction (PR)	This ES aims to compensate for the economic risks taken by farmers who avoid these biopharmaceutical products, thereby enhancing their farm's economic resilience.
Eco-Scheme: Pasture Extensification (PE)	This ES aims to encourage the reduction of livestock density per hectare.

(SPW, 2022)

The Walloon Eco-Schemes are explored in detail in Appendix (**A9** : Walloon Eco-Schemes).

ES payments are made downstream based on the specifications rather than the results. Most payments were made in February 2024 for the previous year, while the payment for the ES-EN was made in June. The synergies with the AECM, which are also part of the green architecture but come from the second pillar budget, will not be explored.

ES-LGC and ES-PE are the most significant ES in terms of financial share and UAA predicted within the ES budget and targeted areas. The lowest financial share of the predicted budget is allocated to ES-PR and ES-EFC. The predicted surfaces targeted for ES-EFC and ES-EN are the smallest (**Table 3**).

Table 3: Surface and Funding Ratio in Wallonia by Eco-Scheme

ES name	Ratio of ES Fund in Total ES Funding (%)	Ratio of Surface Area Covered by ES per UAA (%)
Long Ground Cover	28.85	86.61
Environment Friendly Crops	8.85	1.99
Ecological Network	16.88	3.66
Pesticide Reduction	8.89	10.45
Pasture Extensification	36.54	38.19

(SPW, 2022)

All ES areas are targeted except for animal welfare (**Table 4**). In Wallonia, animal welfare is already included in the Walloon Animal Welfare Code, and no requests were made on this subject during stakeholder consultation sessions (SPW Agriculture Policy Directorate agent).

Table 4: Areas targeted by Walloon ES

Areas targeted	ES-LGC	ES-EFC	ES-EN	ES-IR	ES-PE
Climate change mitigation	1	0	0	0	1
Climate change adaptation	0	1	0	0	1
Water	0	1	1	1	1
Soil	1	0	1	1	1
Biodiversity	0	0	1	1	0
Pesticides	0	1	0	1	0
Animal Welfare	0	0	0	0	0

0 Absent

1 Present

(Based on CSP Wallonia 2023)

In Wallonia, payment top-up method (a) is employed to pay for ecosystem services by recognising and compensating the farmer's efforts, promoting a paradigm shift and valuing those who adopt this philosophy. This approach concerns ES-LGC and ES-EN, where income loss is challenging to estimate. However, evaluating these ecosystem services is complex and inadequately documented.

Therefore, the compensatory method (b) is used when previous ecosystem services approaches are not feasible. This method is based on a market-based logic to estimate potential losses associated with ES-PR, ES-PE, and ES-EFC (SPW Agriculture Policy Directorate agent).

Arable land, grassland, and permanent crops are each targeted by at least two ES (**Table 5**). Wallonia proposes ES with a wide scope of applications (CSP WA). The SPW justifies this choice by stating that it allows for broad accessibility and encourages good participation while maintaining genuine environmental commitment. This is also why the number of ES is limited. The five ESs address Wallonia's key priorities and are designed to fit the profiles of impacted farmers. Additionally, having fewer ESs makes it simpler and easier to control, ensuring clarity for the Walloon CAP. The practices are not overly specific, as the aim is to avoid overly restricting farmers and to prevent confusion (SPW Agriculture Policy Directorate agent).

Table 5: Type of land target by Walloon ES

Land Targeted	ES-LGC	ES-EFC	ES-EN	ES-IR	ES-PE
Arable Land	1	1	1	1	0
Grassland	1	0	1	0	1
Permanent Crop	0	0	1	1	0

0 Absent

1 Present

(Based on CSP Wallonia 2023)

4.2.4. Dissemination and transmission of information on Eco-Schemes

Innovations and the content of the Eco-Schemes must be communicated to farmers for the effective implementation. This section focuses on presenting the dissemination and transmission of ESs to farmers.

In Wallonia, this aspect is managed by a network of stakeholders, including the SPW, advisors, and agricultural unions. SPW transmits information and updates via the internet (SPW portal, 2023). This is supplemented by information sessions conducted by the seven external services in collaboration with the paying agency (OPW).

In 2022, the Walloon Minister of Agriculture, Willy Borsus, conducted a "PAC Tour" from October 11 to 21 across the entire Walloon Territory, during which he presented the new CAP and ES (SPW portal, 2023). In this presentation, ES are introduced as incentives and rewards for farmers engaged in environment-friendly practices. The minister also directly linked these ES to the green payment of the previous CAP period, presenting them as a direct continuation of this former measure with a 4% reduction in the first pillar budget allocation. Furthermore, he presented them as an integral part of the 74% of the first pillar budget dedicated to supporting farmers' income (*Nouvelle PAC en vigueur dès le 1er janvier 2023*, 2022).

The external service conducted informational sessions during the winter of 2023 to disseminate new CAP information to farmers in collaboration with the paying agency (OPW). Subsequently, a FAQ was made available to enable communication with experts and to answer questions raised during these sessions. Additionally, a CAPaid simulator tool was provided to help farmers understand the impact on their finances and adjust their strategies and business plans accordingly (external service SPW agent).

The effectiveness of these informational tools was limited because their implementation occurred close to the CAP declaration period, and numerous modifications were subsequently made. As a result, farmers did not have the opportunity to respond to the proposed measures or to adjust their operational strategies, explains an external service SPW agent. Additionally, the rapid withdrawal of the aid simulator following these numerous modifications may have given the impression that the simulator was unreliable and fostered distrust among farmers.

The agent explains that, in agriculture, there are two types of deadlines: agronomic and administrative. To ensure coherence and avoid a disconnect between the two, it is important to have upstream discussions with stakeholders, especially farmers, about the policies being implemented. However, the short timeframe mentioned prevented this process and led to certain inconsistencies and difficulties in facilitating the adoption of measures from an economic and agronomic perspective (external service SPW agent, 2024).

For example, the list of prohibited molecules for the ES-PR was released after the start of the CAP period and was insufficiently considered. This ES targets maize, among other crops, but the communication regarding the incompatibility of the substance in seed coatings with this ES came too late. Farmers had already purchased coated seeds, and the removal of this incompatibility also came too late relative to the 2023 surface area declaration deadlines, impacting farmers (external service SPW agent, 2024).

In fact, farmers must commit before knowing the full details of the measures and cannot assess their impact on the direction of their operations. According to the agent, this aspect played a significant role

in whether certain farmers chose to commit to the measure or not. It also raised questions about trust in the SPW and the EU.

The SPW payment agency (OPW) is also linked to farmers' decision-making. In addition to informational meetings organised with the external service, it offers its services to farmers to help them practically complete their CAP declarations. However, many farmers rely on this assistance for advice, explains the advisor from BioWallonie and the SPW external service agent. But the advisory aspect represents a conflict of interest, and the administrative advisors from this department do not have the adequate expertise for agronomic consultancy.

This competence is offered outside the public service through a network of actors specialised in consultancy. Agricultural Knowledge and Innovation Systems (AKIS) program of the Walloon CAP plan belongs to the transversal objective and was chosen to connect the actors of this network. Indeed, in the Walloon SWOT analysis, it was identified that there was a lack of interaction among all these actors. Therefore, it was decided to use CAP funds to facilitate the flow of information and interactions among all these actors. To this end, a platform will be set up with resources from technical assistance (SPW, 2022).

Walloon SWOT analysis identifies that training programs for farmers insufficiently integrate aspects related to climate and the environment. The AKIS program, through its platform, will be able to highlight training on the environment and green architecture, explains the head of AKIS at the SPW. Additionally, the allocated budget is used to finance technical assistance (evaluation, administrators, and the Walloon CAP network). In this context, operational groups are also initiated and financed to put innovation into practice. It would be conceivable to use such operational groups for innovations on ES using a bottom-up method. However, currently, there are no interventions set (AKIS SPW responsible, 2024).

However, using an external consultancy service outside the SPW raises questions of data protection and incurs a cost for the farmer, reminds the agent from the external SPW service.

Subsequently, opinions from private advisors in both organic and conventional agriculture were collected. The advisors agree that the CAP has become increasingly complicated, which requires advisors from the “Fédération Wallon de l’Agriculture” (FWA) to attend numerous meetings to provide advice because "it has become very complicated". Additionally, they state that advisors find themselves explaining the CAP to farmers in addition to giving advice because “they are lost.” (FWA advisor, 2024)

The green architecture approach complicates the regulations, and all advisors recognise that the controllable aspect is complicated and that finding a middle ground is not easy. The ES are presented by all advisors as the continuation of the greening of the former CAP. For them, it is now necessary to find this money through the ES to make up for the loss, whereas before it was almost automatic. This perspective was conveyed by the “PAC tour”, justifies the BioWallonie advisor.

During the presentation by advisors at the “Collège des producteurs” presentation, the reflection on the economic model with a "farm management" approach to seek subsidies is highly debated. The change in practices is not their approach advanced by the advisors. For the consumer and the farmer, the primary concern is the price, and then the environment comes second, so if there is an issue with the first, it gets pushed to the background (Collège des producteurs, 2024).

The relationship between the work cost and the subsidy is presented as the key component to consider for the adoption of the ES. They are presented as a way to enhance less productive lands (Collège des producteurs). The FWA advisor states that farmers who adopt ES are those who already have marginal plots but not the priority regions (FWA advisor, 2024).

The question of the evolution of compensatory aids compared to market prices is raised, as well as the budget amount, by the advisors from the “Collège des producers” and the FWA.

The organic advisor talks about the possible accumulation of aid in organic farming, particularly the balance between the CAP organic aid and the coupled protein crop aid. "It is more advantageous to have substantial organic aid along with the coupled aid than to commit to ES-EFC, which pairs with lower organic aid."

Additionally, all advisors agree that these public subsidies are absorbed by various stakeholders in the food supply chain, meaning that farmers do not retain the full benefits of these subsidies. For example, traders purchase fava beans from farmers at a price €100 lower than previously, with the reduction justified by the availability of these subsidies. Only autonomous livestock farming in short supply chains seems unaffected by this problem.

From an agronomic perspective, advisors share concerns about "contaminating the land" by implementing environmental measures, such as a bee-friendly fallow, which could attract aphids (Collège des Producteurs, 2024), and in organic farming, the difficulty of addressing such problems without pesticides (BioWallonie advisor, 2024). More specifically, for ES-LGC, the cost of cover crops is highlighted (Collège des Producteurs, 2024). Also, its connection to the use of glyphosate in conventional farming is raised, as well as the challenge of destroying the cover crop mechanically in organic farming under unfavourable weather conditions. These issues are becoming more frequent with climate change (BioWallonie advisor). Furthermore, this measure with heavy soils, such as clayey in some regions, is not suitable, preventing these farmers from accessing these funds. The BioWallonie advisor recommends not opting for the highest level to adapt (BioWallonie, 2024).

Climatic events are pushing farmers to adapt, and for this reason, in 2023 and 2024, many purchased seeds could not be sown. This, according to him, makes the early acreage declaration with the rotation plan of this ES inconsistent (BioWallonie advisor, 2024).

ES-EFC is presented as interested in less productive regions (Collège des Producteurs, 2024), and organic actors were consulted during its development. Nevertheless, some minor improvements could be made, mentions the BioWallonie advisor. For example, in Variant 1 of the ES-EN (outlined in Appendix **A9**. Walloon Eco-Schemes), vetch is an agronomically unappealing, non-climbing annual and could be removed. Conversely, Variant 2 could benefit from incorporating species such as chia, amaranth, millet, winter rye, and chickpeas to offset the financial risks associated with their cultivation. These species can enhance farm resilience, diversify income sources, improve soil quality, and increase crop diversity (BioWallonie advisor, 2024).

ES-EN received no agronomic criticism from the advisors except for cereals left standing, which now sustain artificial pest populations, maintain scorch pathogens, and immobilise nitrogen for the next crop (BioWallonie advisor, 2024).

Thanks to the modifications implemented in 2024, ES-PR which includes mechanical weeding, and ES-PE which involves changes to spreading constraints, have been positively evaluated.

Close to the farmers and acting as links with other network agents, the Walloon unions are very active. They defended their members' interests during the creation of the CSP as well as its modifications and continue to gather farmers' opinions through the working groups they organise. Some, like the FWA, offer advisory services.

Both the FWA and the "Union Nationale des Agrobiologistes Belges" (UNAB), which were interviewed, expressed dissatisfaction with the outcomes of the participatory meetings for the Walloon CAP plan and said they did not feel heard.

4.3. Eco-Scheme adoption by Walloon farmers

This section presents the results regarding the adoption of Eco-Schemes by Walloon farmers in 2023, along with the endogenous, exogenous, and perceptual factors influencing this adoption.

4.3.1. Eco-scheme adoption by Walloon farmers in 2023

To transition from the strategic framework outlined in the CAP to the practical realities of the field implementation, we examine the outcomes of the first year (2023). According to the annual performance report by the SPW, the areas covered by ES are largely in line with the planned values. However, there were discrepancies: the coverage for ES-PR was below expectations due to the late publication of the list of prohibited substances, and the coverage for ES-EFC had to be estimated due to a change in the harvest date for a variant (SPW, 2024a).

The OPW data provide a basis for analysing the adoption rates of these ES.

ES-LGC has the highest adoption rate, which can be explained by its continuity with the greening measure, a practice already known. The scheme ES-PE has the second-highest adoption rate at 51.21%. ES-EFC, being more specific, targets fewer farmers and has an adoption rate of 11.63%. The scheme ES-PR is only 2.12%, due to a delay in communicating the list of banned substances, resulting in the lowest adoption rate (**Table 6**).

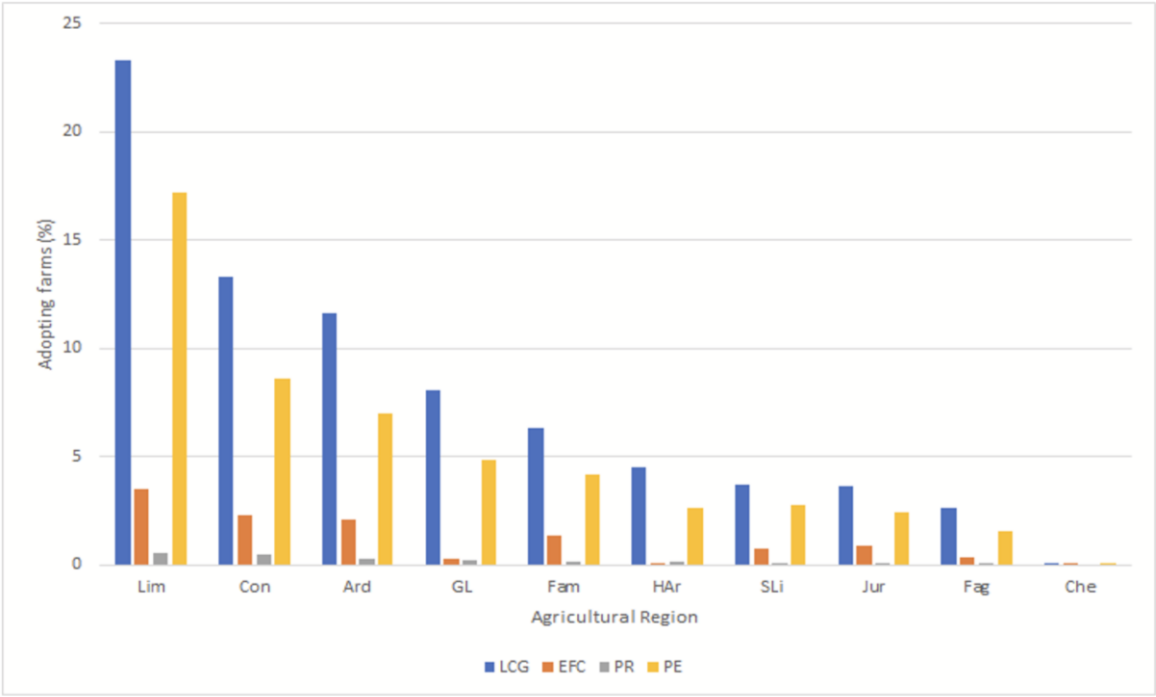
Table 6: Percentage of farms adopters in Wallonia by ES in 2023

Eco-Scheme	ES-LGC	ES-EFC	ES-PR	ES-PE
Number of adoptants	9364	1411	257	6214
Percentage of adoptants (%)	77.17	11.63	2.12	51.20

(Based on OPW data 2024)

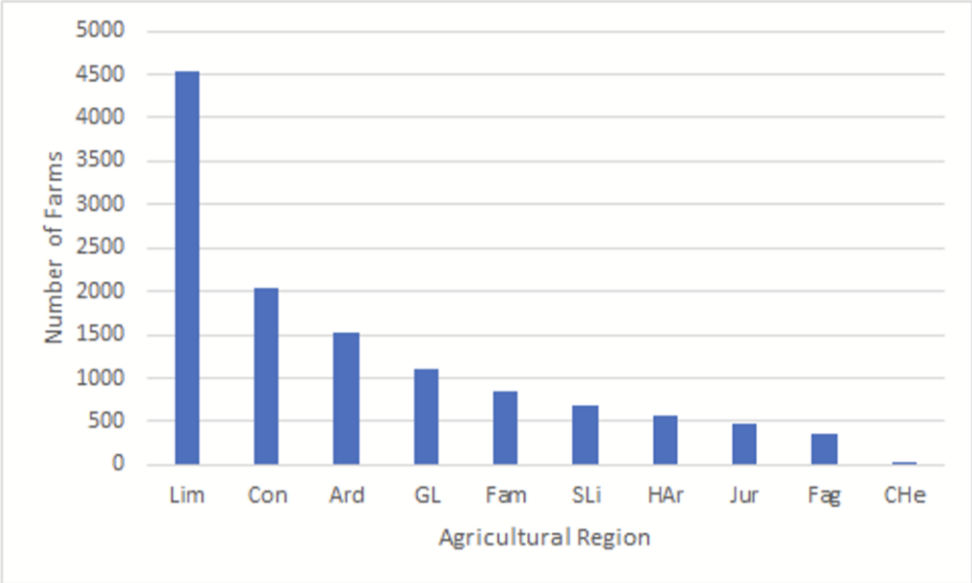
The adoption of ES generally follows the number of farms distributed by AR (**Figure 7**), except for ES-EFC, which is linked to the TF field crop (100) (**Figure 6**).

Figure 6: Eco-Schemes distribution of farm adopters in Wallonia based on their Agricultural Regions (in 2023)



(Based on OPW data 2024)

Figure 7: Number of farms by Agricultural Region (in 2023)

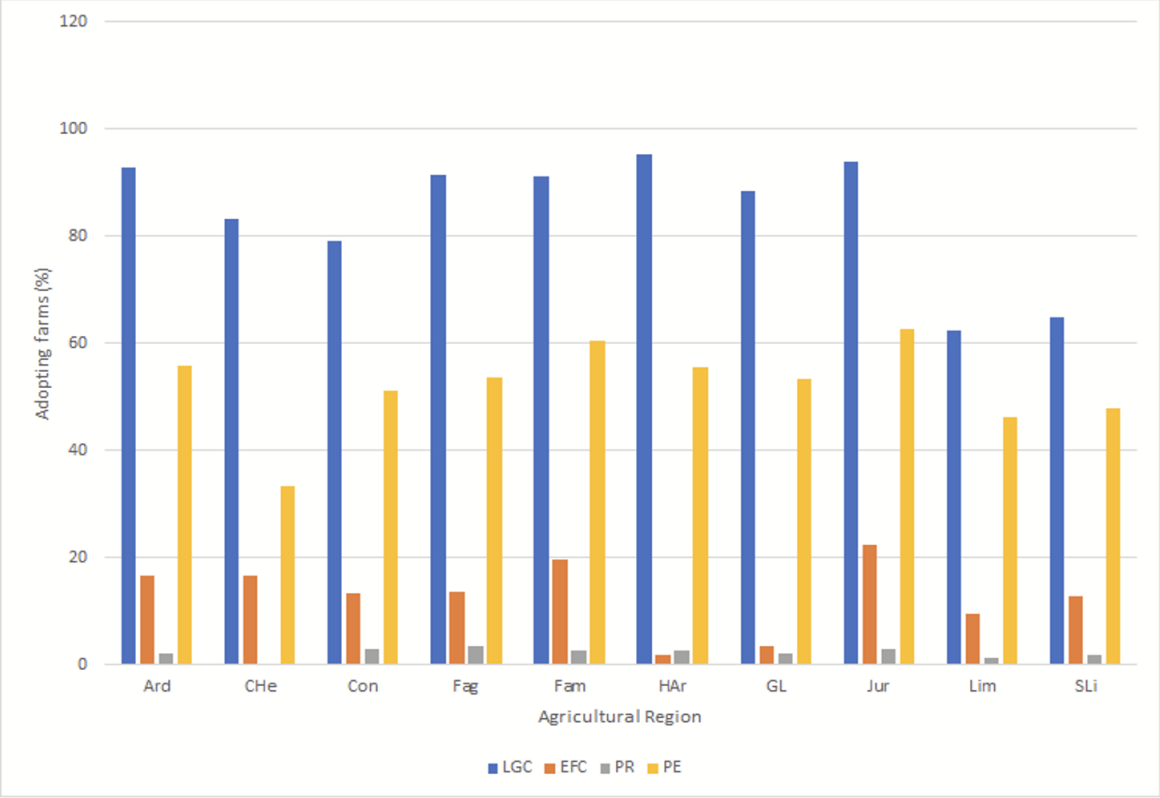


(Based on OPW data 2024)

ES-LGC adoption is above 60% in all ARs. The adoption of this ES is close to or exceeds 80%, except for Limey and Sandy-Limestone, around 60%. ES-EFC has low adoption rates, ranging from 2% to 22%, with the Haute Ardenne and Grassland regions having the lowest adoption rates. ES-PR has equivalent

adoption rates between regions and is very low, between 1.5% and 3.5%. ES-PE adoption rate is close to or above 80%, except for Sandy-Limestone and Limey regions, similar to ES-LGC (**Figure 8**).

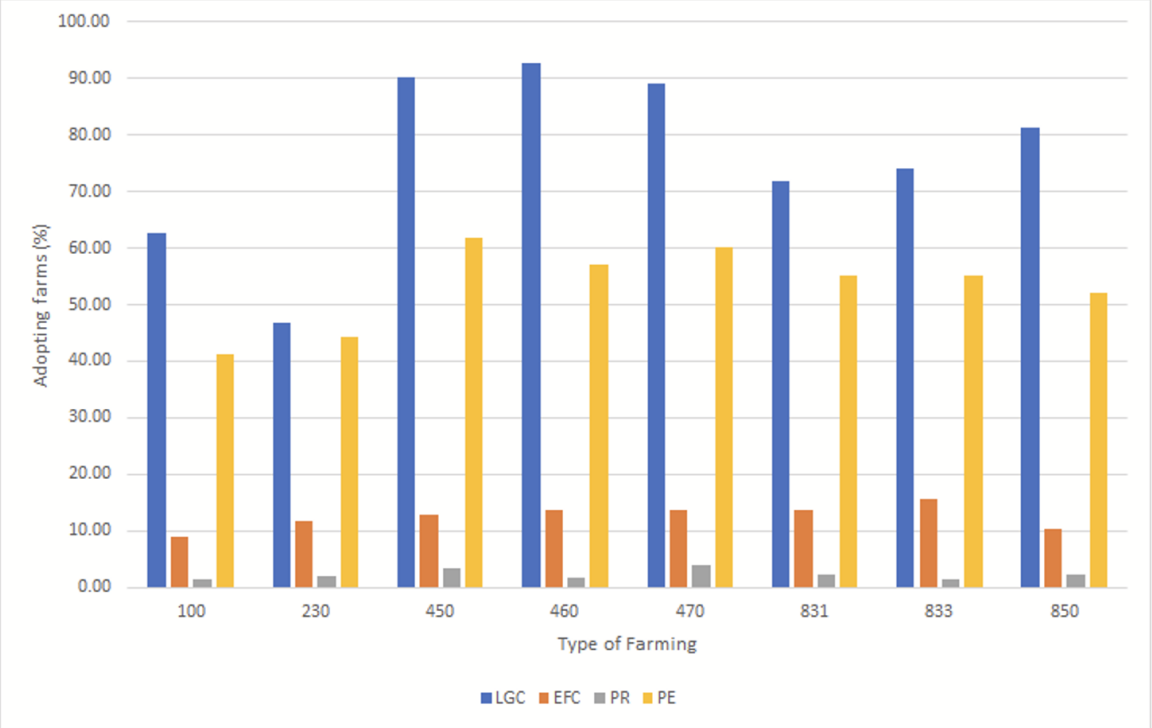
Figure 8: Eco-Schemes adoption rate by Agricultural Region (in 2023)



(Based on OPW data 2024)

The TF with the highest adoption is field crop specialists (100), followed by cattle rearing (450,460, 470), which are the predominant TFs in Wallonia (**Figure 9**).

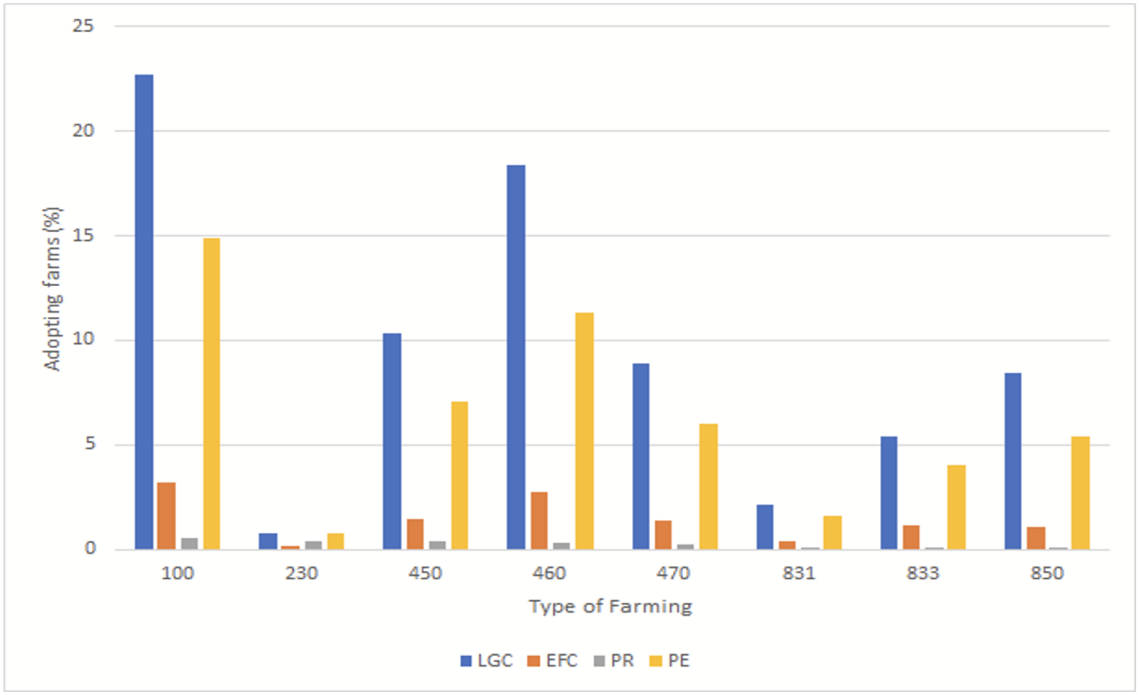
Figure 9: Eco-Schemes distribution of farm adopters in Wallonia based on their Type of Farming (in 2023)



(Based on OPW data 2024)

Cattle rearing has the highest adoption rate of ESs within its TF. For ES-LGC, cattle farming adopts at over 90%, while field crop specialists adopt at 60%. ES-PE is adopted by more than 50% of cattle farmers. ES-EFC is adopted at rates between 8 and 15% within each TF in a roughly equivalent manner. ES-PR has too few adopters to identify any trends (**Figure 10**).

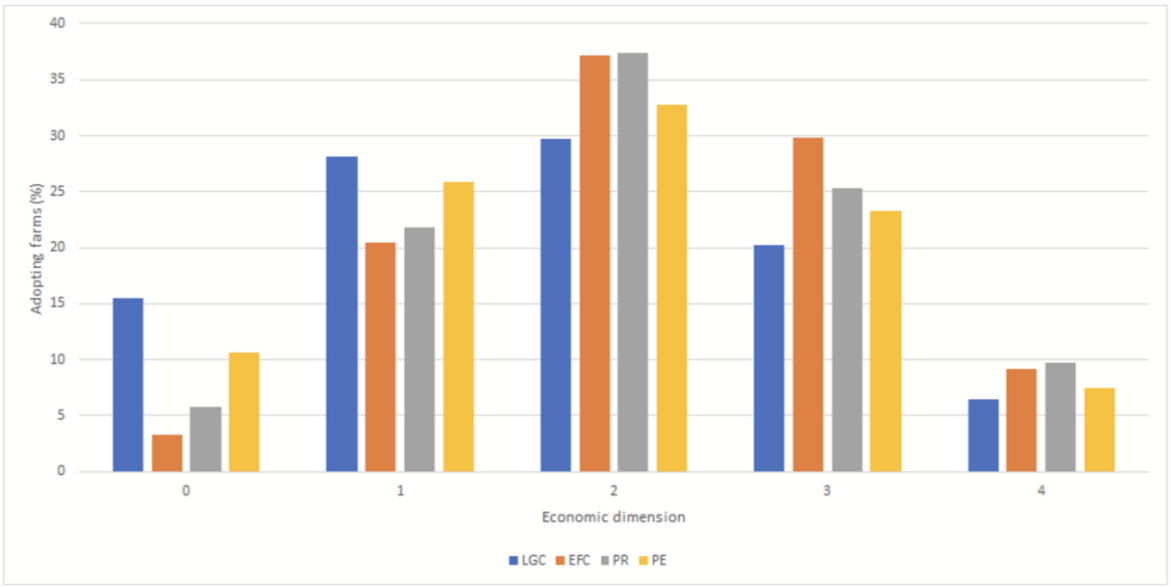
Figure 10: Eco-Scheme adoption rate by Type of Farming (in 2023)



(Based on OPW data 2024)

The second economic dimension class adopts ES most extensively, followed by the second class. The classes 0 and 4 exhibit the lowest adoption rates (**Figure 11**).

Figure 11: Eco-Schemes uptake distribution by economic dimension in Wallonia (in 2023)



(Based on OPW data 2024)

4.3.2. Analysis of farmer profiles and variables correlated with the receipt of ES-LGC and ES-EFC financial amounts

This chapter presents the results of examining the relationships between farmers and the financial support levels of ES-LGC and ES-EFC.

4.3.2.1. Linear relationship between variables and Eco-Schemes

The section presents the results of the linear relationship between variables and the amount received from ES-LGC among adopting farmers.

4.3.2.1.1. ES-LGC linear relationships

All figures referenced in this section can be found in the Appendix (**Tables A10** and **A11**, which present the linear relationship tests between the amount of ES paid and each variable).

Structural variables

Linear regressions between the indicators are not significant or are very weakly explanatory (Pr F > 0.05 and R^2 too low). Gender, age, and the number of farmers do not seem to significantly influence the adoption of ES-LGC.

However, analysis of variance shows that the **legal form** has a significant effect (p-value < 0.05) on the variable ES-LGC (p-value < 0.05). Tukey's HSD post-hoc test reveals significant differences (p-value < 0.05) between the means of ES-LGC for all comparisons between legal form groups.

Aid CAP variables

A linear regression model reveals a statistically significant positive relationship between “ES-LGC” and **coupled payment (CP)** ; **Basic payment (BP) ; Redistributive Payment (RP) ; Young Farmer payment (YFP)** (p-value < 0.05). This suggests a correlation whereby elevated values of CP, BP, RP, and YFP are associated with higher values of "ES-LGC." Specifically, the analysis reveals that YFP accounts for a substantial proportion of the variance in "ES-LGC," whereas BP, CP, and RP contribute moderately. Conversely, organic payment does not present a significant link.

Production variables

Significant linear regressions (p-value < 0.05) show a strong relationship between the **number of cattle, forage surface** and the **Permanent Pastures surface**. Other linear regression models involving production variables do not exhibit significant relationships or demonstrate only weak explanatory representation.

An analysis of variance shows that the factor **economic dimension, Type of Farming** and **agricultural region** have a significant effect on the variable ES-LGC (p-value < 2e-16). Tukey's HSD post-hoc test reveals significant differences (p-value < 0.05) between the means of ES-LGC for all comparisons.

4.3.2.1.2. ES-EFC linear relationships

Structural variables

Linear regressions between the indicators are not significant or are very weakly explanatory. Gender, age, and the number of farmers do not have a significant relationship with ES-EFC amount receipt. However, analysis of variance shows that the **legal form** has a significant effect (p-value < 2e-16) on the variable ES-EFC. Tukey's HSD post-hoc test reveals significant differences (p-value < 0.05) exclusively between the "PP" and "PM" groups for the ES-EFC amount received.

Aid cap variables

All of the linear regressions between the indicators and ES-EFC are **not significant** or are very weakly explanatory.

Production variables

Significant linear regressions (p-value < 0.05) show a moderate positive relationship between **UAA** or **cereal crop surface** and ES-EFC amount received. The other regressions do not show a significant [lt2] relationship or a weak one.

An analysis of variance shows that the factor **economic dimension** has a significant effect on the variable ES-LGC (p-value < 2e-16). Tukey's HSD post-hoc test reveals significant differences (p-value < 0.05) between the means of the group composed of dimensions 0 and 1 and the group consisting of dimensions 2, 3, and 4 regarding behaviour toward the amount of ES-EFC received.

The analysis of variance also shows that **Type of Farming** and **Agricultural Region** have a significant effect on the variable ES-EFC (p-value < 2e-16). However, Tukey's HSD test reveals that there are no specific pairwise comparisons between TF or AR for the amount of ES-EFC received (p-value > 0.05).

4.3.2.1. Farmers' profile based on the ES-LGC and ES-EFC amounts received

This section presents the results of the farmer profiles identified based on the ES-LGC and ES-EFC amounts received.

4.3.2.1.1. ES-LGC typology

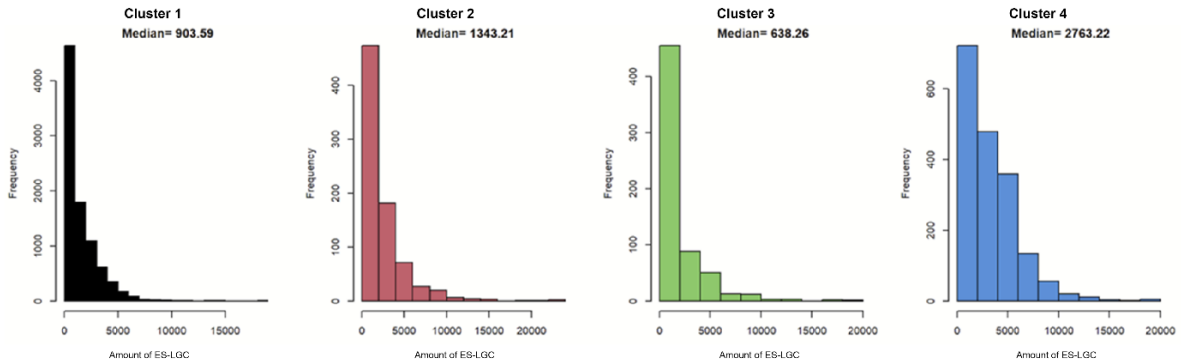
The adoption of ES-LGC is characterised by a mean value of €2,286.37 and a median of €1,676.94. The interquartile range is €2,383.63, with the first quartile at €752.51 and the third quartile at €3,136.14.

Structural clustering

The clustering analysis, based on structural variables and the amount of ES-LGC received by farms, results in four distinct groups, as illustrated in **Figure 13**. Also, **Figure 12** displays the frequencies of the amounts of ES-LGC received by farms in Wallonia in 2023, categorised by cluster.

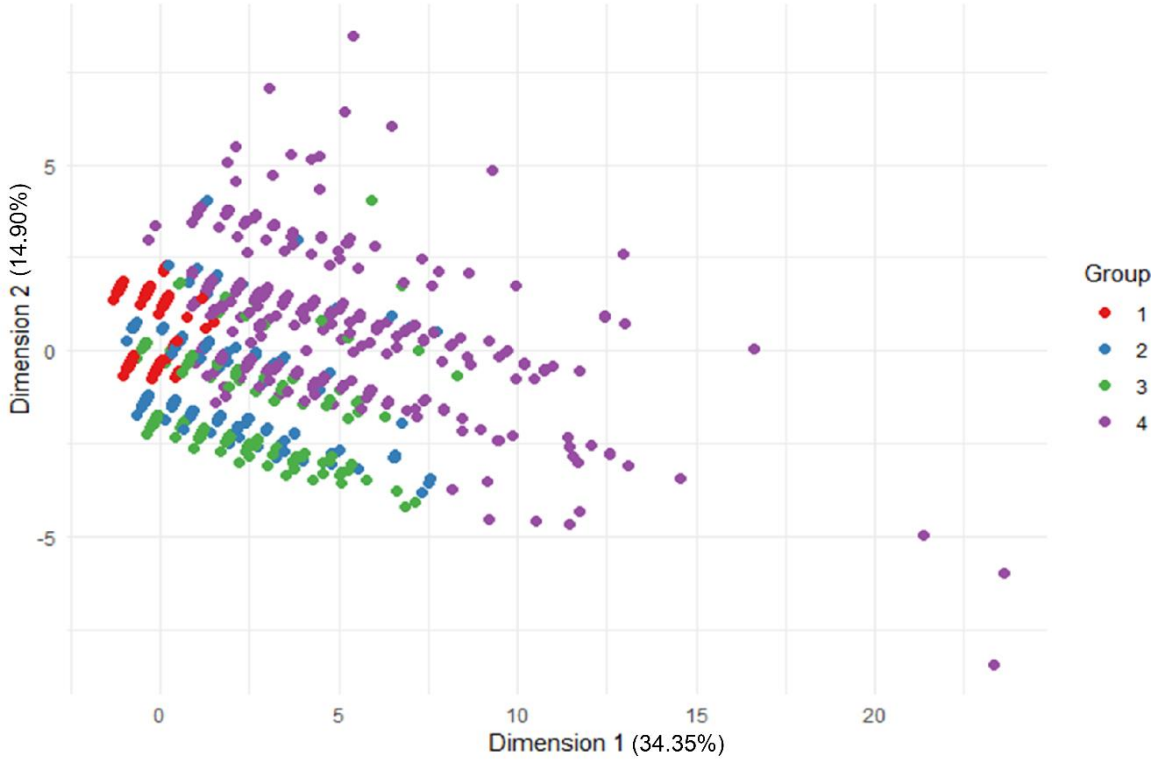
PCA and AFDM are utilised solely as pre-processing steps to enhance clustering quality; thus, they will not be detailed here. Additionally, graphical representations of the clustering results will be limited to the first two dimensions.

Figure 12 : Structural clustering frequency of ES-LGC adoption perceived by farms in Wallonia (in 2023)



(Based on OPW data 2024)

Figure 13 : Structural clustering individual projection on the first two dimensions of ES-LGC



(Based on OPW data 2024)

The distribution of young farmers, farm owners, and gender follow a consistent pattern. Typically, farms are operated by one or two individuals, with a predominance of men. Young farmers and women are less common, and their presence increases with the size of the farm.

Cluster 1 (red) comprises 8,861 farms, representing 73% of the total. It is characterised by a legal form of **"natural person"**. This group receives a mean of €1,441 and a median of €903 in ES-LGC.

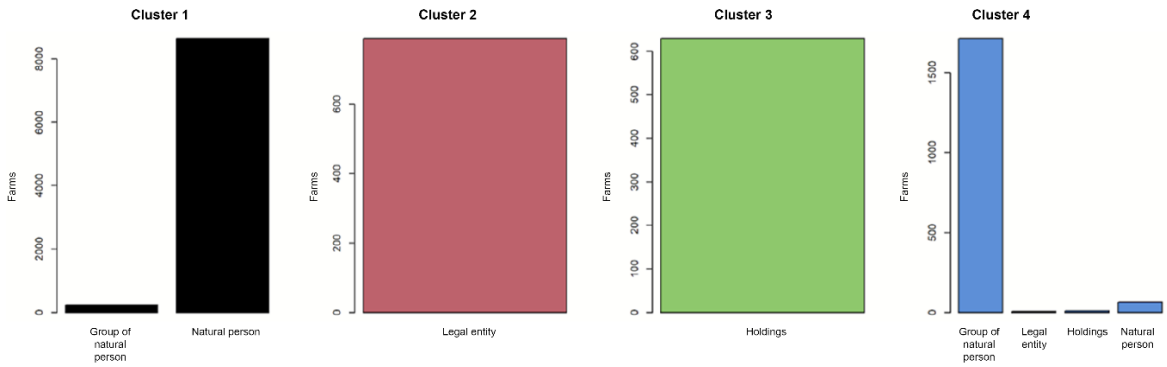
Cluster 2 (blue) consists of 789 farms, accounting for 7% of the total. It is characterised by a legal form of **"legal entity"** and receives a mean of €2,215 and a median of €1,343 in ES-LGC.

Cluster 3 (green) includes 629 farms, representing 5% of the total. It is characterised by a legal form of **"holdings"** and receives a mean of €1,632 and a median of €638 in ES-LGC.

Cluster 4 (purple) comprises 1,790 farms, representing 15% of the total. This cluster has the **highest number of farmers**, including a higher proportion of women and young farmers (more than two). It predominantly has a legal form of "group of natural persons" and receives the highest average ES-LGC, with a mean of €3,172 and a median of €2,763.

The distribution of farms by legal form across clusters is depicted in **Figure 14**.

Figure 14 : Distribution of farms by legal form across clusters



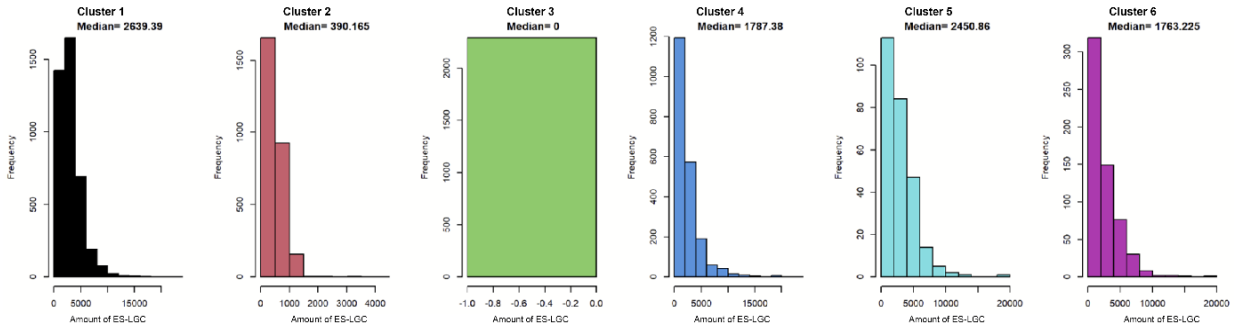
(Based on OPW data 2024)

Results from the Kruskal-Wallis test (chi-squared = 748, p-value < 2.2e-16) and Dunn's post-hoc test reveal statistically significant differences in the distribution of the amount received from ES-LGC (p-value < 0.05) among the groups. Specifically, Groups 1, 2, and 3 exhibit significantly different distributions of "ES-LGC" compared to Group 4.

CAPaid clustering

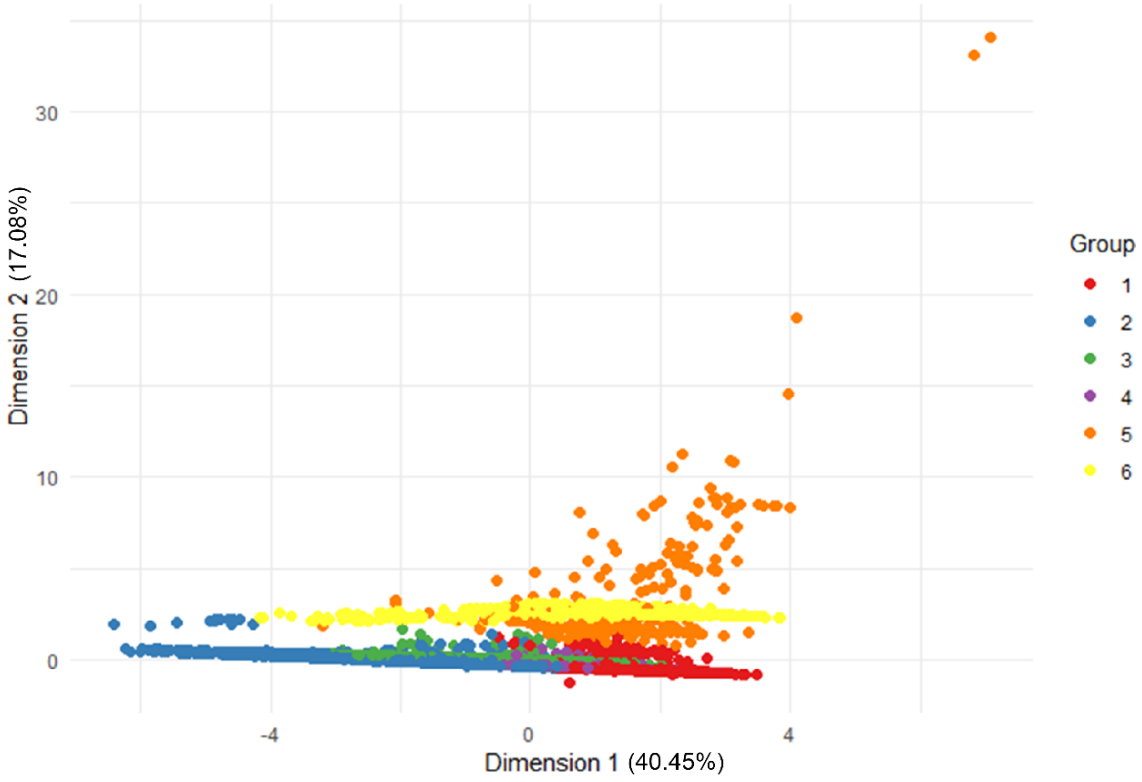
The clustering analysis, based on CAPaid variables and the amount of ES-LGC received by farms, results in six distinct groups, as illustrated in **Figure 16**. Also, **Figure 15** displays the frequencies of the amounts of ES-LGC received by farms in Wallonia in 2023, categorised by cluster.

Figure 15 : Structural clustering frequency of ES-LGC adoption perceived by farms in Wallonia (in 2023)



(Based on OPW data 2024)

Figure 16 : CAP aid clustering individual projection on the first two dimensions of ES-LGC



(Based on OPW data 2024)

Cluster 1 (red) comprises 4,081 farms, representing 34% of the total. This cluster is characterised by the **absence of YF aid**. Farms in this cluster receive a **high PB**, with a mean of €8,262 and a median of €7,015. They also receive a mean of €3,087 and a median of €2,639 in ES-LGC.

Cluster 2 (blue) consists of 2,748 farms, accounting for 23% of the total. This cluster is characterised by receiving the **least PB**, with a mean of €1,028 and a median of €906. **RP is lower** compared to other groups, with a mean of €1,637 and a median of €1,547, compared to a median of €4,000 in other

clusters. Farms in this cluster receive relatively **low ES-LGC payments**, with a mean of €446 and a median of €390.

Cluster 3 (green) includes 2,292 farms, representing 19% of the total. This cluster is characterised by the **absence of YF aid**, and the **BP is average** compared to other clusters, with a mean of €6,326 and a median of €4,546. Farms in this cluster do not receive ES-LGC payments.

Cluster 4 (purple) comprises 2,093 farms, representing 17% of the total. This cluster is characterised by the **absence of YF aid and CP**. It has an **average BP** compared to other groups, with a mean of €9,828 and a median of €5,310. Farms in this cluster receive ES-LGC payments, with a mean of €2,526 and a median of €1,787.

Cluster 5 (orange) comprises 267 farms, representing 2% of the total. This cluster is notable for being the **only group with significant organic payments,** with a mean of €3,375 and a median of €2,252. It also has a **high BP** compared to other clusters, with a mean and median of €8,532. CP is substantial, with a mean of €7,098 and a median of €3,212. Farms in this cluster receive ES-LGC payments, with a mean of €2,752 and a median of €2,450.

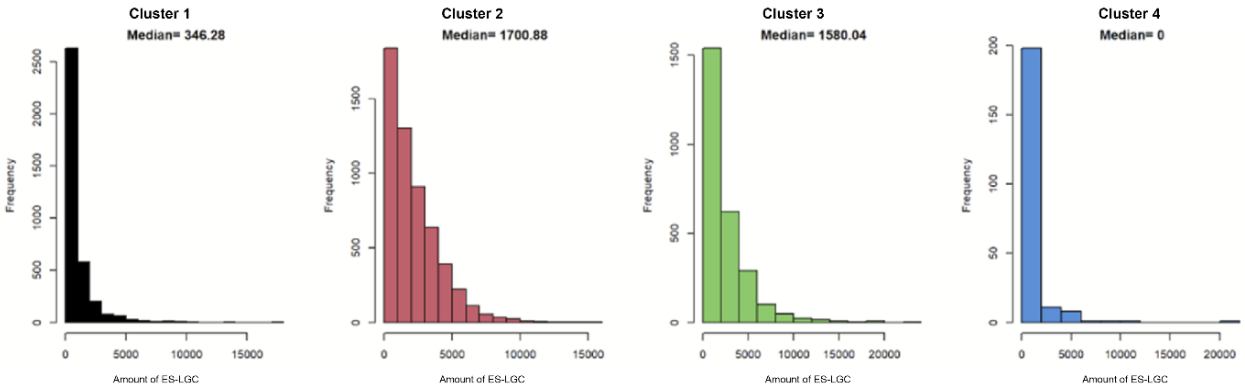
Cluster 6 (yellow) comprises 588 farms, representing 5% of the total. This cluster is unique for receiving **significant YF payments,** with a mean of €7,229 and a median of €8,105. It also receives a **high BP,** with a mean of €8,673 and a median of €7,762, and CP with a mean of €7,098 and a median of €3,212. Farms in this cluster receive ES-LGC payments, with a mean of €2,340 and a median of €1,763.

Results from the Kruskal-Wallis test (chi-squared = 8654, p-value < 2.2e-16) and Dunn's test indicate that the distribution of ES-LGC aid is different in some clusters (p adj < 0.05). Clusters 1, 2, and 3 have significantly different distributions of the variable "ES-LGC" from each other. Cluster 4 has a significantly different distribution of the variable "ES-LGC" from clusters 1 and 3, but not from cluster 2. Clusters 5 and 6 have significantly different distributions of the variable "ES-LGC" from all other clusters.

Production clustering

The clustering analysis, based on production variables and the amount of ES-LGC received by farms, results in four distinct groups, as illustrated in **Figure18**. Also, **Figure 17** displays the frequencies of the amounts of ES-LGC received by farms in Wallonia in 2023, categorised by cluster.

Figure 17 : Production clustering frequency of ES-EFC adoption perceived by farms in Wallonia (in 2023)



(Based on OPW data 2024)

Figure 18 : Production clustering individuals projection on the first two dimensions of ES-LGC

(Based on OPW data 2024)

Cluster 1 (red) represents **cereal farmers**, comprises 3,633 farms, representing 30% of the total. This cluster is characterised by predominantly producing cereal crops (mean 11 ha, median 6 ha) and having a low permanent pasture area (mean 9 ha, median 3 ha). The primary types of farming are field crops (100) and poultry, sheep, and goat rearing (850), with farms mainly located in the Limey region, as well

as Sandy-Limestone, Condroz, Grassland, and Ardenne regions. The **economic dimensions are 0 and 1**. Farms in this cluster receive ES-LGC funding with a mean of €849 and a median of €346.

Cluster 2 (blue) represents **livestock farmers**, consists of 5,550 farms, accounting for 46% of the total. This cluster is characterised by owning a significant number of cattle (median 105), producing forage crops (mean 11 ha, median 5 ha), and having a high permanent pasture area (mean 42 ha, median 35 ha). The primary types of farming are cattle rearing (450, 460, 470), some field crops (100), and poultry, sheep, and goat rearing (850). Farms in this cluster are distributed across all agricultural regions, with a particular concentration in Ardenne, Grassland, and Limey regions. The **economic dimensions are 1, 2, and 3**. This cluster receives ES-LGC funding, with a mean of €2,167 and a median of €1,700.

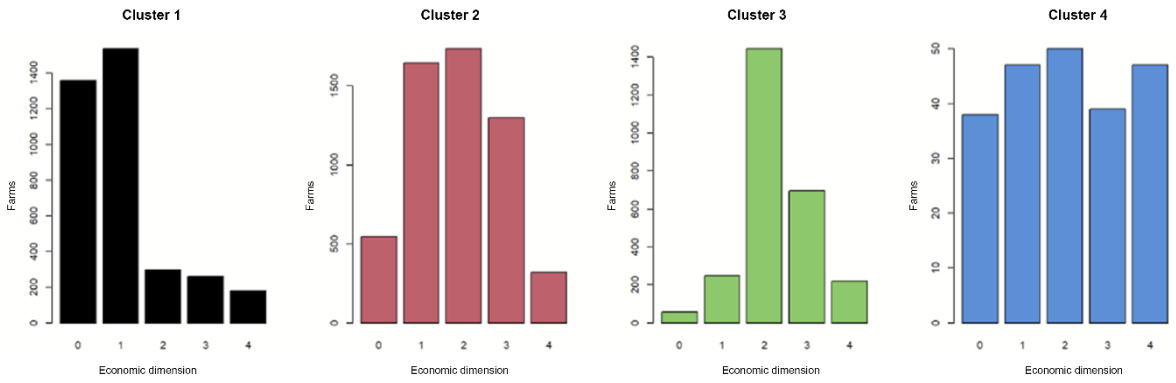
Cluster 3 (green) represents **arable farmers**, includes 2,665 farms, representing 22% of the total. This cluster is characterised by owning few cattle but a high area of forage crops (median 5 ha, mean 8 ha), cereal crops (mean 54 ha, median 31 ha), industrial crops (mean 11 ha, median 8 ha), and potato crops (mean 10 ha, median 8 ha). The primary types of farming are field crops (100) and mixed farms (831 and 833), with farms primarily located in the Limey and Condroz regions. The **economic dimension is 2.** This cluster receives ES-LGC funding with a mean of €2,231 and a median of €1,580.

Clusters 1 and 2 receive similar amounts of ES-LGC funding, with Cluster 2 receiving higher amounts than Cluster 1.

Cluster 4 (purple) comprises 221 farms, representing 2% of the total. This cluster consists of farms that do not fit into the other three groups.

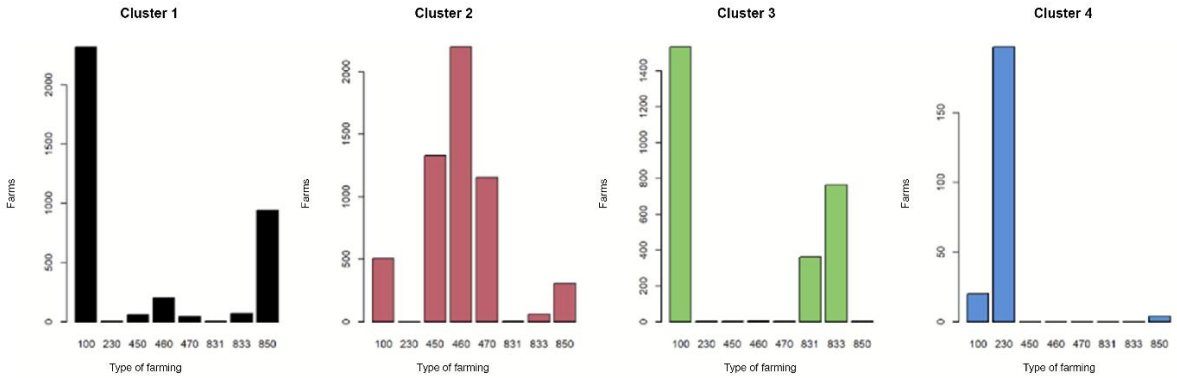
The distribution of farms by type of farming, economic dimension, and agricultural region across clusters is depicted in **Figure 19**, **20** and **21**.

Figure 19 : Distribution of farms by economic dimension across clusters



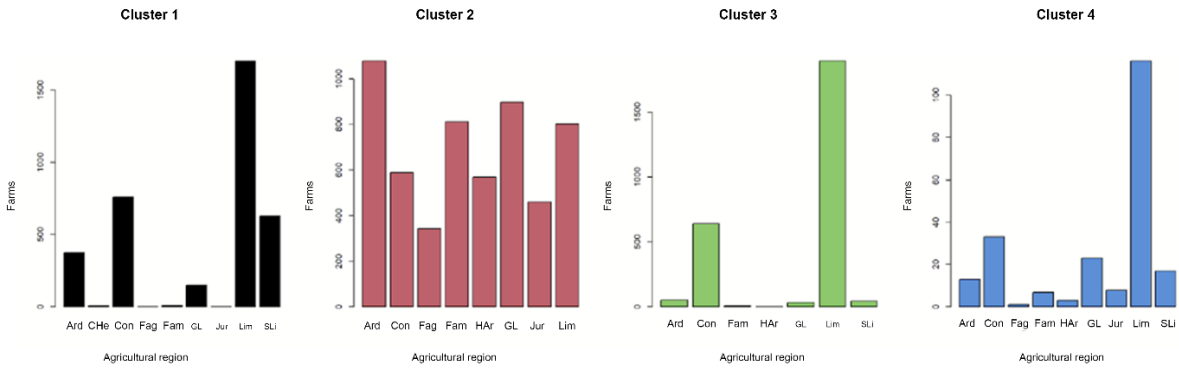
(Based on OPW data 2024)

Figure 20 : Distribution of farms by TF across clusters



(Based on OPW data 2024)

Figure 21 : Distribution of farms by agricultural region across clusters



(Based on OPW data 2024)

The Kruskal-Wallis test (chi-squared = 1675, p-value < 2.2e-16) and Dunn's post-hoc test indicate that there are significant differences in the distribution of the ES-LGC aid between the four groups (p-value < 0.05). In particular, groups 1, 2, and 3 have significantly different distributions of the variable "ES-LGC", while group 4 does not show a significant difference compared to groups 2 and 3 (p-value > 0.05).

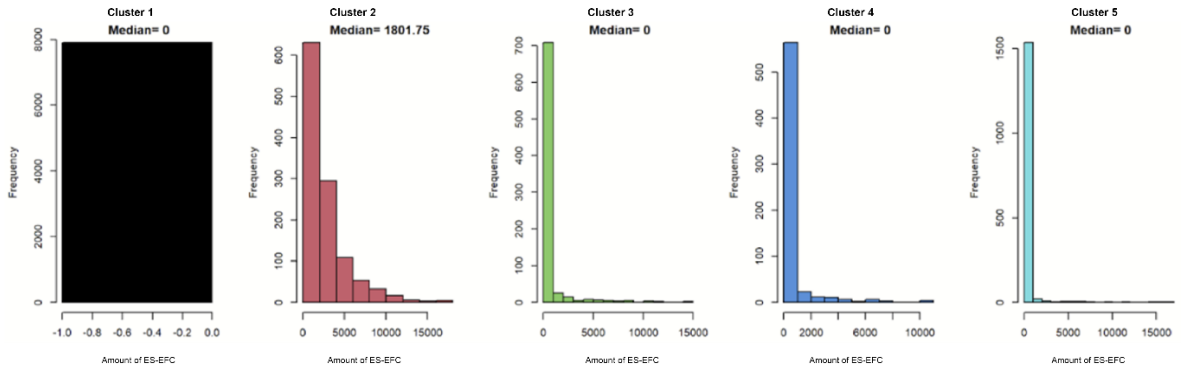
4.3.2.1.2. ES-EFC typology

The adoption of ES-LGC is characterised by a mean value of €2,891.28 and a median of €1,855.54. The interquartile range is €2,499.93, with the first quartile at €991.85 and the third quartile at €3,491.77.

Structural clustering

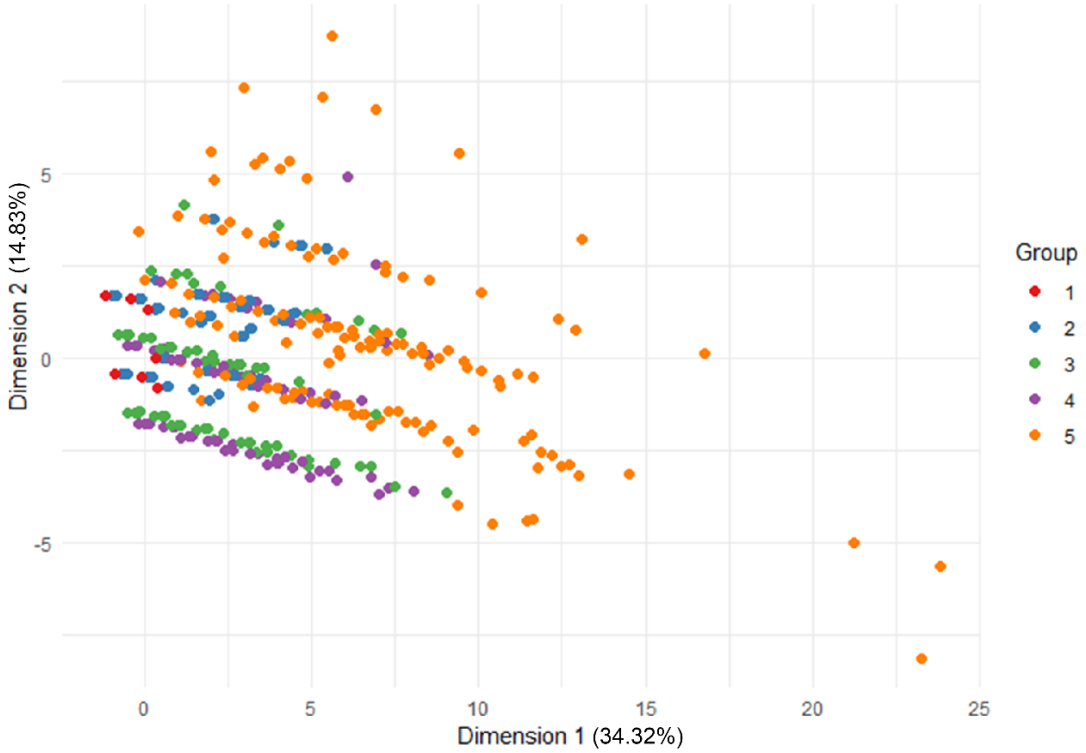
The clustering analysis, based on structural variables and the amount of ES-LGC received by farms, results in five distinct groups, as illustrated in **Figure 23**. Also, **Figure 22** displays the frequencies of the amounts of ES-LGC received by farms in Wallonia in 2023, categorised by cluster.

Figure 22 : Structural clustering frequency of ES-EFC adoption perceived by Farms in Wallonia (in 2023)



(Based on OPW data 2024)

Figure 23 : Structural clustering individual projection on the first two dimensions of ES-EFC



(Based on OPW data 2024)

The distribution of young farmers, farm owners, and gender follows similar patterns to those observed in the ES-LGC structural clustering.

Cluster 1(red) comprises 7,907 farms, representing 66% of the total. It is characterised by a legal form of **"natural person**" and receives no ES-EFC funding, with both mean and median amounts at €0.

Cluster 2 (blue) consists of 1,152 farms, accounting for 10% of the total. It is characterised primarily by the legal forms **"legal entity"** and **"group of natural persons"**. This is the only cluster to receive significant ES-EFC funding, with a mean of €2,667 and a median of €1,801.

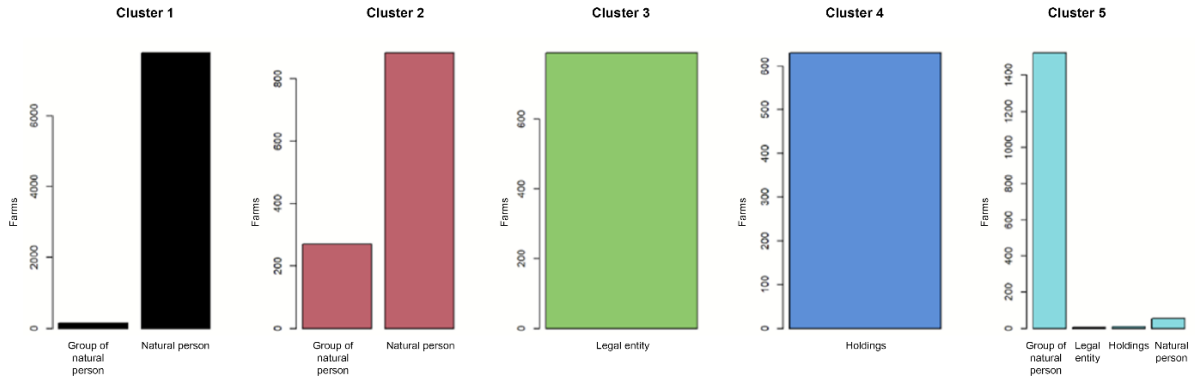
Cluster 3 (green) includes 790 farms, representing 7% of the total. It is characterised by the legal form **"legal entity"** and shows disparate receipt of ES-EFC funds, with a median of €0.

Cluster 4 (purple) comprises 630 farms, representing 5% of the total. This cluster predominantly has a legal form of **"holdings"** and exhibits varied receipt of ES-EFC funds, with a median of €0.

Cluster 5 (orange) consists of 1,590 farms, accounting for 13% of the total. It is characterised by the legal form **"group of natural persons"** and has the highest number of farmers, including a larger proportion of women and young farmers (more than two).

The distribution of farms by legal form across clusters is depicted in **Figure 24**.

Figure 24 : Distribution of farms by legal form across clusters



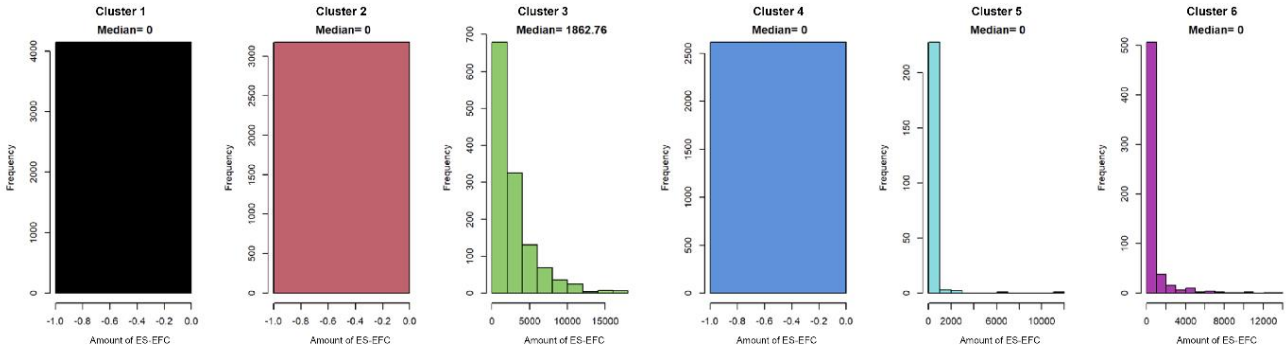
(Based on OPW data 2024)

The results of the Kruskal-Wallis test (chi-squared = 9829, p-value < 2.2e-16) and Dunn's post-hoc test indicate that the distribution of the ES-EFC amount received varies significantly among some clusters. Specifically, Groups 1, 2, 3 and 4 exhibit significant differences in ES-EFC funding (adjusted p-value < 0.05). Conversely, Group 5 does not show significant differences in ES-EFC amounts than other groups (adjusted p-value > 0.05).

CAPaid clustering

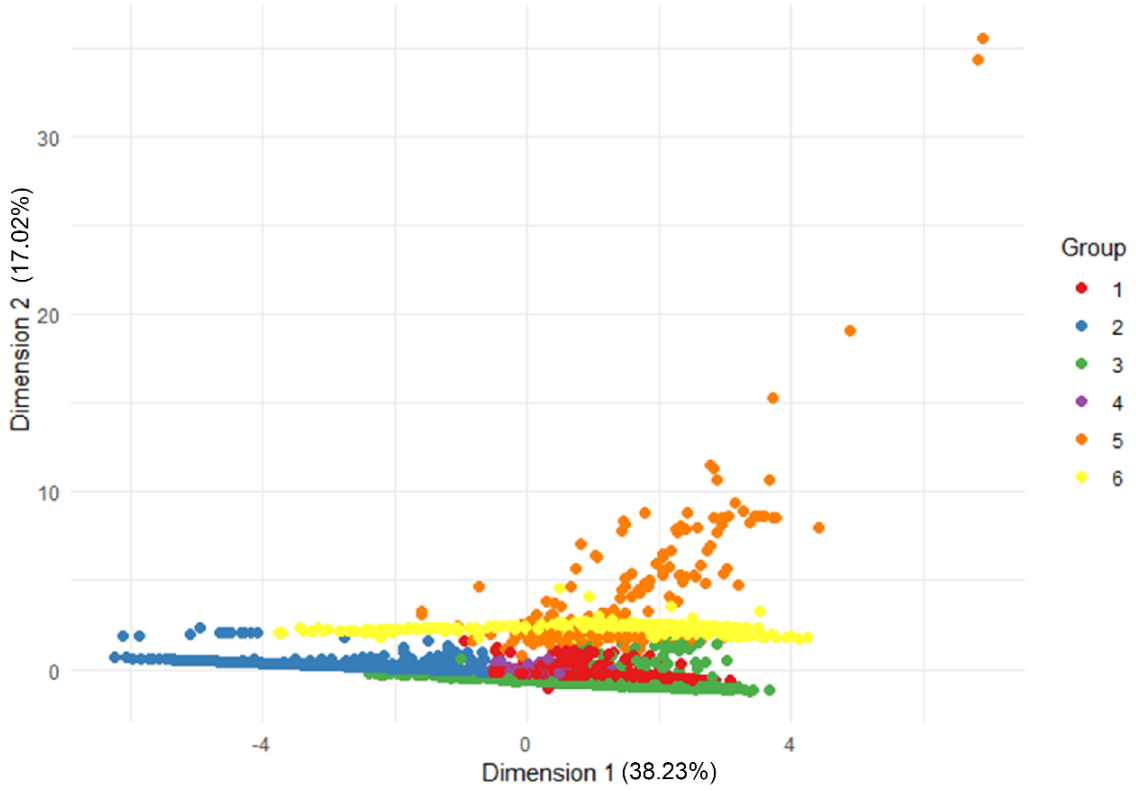
The clustering analysis, based on CAPaid variables and the amount of ES-LGC received by farms, results in six distinct groups, as illustrated in **Figure 26**. Also, **Figure 25** displays the frequencies of the amounts of ES-LGC received by farms in Wallonia in 2023, categorised by cluster.

Figure 25 : Structural clustering frequency of ES-EFC adoption perceived by Farms in Wallonia (in 2023)



(Based on OPW data 2024)

Figure 26 : CAPaid clustering individuals projection on the first two dimensions of ES-EFC



(Based on OPW data 2024)

Cluster 1 (red) comprises 4,157 farms, representing 34% of the total. It is characterised by receiving the **highest BP** (mean €8,513, median €5,835) and **receives no ES-EFC** funding, with both mean and median amounts at €0.

Cluster 2 (blue) consists of 3,182 farms, accounting for 26% of the total. This cluster is characterised by a **lower BP** (median €966, mean €1,100) compared to other clusters, where the basic payment mean and median are €7,000 and €9,000, respectively. The redistributing payment in this cluster is €4,075

for all groups, except for Cluster 2, which is lower (median €1,544, mean €1,643). This cluster also receives **no ES-EFC funding,** with a median of €0.

Cluster 3 (green) includes 1,283 farms, representing 11% of the total. This cluster is characterised by a **higher BP** (mean €8,876, median €7,585) and is the only group that **receives ES-EFC funding significantly and uniformly** (mean €2,813, median €1,862).

Cluster 4 (purple) comprises 2,620 farms, representing 22% of the total. It is characterised by having **no BP** and shows disparate receipt of ES-EFC funds, with a median of €0.

Cluster 5 (orange) consists of 235 farms, accounting for 2% of the total. This cluster is notable for being the only group with significant and **uniform organic payments** (mean €3,555, median €2,375) and shows disparate receipt of ES-EFC funds, with a median of €0.

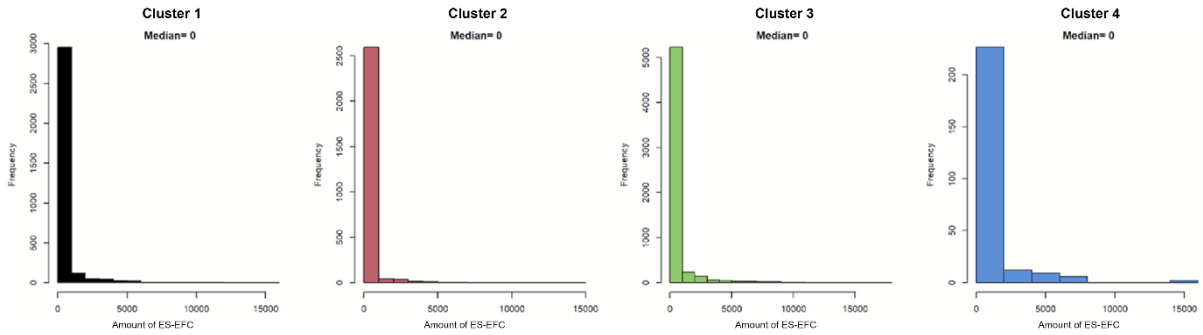
Cluster 6 (yellow) consists of 592 farms, accounting for 5% of the total. This cluster is unique for receiving **significant and uniform YFaid** (mean €7,233, median €8,105) and shows disparate receipt of ES-EFC funds, with a median of €0.

The results of the Kruskal-Wallis tests (chi-squared = 11091, p-value < 2.2e-16) and Dunn's test indicate that the distribution of the ES-EFC payment differs across clusters ($p < 0.05$). It reveals a significant difference between Group 3 and the other groups (Groups 1, 2, 4, 5, and 6). Furthermore, Group 6 shows a significant difference when compared to Groups 1, 2, and 4. No significant differences were found among the remaining group pairs.

Production clustering

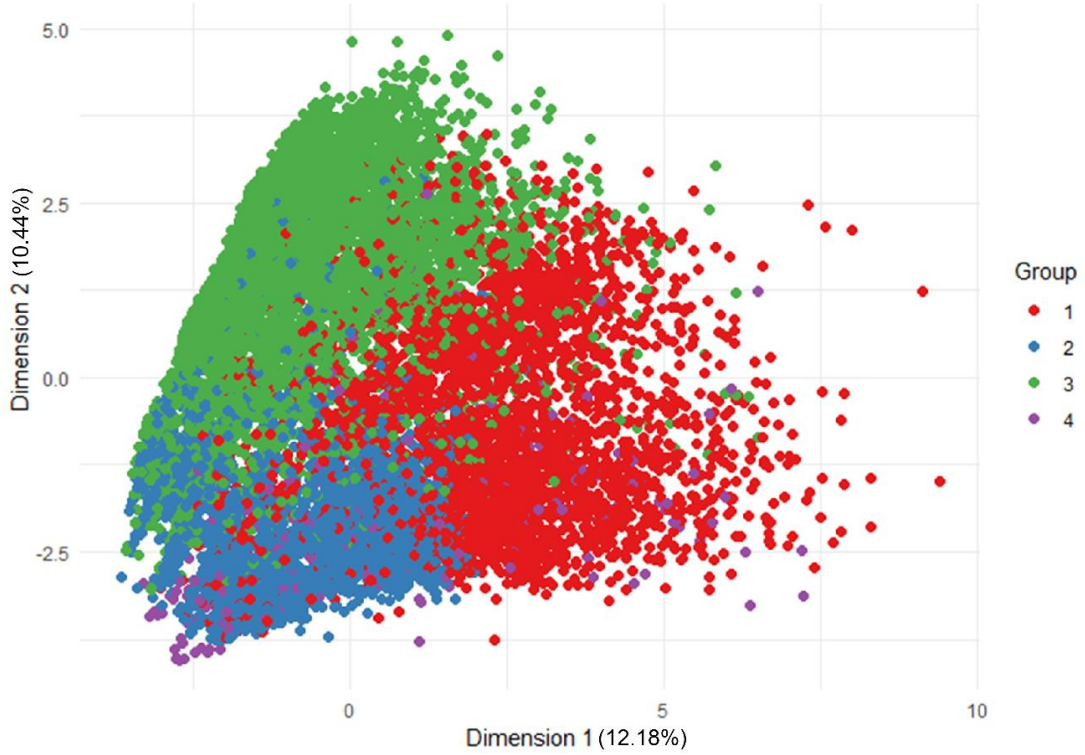
The clustering analysis, based on production variables and the amount of ES-LGC received by farms, results in four distinct groups, as illustrated in **Figure 28**. Also, **Figure 27** displays the frequencies of the amounts of ES-LGC received by farms in Wallonia in 2023, categorised by cluster.

Figure 27 : Production clustering frequency of ES-LGC adoption perceived by farms in Wallonia (in 2023)



(Based on OPW data 2024)

Figure 28 : Production clustering individuals projection on the first two dimensions of ES-EFC



(Based on OPW data 2024)

Cluster 1 (red) **arable farmers,** comprises 3,262 farms, representing 27% of the total. This cluster is characterised by a focus on cereal crops, industrial crops, potatoes, and permanent grassland. The average Utilised Agricultural Area (UAA) is 87 ha. The primary types of farming include field crops (100) and mixed farms (833, with some 831). Farms are predominantly located in the Limey region, with some in Sandy-Limestone, Condroz, Grassland, and Ardenne regions. All economic dimensions are represented, particularly **economic dimension 2**. ES-EFC funds received an average €352, with a median of €0.

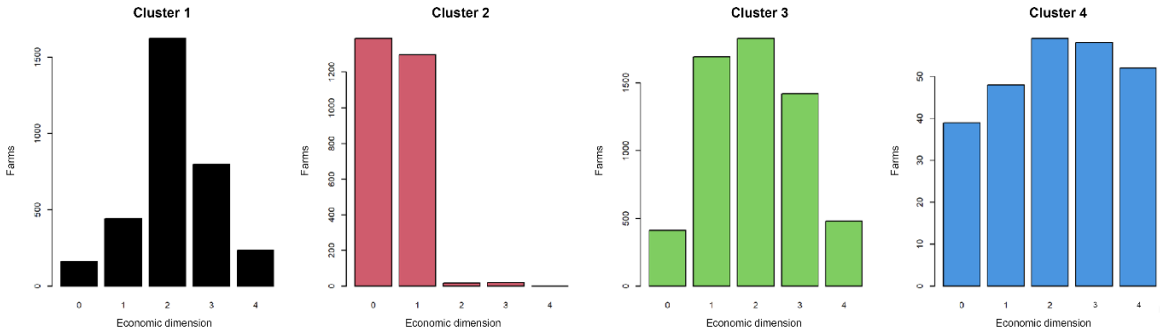
Cluster 2 (blue) **mixed production farmers,** consists of 2,724 farms, accounting for 23% of the total. This cluster focuses on cereals and permanent grassland, with an average UAA of 20 ha. The primary types of farming are field crops (100), with some beef cattle (460) and goat, sheep, and poultry rearing (850). Farms are mainly in the Limey region, with some in Ardenne, Condroz, and Grassland regions. **Economic dimensions 0 and 1** are represented. ES-EFC funds received an average €154, with a median of €0.

Cluster 3 (green) **livestock farmers,** includes 5,827 farms, representing 48% of the total. This cluster is characterised by a focus on forage, cattle, and permanent grassland, with an average UAA of 65 ha. The primary types of farming are cattle rearing (460, 470, 450), with some field crops (100) and goat, sheep, and poultry rearing (850). Farms are located in all agricultural regions except Sandy-Limestone, and all economic dimensions are represented, especially **economic dimensions 1, 2, and 3**. ES-EFC funds received an average €377, with a median of €0.

Cluster 4 (purple) comprises 256 farms, representing 2% of the total. This cluster is characterised by its non-homogeneous composition and distinct characteristics that set it apart from the other clusters.

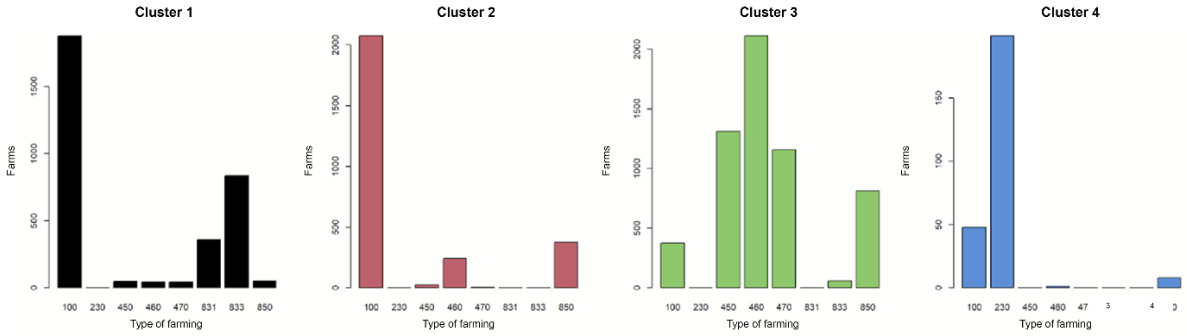
The distribution of farms by type of farming, economic dimension, and agricultural region across clusters is depicted in **Figures 29**, **30** and **31**.

Figure 29 : Distribution of farms by economic dimension across clusters



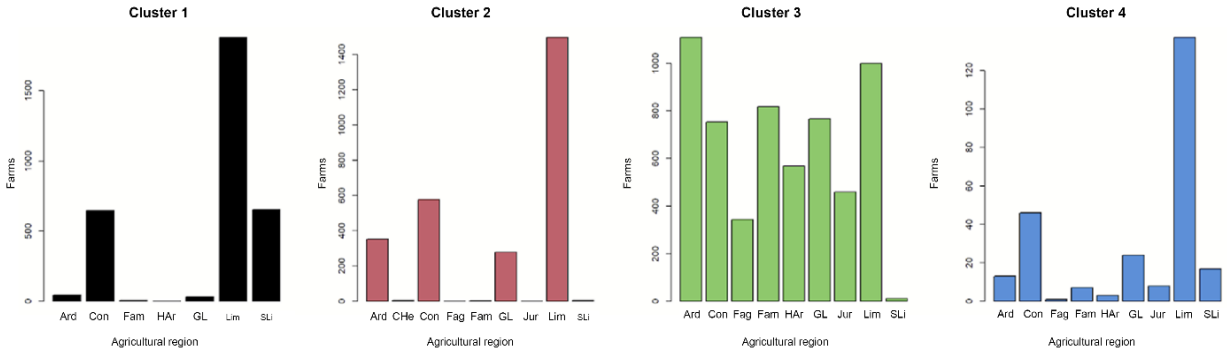
(Based on OPW data 2024)

Figure 30 : Distribution of farms by Type of Farming across clusters



(Based on OPW data 2024)

Figure 31 : Distribution of farms by Agricultural Region across clusters



(Based on OPW data 2024)

The Kruskal-Wallis test (chi-squared = 100, p-value < 2.2e-16) and Dunn's post-hoc test indicate that there are significant differences in the distribution of the ES-LGC payment between cluster 2 and the other groups (p-value < 0.05). Meanwhile, the other groups do not show significant differences among themselves (p-value > 0.05).

4.3.2.1.3. Cluster comparison

The results from contingency tables used to compare the composition of groups across different typologies reveal that the clusters formed by the CAPaid ES-EFC / production ES-EFC clustering, as well as the groups structured by ES-LGC / ES-EFC and PAC aid ES-LGC / ES-EFC, exhibit similar compositions. In contrast, the other groupings—production ES-LGC / ES-EFC, structure ES-EFC / production ES-EFC, structure ES-EFC / PAC aid ES-EFC, PAC aid ES-LGC / production ES-LGC, and structure ES-LGC / production ES-LGC—do not show similar farm compositions.

4.3.3. Exogenous factors and factors related to perception and preferences influence the adoption of Eco-Schemes.

This part presents interviews with Walloon farmers, revealing their perceptions of Eco-Schemes. The insights gained from these interviews provide a deeper understanding of the factors influencing the adoption and effectiveness of the ES.

ES are often perceived by farmers as being the "greening" and a financial loss. 9 out of 31 farmers did not understand the purpose of ES. "What are the ESs? They keep changing the regulations, and no one explains them to us," was argued by a farmer. Understanding improved after they filled out the CAP declaration in April. However, 10 out of 31 farmers **did not understand the green architecture**, leading to significant confusion with the AECMs. Those who did not grasp the green architecture does not necessarily seek help to complete their CAP declarations; some are actually doing it themselves. Despite this lack of understanding, 8 of those 10 farmers who experienced comprehension difficulties have nonetheless adopted ES and made corresponding modifications to their practices. Only two of the surveyed farmers did not adopt ES due to lack of understanding.

Three strategies were identified regarding **CAP declarations**. The most common method, used by 15 farmers, involves the farmer completing the declaration and having it checked by an advisor or the ministry. The majority of farmers choose this option. "Since the new CAP, I have to ask for help from the ministry to fill out my CAP declaration because it has become too complicated. I used to do it myself," has been entrusted by a farmer. This sentiment of complexity was shared by all respondents. Even a former advisor claimed he could no longer fill it out alone. Farmers especially fear making errors that could be costly or missing out on aid they would be eligible to receive.

Nine farmers fully trust a consultancy service or the ministry to handle their declarations.

Only two farmers said they completed their declarations without assistance. One was a professional advisor, and the other said he liked to gamble: "I made my CAP declaration without having it checked in Wallonia and Flanders, even though I don't master Flemish. It's better done by myself."

To get information and exchange ideas about the CAP, 22 farmers **attended group meetings** of various kinds and discussed with other farmers. They emphasised the importance of staying informed. Only 3 farmers did not discuss the CAP with others in the sector, although they acknowledged the importance of doing so. Generally, these farmers relied entirely on an advisor to fulfil the CAP declaration.

The four main **motivations** for ES implementation stated are: financial gain or limiting financial losses; agronomic advantages (green manure, erosion protection, soil carbon increase); valuing land with lower potential; and independence from agro-food chains (for livestock farmers).

Several farmers who did not implement new ESs said they were open to adoption - provided it is easy and requires little change- because they did not want to seek these funds.

The "windfall effect" was declared by 22 out of 31 farmers for certain or all ESs obtained in 2023. Some explained this by being in 'sensitive areas' with already strict regulations in place, notably for soil protection. Others said they were already implementing these practices before the ESs creation. One farmer declared, "I am rewarded for my viewpoint, and it's very favourable to my economic model." These farmers changed their practices before the ESs to follow their philosophy or adapt to the market, particularly among those who switched to organic certification. Farmers benefiting from the "windfall effect" did not change their practices to obtain the ES funds.

However, 10 out of 31 farmers reported having **implemented changes in their practices** to secure ESs. For instance, some adjusted the timing of cover crop destruction for ES-LGC, and others invested in new machinery, such as a chisel plough. Four of these farmers regarded these changes as minor or anecdotal. Nevertheless, those who have altered their practices to obtain ES funds remain a minority, as the perceived costs of these investments are considered to outweigh the benefits of the subsidies. One farmer noted that he began using glyphosate, which he had not used previously, to facilitate a transition to no-till farming. Several farmers also highlighted a connection between ES-LGC and the use of Roundup.

The ES-PR also led to significant changes in practices among farmers, including stopping the use of certain products and switching to others. However, some farmers planned to declare this ES partially,

applying it only to plots that do not require treatment. One farmer was trying new cover crop techniques in heavy soils, saying, "It's more complicated; I haven't found the right way to do it yet," to obtain the aid. These farmers say the ESs are not adapted to their region and soil types, yet they need these funds. Another farmer highlighted the disparity in access to ESs, as they are poorly adapted to certain regions. For example, hedges are easy to plant in Condroz but complicated in Gembloux due to drainage issues. Despite this, one farmer acknowledged that "there is something for everyone."

Organic farmers were not necessarily committed to environmental measures for the philosophy behind it, some are only seeing it as a different market. Also, several farmers engage in environmental practices that align with their philosophy but remain conventional without certification.

The biggest **barrier to ES adoption** is the constraints and lack of flexibility (dates, pesticides). For example, one farmer said he is convinced by the approach but took no ES to maintain his freedom. Farmers feared the climatic uncertainties linked to their practice and not being able to adapt in favour of seeking the funds they rely on in their anticipated business plan, particularly for ES-LGC and ES-PR.

Additionally, it represents a risk according to several farmers by increasing the pressure on certain molecules, creating a risk of resistance by pushing for a higher use of certain molecules in larger quantities. The concern of contaminating agricultural soil by implementing favourable measures is mentioned by five farmers. The fear of not being able to correct the damage is mentioned, as well as the fear of not being able to destroy the cover crop at the end of winter.

Two farmers explained that intermediate crops immobilise nutrients for the next crop past a certain growth stage. One of them thus destroys these crops in January to avoid significant nitrogen consumption and prevent the plants from becoming woody. Another farmer reported, "the cover crops were too small and had no benefit for the soil."

Most farmers reported that the ES price was unappealing when compared to the cost of labour and/or seeds. Additionally, a farmer expressed concern that "traders are raising their prices and stealing subsidies."

Also, the knowledge required by the CAP and technical aspects presents a real challenge for farmers. "I am not strong in pesticide reduction; it requires knowledge that I don’t have," told a farmer, raising the issue of training and access to knowledge about the practices to be implemented.

Tree planting for ES-EN presents a complication if the land is leased and depends on the owner's agreement. Additionally, even if the farmer is the owner, once planted, the farmer will not be able to remove it freely and will need external agreements. These two situations block several farmers.

Despite these barriers, in 2024, farmers indicated they will continue with the same ESs or even add new ones, but no one is reverting to the practices of 2023. However, they caution that the planned ban on glyphosate in 2025 will likely lead to a significant reduction in the commitment of many farmers to these ESs in the future.

Since ESs are not result-based, they do not represent a financial **risk.** Farmers have indicated that result-based AECMs, such as MR 14 (carbon-sequestration), which carry a risk of reimbursement, caused them greater concern.

On the other hand, farmers are worried that the adoption of ESs might exceed the available budget, posing a potential risk. They fear committing to and investing in equipment and seeds without guaranteed financial support. There is also concern that changes requiring long-term amortisation may result in reduced or discontinued premiums after a certain period, leaving them at a financial deficit relative to their investment. This mistrust deters the most risk-averse farmers from participating.

Risk aversion is both financial and agronomic. Farmers express a genuine fear of committing to ESs and depending on funding, citing concerns about adapting to the agronomic and climatic constraints inherent to their work. Problems arise with ESs like long soil cover, which imposes specific dates, and input reduction, which restricts the use of certain molecules needed to manage crops. These issues lead some farmers who are already implementing the practices or who align with the philosophy to avoid committing to ESs.

Analysis of the farmers' interviews reveals four distinct cases of behaviour concerning environmentally driven practice changes in response to **external social pressure** from beyond the agricultural sector:

- Unaffected farmers: These farmers are not impacted because they feel aligned with their personal convictions and the mainstream environmental discourse. They view maintaining healthy land for future generations as paramount.
- Positive influence: Positive relationships with consumers, family, and neighbours drive farmers to adopt environmentally friendly practices. Farmers report being encouraged by this support, which fosters environmental respect, especially in direct sales. Motivations tied to family and financial incentives are more effective in protecting ecology when the practices are agronomically beneficial.
- Indirect influence: Farmers explain that external pressures, particularly negative media portrayals, can indirectly alter their farming practices. As one farmer notes, "Media coverage often exaggerates issues and underestimates the real losses in food security. This type of discourse influences EU policy decisions and affects us as a result." These farmers feel that the general public lack understanding and that criticisms are frequently based on misinformation. They argue that outsiders, who are often uninformed about agricultural practices, fail to recognise the efforts farmers put into their work. The resulting negative portrayal, or "agri-bashing" in public discourse further exacerbates the situation.
- Direct negative influence: Tensions with neighbours can have the opposite effect, making farmers feel underestimated, observed, and judged. Issues such as pesticide use become major points of contention. Relationships between farmers and local residents are strained, with elected officials often disconnected from on-the-ground realities. This opposition leads farmers to defend their practices rather than adapt, resulting in increased entrenchments.

Farmers suggested **recommendations** for ES:

- Improve access to information and facilitate peer exchanges: increase the availability of information and promote inter-farmer communication to foster knowledge sharing and collaboration.
- Simplify the CAP and streamline declarations: Reduce the complexity of the CAP and minimise frequent modifications to declarations to alleviate administrative burdens on farmers.

- Introduce flexibility in agricultural practices: Move away from rigid date-based requirements and incorporate greater flexibility to accommodate climatic variability and unforeseen conditions.
- Enhance policy engagement: Strengthen the responsiveness of policymakers to farmer feedback. Many farmers have valued the opportunity to be heard and expressed a desire for continued dialogue.
- Address inconsistencies in ES requirements: Reassess the coherence between various ES measures, such as ES-PR and the increased use of glyphosate, with long-term soil cover and tillage requirements.
- Develop ES for seeds, straw, and manure management: Expand ES to include support for seed usage, straw exchange, and manure management, while considering impacts on the food supply chain to ensure farmer profitability.

5. Analysis and future directions

5.1. Result analysis

From an EU-scale perspective, Wallonia has opted for a moderate number of Eco-Schemes with an average share of financing and a high-targeted area. Wallonia's approach is characterised by compromise, targeting all land types. This strategy is designed with a broad spectrum of applications and practices, with the purpose of balancing income support and environmental protection. It enables widespread adoption of ES-LGC and ES-PE, although adoption rates are lower for more targeted ES such as ES-EFC. Data from CAP declarations reveal that livestock farmers are distinguished by their significant adoption of all ES in 2023. Given that the sector is experiencing erosion, it appears that these farmers seek out ES as a means of mitigation. However, to substantiate this claim, further research on this topic would be necessary. Also, in Wallonia, extreme economic dimensions are less represented among adopters than average.

Typological and linear relationship analyses provide insights into the profiles of adopters and the factors influencing the ES uptake.

Firstly, these analyses reveal that gender and the number of farmers do not significantly influence the adoption of ES-LGC and ES-EFC. This finding is supported by interviews with farmers. However, since the study did not identify the decision-makers within the farms, this information should be interpreted with caution. Only the legal form of the entity has an impact. However, it alone does not fully account for a specific adoption profile, except in the case of the "individual" grouping, which tends to increase the amount of ES-LGC.

Secondly, the CAPaid factors do not significantly influence the uptake of ES-EFC. Conversely, organic payment for ES-LGC is not significant, but CP, BP, RP, and YF have a substantial impact on the adoption. Higher payments are correlated with an increased amount received. Notably, CP has a particular influence, as its presence and amount positively impact the level of ES-LGC adoption, as pastures are considered in the calculation. Livestock farmers receiving CP for cattle hold pastures that benefit from this aid. Additionally, CP for protein crops conflicts with organic aid and ES-EFC adoption, leading farmers to prefer CP over ES.

While these aid payments are contingent upon the acreage, the UAA does not significantly affect ES-LGC adoption. This may be attributed to historical differences in the design of these aids.

Lastly, focusing on production aspects, clustering reveals three distinct profiles of farmers regarding the adoption of ES-EFC:

- Mixed agriculture farmers with a small UAA and small economic dimensions.
- Livestock farmers with economic dimensions, ranging from small to large.
- Arable land farmers with an average economic dimension.

The adoption rates do not differ significantly between the groups. In fact, both AR and TF influence ES-EFC adoption, although there is limited variation among different AR and TF, except for cereal cultivators. For these farmers, adoption levels increase with the size of the cereal area planted. The behavioural differences in adopting ES-EFC are largely attributed to UAA size and economic scale. Farms with smaller UAAs and economic dimensions (0 and 1) exhibit a lower likelihood of substantial ES-EFC adoption, as shown by linear relationship. Farmer interviews highlight that the high implementation costs (including seeds, equipment, and labour) relative to the available aid discourage adoption. This financial burden is particularly challenging for smaller farms.

ES-LGC clustering form also three distinct profiles:

- Arable land farmers with an average economic dimension, primarily located in the Limey and Condroz regions.
- Livestock farmers with economic dimensions ranging from small to large, located in the Ardenne, Grassland, and Limey regions
- Cereal producers small economic dimension located all across Wallonia

Linear relationships and clustering reveals that factors impacting ES-LGC adoption include TF and AR, both interrelated. Mixed producers with small economic dimensions exhibit lower amounts of ES-LGC compared to both arable and livestock farms. Livestock farms exhibit no uptake for extreme economic dimensions, while arable farms only adopt at an intermediate level of economic dimension. In fact, arable farms with higher economic dimensions are less inclined to adopt ES-EFC practices.

This pattern of adoption can be attributed to the eligibility of pastures included in ES-LGC calculation. Interviews reveal that livestock farmers who adopt ES-LGC perceive this ES as a windfall benefit. An increase in forage area, permanent pastures, and the number of cattle is positively correlated with a higher adoption of ES-LGC. In this context, the ES-LGC supports livestock farmers' income and helps maintain pastures, contributing to carbon sequestration and promoting forage self-sufficiency.

For arable land farmers, the imminent restriction on glyphosate in 2025 poses a risk of reducing ES-LGC adoption, as explained in the interviews. This reduction could negatively impact soil protection efforts in field crops, potatoes and industrial crops, which has been highlighted as a crucial need in the Walloon SWOT analysis.

The aspects that attract and motivate farmers to adopt ES are primarily financial incentives and agronomic benefits, such as soil enrichment from cover crop destruction. However, this motivation is hindered by the complexity of the CAP, especially with the introduction of the green architecture,

which poses understanding challenges for farmers and requires them to invest time and acquire knowledge. This complexity makes them dependent on external advice for CAP declarations and practice orientation, a barrier to adoption.

Another obstacle lies in the delayed communication around ESs, which limits adaptation and pre-discussion, reinforcing the sentiment among farmers of having policies imposed on them. This creates opposition to the new model advocated by the EU, which introduces a paradigm shift favouring environmental protection over income support. This sentiment is further reinforced by the presentation of ES as a continuation of the previous CAP "greening" measures, adding to the confusion. Consequently, many farmers perceive ES as an income support mechanism accessible to all.

Additionally, a rigid regulatory framework, sometimes conflicting with agronomic deadlines, discourages adoption and raises questions about long-term commitment. The lack of flexibility in adapting to climate change is perceived as a risk by risk-averse farmers. In some regions, ES practices are challenging to implement due to unsuitability, but some farmers seek these funds to support their income. The financial aspect plays a predominant role in ES adoption, and implementation costs (seeds, labour, equipment) can outweigh the perceived benefits. This makes adoption less attractive unless ES are easy and low-cost to implement or provide added value to less productive land.

The ES adoption introduces some changes in agricultural practices:

- ES-EFC: Introduces new, more specific cultural practices adopted by few farmers. However, it receives positive feedback and satisfies sector needs.
- ES-LGC: Requires later destruction of cover crops, facing challenges due to climatic variability. The use of glyphosate for cover crop destruction in conventional agriculture is highly linked to this ES, with some farmers even changing their practices to use it in order to obtain the funds.
- ES-PR: Involves changing the molecules used, demanding new knowledge and raising concerns about increased pressure on certain molecules, leading to resistance and the need for higher doses. The practice change is limited, with farmers enrolling only a partial surface of their exploitation, often in areas not requiring treatment or benefiting from windfall effects.
- ES-PE: Aims to reduce livestock density per hectare, but its effectiveness should be studied in relation to coupled aid.
- ES-EN: Reward mostly existing structures but face legal challenges in implementing landscape elements like trees.

Farmers interviews in the north of the “Sambre et Meuse” valley highlights few significant practice changes with a strong prevalence of windfall benefits. Farmers tend to adopt these ES for less productive lands or where the practices are perceived as easy to implement.

Engagement in ES does not inherently represent a risk due to its non-result-based nature. However, farmers view frequent changes in measures as concerning, particularly when the amount of aid can fluctuate. They also fear potentially insufficient funds if commitments are too high at the Walloon level. This represents a risk, especially if investments or practice changes are required, leading to distrust that impacts their commitment to ES. In general, farmers have conveyed during interviews a notable lack of confidence in agricultural policies, including those implemented by the SPW. This sentiment reflects a broader scepticism towards the effectiveness and reliability of the current agricultural policy framework and its administration.

5.2. Bias and study limitations

In addition to the biases previously discussed in the study, there are inherent biases related to the design of the interview questionnaire, which steer responses towards the information sought by the researcher. Responses might have varied if the form had been developed and administered by another individual.

Furthermore, the typologies are constructed based on variables provided by the SPW CAP declaration. The content and methods of data collection were not specifically tailored for this study.

Additionally, the study is limited by its temporal scope, covering only a single year, which restricts the depth of analysis and the ability to observe long-term trends.

Moreover, the ES-PE and ES-NE schemes require a specialised methodological approach and detailed contextual analysis for further investigation, which presents an additional limitation of the study.

6. Conclusion and recommendations

6.1. Conclusion

The latest CAP reform for the 2023-2027 period introduces several enhancements, notably increasing subsidiarity by allowing each Member State to develop its own CAP Strategic Plan tailored to national needs. This reform sets more ambitious goals for the CAP regarding environmental and climate protection by establishing a comprehensive green architecture that includes enhanced conditionality, Eco-Schemes, and Agri-Environmental and Climate Measures.

ESs support active farmers who implement agricultural practices that benefit the climate, environment, and animal welfare, striving to balance environmental protection with income support. The mandatory implementation of ES for Member States, in contrast to their voluntary adoption by farmers, seeks to balance environmental objectives with incentives designed to encourage farmer participation.

In Wallonia, a decision was made to limit the number of ES to a smaller set with a broad range of practices and land scopes. The goal is to balance income support with the implementation of measures that have environmental impact while encouraging adoption. In 2023, the adoption of ESs were widespread among livestock farmers, whereas it was less prevalent among arable land farmers, with a notable concentration in medium economic dimension farms. Small economic dimensions farms find the changes to adopt costly, while attracting large-scale arable land farmers to modify their practices remains challenging.

The analyses reveal that the adoption of ES-LGC is predominantly driven by livestock farmers. This ES effectively targets a broad economic dimension spectrum of livestock farmers and average-sized economic dimension arable land farmers. Both groups adopt this ES with similar amounts across Wallonia. Among livestock farmers, the ES-LGC is perceived as a windfall effect that supports their income, aids in the maintenance of pastures, contributes to carbon sequestration, and promotes forage self-sufficiency. For arable land, the primary concern is soil preservation for crops, which is a

significant issue in Wallonia, particularly in the northern part of the Sambre-Meuse region, classified as sensitive. This issue is addressed by extending the deadline for the destruction of permanent cover compared to previous practices.

In contrast, the ES-EFC, with a narrower focus than LGC, exhibits a more limited adoption rate. This ES is influenced by factors such as UAA and cereal surface area, with few other factors affecting its uptake.

However, the actual change in practices resulting from ESs uptake has been limited. Farmers tend to adopt ESs for less productive lands or where the practices are perceived as easy to implement, or due to the windfall effect for those already following similar practices. The complexity of the new green architecture demands significant time and knowledge from farmers, along with a greater need for advisory support.

The perceived high costs for all ES with the exception of ES-PE—comprising seeds, labour, knowledge, and equipment—relative to the financial benefits have discouraged farmers from making significant changes to their farming practices. Financial incentives alone are insufficient to justify substantial investments. Additionally, concerns about the stability and permanence of financial support have further deterred investment, as farmers are apprehensive about their ability to recoup these costs.

Also, the short time lapse between the announcement of new measures and their implementation hampers constructive dialogue between the SPW and farmers. This prevents adjustments before the measures take effect, potentially leading to inconsistencies with field realities. Such a situation fosters opposition and dissatisfaction among farmers, who feel imposed upon and inadequately heard. This makes a full-sector implementation challenging and impedes farmers' ability to anticipate, reflect, and adjust their practices and business plans in a sustainable manner.

Furthermore, communication and dissemination play a crucial role. The information campaign has been insufficient and delayed, failing to convey a message that clearly differentiates the new « greening » from the previous CAP period. As a result, the paradigm shift has not been effectively established. Currently, funds allocated to ES are intended to promote environmental benefits rather than merely providing income support as was the case under the previous CAP. However, the communication and dissemination efforts have not enabled the sector to move away from the philosophy of the old model nor have they provided clear guidance to farmers in navigating this significant paradigm shift, which impacts their income substantially.

6.2. Policy recommendations

Based on the conclusions, the following recommendations could enhance Eco-Schemes and their adoption by Walloon farmers in the future, while maximising environmental impact. These recommendations reflect the views of the authors alone:

- Reframe the ES discourse: Shift the focus of communication regarding ES away from the greening concept, and clearly define whether the strategy centres on environmental changes and rewards rather than income support. This might help the sector understand and embrace the paradigm shift.

- Initiate early information sessions: Begin information sessions earlier and establish a feedback system to allow farmers to provide input and have adequate time to adjust measures or modifications that concern them.
- Implement flexible timing: Consider a system with adaptable deadlines based on climatic conditions to accommodate weather variability and its impact on farming practices.
- Align ES-LGC with glyphosate policy: Adjust the ES-LGC framework in alignment with current political strategies regarding glyphosate use, ensuring coherence with broader policy goals.
- Attract Large-Scale Arable Farms: Develop strategies to engage arable land farmers with high economical dimensions to encourage their participation in ES programs.

6.3. Perspectives and future directions

To further and complete this study, it would be valuable to replicate the methodology over the coming years and introduce a long-term global analysis to identify trends. This approach would enable continuous monitoring of Eco-Schemes in relation to their adoption while allowing stakeholders to express their opinions.

Including Eco-Schemes such as « pesticide reduction », « ecological networks », and « pasture extensification » could help determine the profiles of their adopters.

Additionally, exploring the relationship between ES and coupled aids would provide insights into their interactions and potential synergies.

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8. Appendix