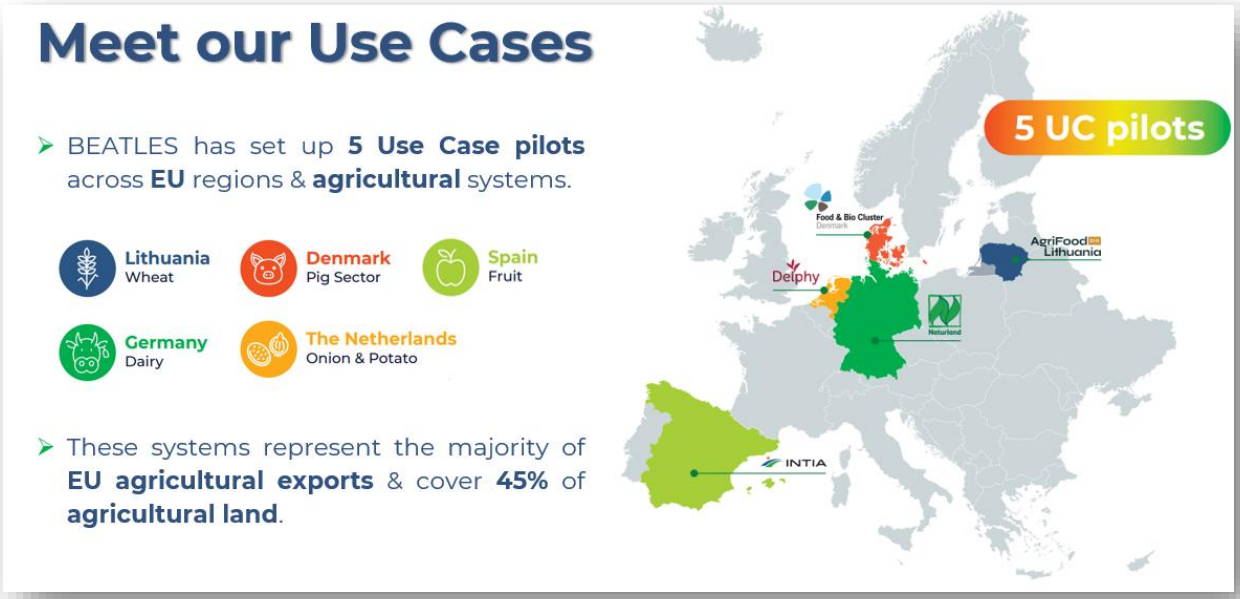
# BEATLES final event – Dossier of results

Ahead of the final event of the Horizon Europe BEATLES project , which will take place on 2 June 2026 in Brussels, this dossier of results has been prepared to summarise the project's main outcomes and findings that will be presented by the different project partners. The dossier has been developed by AEIDL to support the preparation of the external experts participating in the policy roundtable, as well as commentators and stakeholders attending the event.

The **BEATLES project (Behavioural Change Towards Climate-Smart Agriculture) is a Horizon Europe research and innovation project (2022–2026)**, funded under Grant Agreement No. 101060645 and coordinated by the Agricultural University of Athens. Bringing together 18 partner organisations from 10 European countries, the project aims to encourage long-term and large-scale transitions towards sustainable, productive and Climate-Smart Agriculture (CSA).

Over the past four years, BEATLES **has explored how behavioural insights can accelerate the transition towards Climate-Smart Agriculture and improve the effectiveness of EU agri-food policies, particularly the Common Agricultural Policy (CAP)**. Through research, co-creation activities, behavioural experiments and stakeholder engagement, the project has investigated the individual, systemic and policy factors that facilitate or hinder the adoption of sustainable agricultural practices and smart farming technologies.

The **project has worked across five Use Cases representing different European regions and agricultural systems, including wheat, dairy, fruits, pig farming, onions and table potatoes, covering countries such as Lithuania, Germany, Spain, Denmark and the Netherlands.**




This **dossier provides an overview of the project's main results**, including behavioural insights and experiments, sustainability assessments, business models and value propositions, advisory

guidelines, co-creation activities, and policy recommendations and tools designed to support the transition towards fair, inclusive and climate-smart agri-food systems. The following sections present these results individually and in greater detail.

### 25 Climate-Smart Agriculture practices assessed

**The project assessed 25 Climate-Smart Agriculture (CSA) practices across environmental, social, and economic dimensions through five representative European Use Cases covering different agricultural systems and regional contexts.**

The analysis included wheat cultivation in Lithuania, organic apple orchard systems in Spain, organic dairy farming in Germany, pig production in Denmark, and potato and onion systems in the Netherlands. Across these use cases, the project evaluated a broad range of CSA practices aligned with CAP strategic plans and sustainability objectives.

The practices analysed included precision farming, no-till systems, wetland restoration, intercropping, cover crops, organic farming, grazing management, floral bands, improved slurry handling, ventilation technologies, sustainable irrigation systems, biodiversity measures, precision fertilisation, and integrated crop protection measures. The assessment also explored the role of renewable energy solutions such as solar energy, biogas, and agro-photovoltaic systems, as well as protein crop and feed-related practices including regional protein sourcing and green protein alternatives for animal feed.

**Scope of analysis: 25 Climate-Smart Agriculture practices**

| | Use case 1<br>Lithuania<br>Wheat cultivation | Use case 2<br>Spain<br>Organic apple orchard system | Use case 3<br>Germany<br>Organic dairy farming | Use case 4<br>Denmark<br>Pig production | Use case 5<br>Netherlands<br>Potato and onion system |
|---|---|---|---|---|---|
| **Practices analysis with CAP strategic plans** | • Precision farming<br>• No-till system<br>• Extensive wetlands management<br>• Intercropping | • Cover crop<br>• Organic farming<br>• Grazing<br>• Floral bands | • Organic/Naturland standards<br>• Feed conversion to 100%<br>• Breeding for longevity | • Slurry handling (frequency, discharge, acidification)<br>• Technologies for ventilation | • Sustainable irrigation<br>• Biodiversity measures (farm level)<br>• Precision fertilization and soil management<br>• Crop protection (all IPM measures, total impact) |
| **Energy-related practices** | • Alternative green energy | • Renewable energy (e.g. solar energy) | • Agro-photovoltaic system | • Use of biogas | • Renewable energy (e.g. solar energy) |
| **Practices related to protein crops and use** | – | – | • Regional protein source | • Green protein for feed | – |

This comparative assessment provided evidence on how different CSA practices contribute to sustainability transitions across diverse European farming systems, highlighting both common opportunities and context-specific challenges for the adoption of climate-smart solutions.

## BEATLES Project – Key Achievements in Numbers

- **25 CSA practices** assessed across environmental, social, and economic dimensions.
- **90+ lock-ins and levers** identified affecting behavioural shifts towards Climate-Smart Agriculture (CSA) across the agri-food system.
- **4,700+ participants** involved in behavioural experiments and field activities.
- **13 fair business models** co-created with stakeholders across the 5 use cases.
- **12 policy recommendations** at EU level, **5 policy insights at Use Case level** and a policy toolkit developed with **3 practical tools**.
- **10+ behavioural interventions** designed to facilitate the transition to CSA.
- **13 publications** produced during the project.
- **20 co-creation workshops** organised across Europe.
- **122 experts from 21 EU Member States** engaged through the EU Multi-Actor Working Group.
- **1,600 stakeholders mapped** during the project engagement process.
- **42,000+ stakeholders reached** through project dissemination and engagement activities.
- **2,500+ followers** across communication channels.
- **800+ webinar participants/views** in capacity-building activities.
- **77 external events** attended and supported.
- **41 synergy projects** established with related initiatives.
- **6 webinars** delivered for advisors and policymakers.
- **97% of participants** reported improved understanding of CSA policy challenges and opportunities.

**Public deliverables** developed by the different BEATLES project partners can be explored here: **https://beatles-project.eu/public-deliverables/**

## Behavioural Insights & Experiments

The BEATLES project carried out an extensive programme of behavioural experiments to better understand the factors that encourage or hinder the adoption of Climate-Smart Agriculture (CSA) practices among farmers, consumers and agricultural advisors across Europe. Combining behavioural economics, social sciences and experimental methods, the project tested how interventions such as economic incentives, social norms, fairness messages, information provision and recognition mechanisms influence decision-making processes related to sustainability transitions.

The research included eight laboratory experiments and two field experiments involving more than 4,700 participants across several European countries. Results showed that financial incentives, trusted information and social influence can positively affect behavioural change, although adoption pathways often remain gradual and strongly influenced by structural and contextual barriers. Consumer experiments demonstrated a generally positive willingness to support climate-friendly products, but also revealed persistent challenges linked to trust in sustainability labels and limited willingness to pay higher price premiums. Farmer and advisor experiments highlighted the importance of combining economic support with practical knowledge, advisory guidance and long-term confidence-building measures.

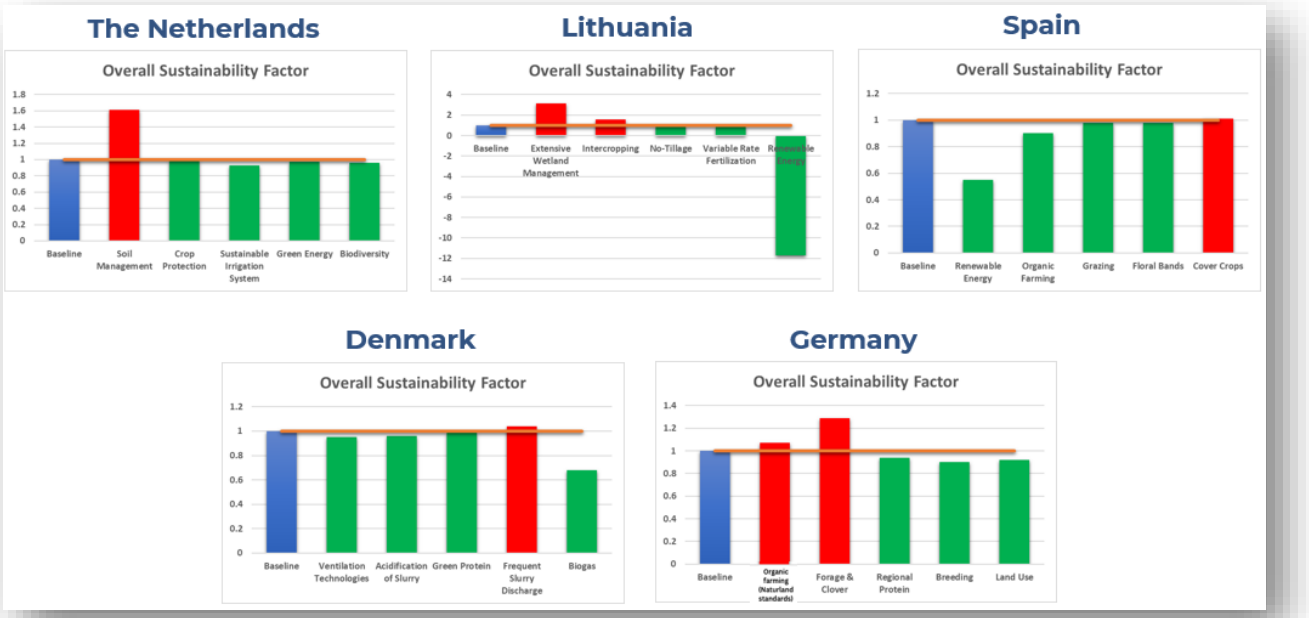
## Sustainability and Behavioural Change Assessment

The BEATLES project developed an integrated sustainability and behavioural change assessment framework to evaluate the environmental, economic, social and behavioural impacts of CSA practices implemented across different European farming systems. The assessment combined Life Cycle Assessment (LCA), Life Cycle Costing (LCC), Social Life Cycle Assessment (s-LCA), Cost–Benefit Analysis (CBA) and Theory of Change methodologies to analyse both sustainability performance and adoption dynamics.

*Methodological approach – Life Cycle*

The project assessed 25 Climate-Smart Agriculture practices across five Use Cases covering wheat farming in Lithuania, pig farming in Denmark, dairy farming in Germany, onion and potato production in the Netherlands, and apple orchards in Spain. For each of the practices the Overall Sustainability Factor (OSF) have been calculated.

*Results – OSF Use Cases*




Results identified significant environmental benefits associated with practices such as renewable energy integration, precision agriculture, biodiversity-enhancing measures and nutrient management systems. Economic analyses showed that several practices can improve farm profitability and efficiency, although high investment costs remain a major obstacle for some technologies. The social assessment also highlighted positive impacts related to worker health, reduced chemical exposure and improved resilience, while revealing important trade-offs linked to labour requirements and upstream impacts of certain technologies.

## Business Models & Value Propositions

The BEATLES project analysed how fair business models and market conditions can facilitate the transition towards Climate-Smart Agriculture by improving value distribution, reducing risks and strengthening cooperation across agri-food chains. Through behavioural analysis, stakeholder engagement, interviews and co-creation activities, the project explored how farmers, consumers and other value-chain actors perceive fairness, sustainability and economic viability in CSA transitions.

The research identified four main farmer profiles — environmentalists, constrained farmers, indifferents and traditionalists — each characterised by different motivations and barriers regarding CSA adoption. Consumer analysis similarly revealed that sustainability-oriented choices are influenced not only by price, but also by trust, fairness perceptions and confidence that sustainability efforts are shared fairly across the food chain.

Based on these findings, the project developed 13 fair business model prototypes, including outcome-based payments, risk-sharing schemes, collaborative resource models, transparency branding and consumer-driven pricing approaches designed to support long-term CSA uptake and fairer agri-food systems.

The 13 fair business model prototypes developed by BEATLES are:

1. **Pay for Success** — farmers are rewarded for achieving jointly agreed and measurable climate-smart outcomes.
2. **Crowdfunding** — consumers provide upfront financial support for climate-smart farm investments or products.
3. **Consumer-Driven Pricing** — farmers and consumers jointly define fair prices reflecting sustainable production standards.
4. **Risk-Sharing Fund** — financial protection mechanisms compensate farmers for risks and losses linked to CSA implementation.
5. **Outcomes-Based Pricing** — farmers access agricultural technologies without upfront costs and pay only if agreed outcomes are achieved.
6. **Bio-Districts** — local collaborative agreements supporting sustainability, territorial identity and market access.
7. **Retail-Choice Editing** — retailers promote sustainable consumption by prioritising climate-smart products and reducing unsustainable alternatives.
8. **Data Coopetition Network** — farmers share anonymised data with peers to improve benchmarking, efficiency and decision-making.
9. **Shared Resource Pool** — collective access to technologies and equipment through rental or pay-per-use systems.
10. **Open Source** — collaborative co-development and sharing of practical climate-smart agricultural solutions and tools.
11. **Transparency Branding** — joint communication approaches that strengthen trust through transparent sustainability reporting.
12. **Consumer Engagement Platform** — digital tools supporting informed sustainable purchasing decisions based on environmental impacts.
13. **Peer-to-Peer Knowledge Sharing** — collaborative learning networks where farmers exchange practical experiences and best practices

### Advisors' Guide & Training Tools

Recognising the central role of agricultural advisors in supporting behavioural change and Climate-Smart Agriculture adoption, the BEATLES project developed a comprehensive Advisors' Guide and a set of training tools aimed at strengthening advisory capacity across European farming systems. The work addressed key challenges identified throughout the project, including limited technical support, fragmented climate information, insufficient economic knowledge on CSA practices and difficulties in addressing farmers' resistance to sustainability transitions.

The Advisors' Guide combines methodological guidance with country- and sector-specific content covering the five BEATLES Use Cases. It includes material on Climate-Smart Agriculture principles,

behavioural farmer typologies, sustainability assessments, fair business models and practical implementation approaches for different agricultural systems. In parallel, the project developed online training activities and webinars focused on climate resilience, greenhouse gas accounting tools, behavioural communication and practical CSA integration into advisory services. The results highlighted the importance of combining technical expertise with behavioural understanding, trust-building processes and context-specific advisory approaches to support successful climate transitions.

**Policy insights for advisors from the BEATLES Use Cases**

The BEATLES Advisors' Guide highlighted that advisors play a key role in helping farmers combine CAP support, investment planning and practical implementation of Climate-Smart Agriculture (CSA) practices. Across the five Use Cases, several concrete advisory priorities emerged.

**Germany – Organic Dairy Farming**

- Support dairy farmers in combining organic farming support with eco-schemes for legumes and grassland extensification.
- Advise farmers on regional protein sourcing strategies and cooperation with local feed processors.
- Assess Agri-PV investments together with CAP eligibility rules and energy support schemes.
- Integrate animal welfare, housing and herd-management advice into longevity strategies.

**Spain – Organic Apple Orchards**

- Help orchard farmers combine cover-crop eco-schemes, biodiversity measures and organic farming payments.
- Provide technical advice on floral bands, grazing integration and biological pest control.
- Support farmers in accessing Navarra renewable-energy schemes for on-farm solar investments.
- Assist small producers with certification requirements and CAP administrative procedures.

**Netherlands – Potatoes and Onions**

- Advise farmers on precision fertilisation, precision crop protection and irrigation-efficiency technologies.
- Support compliance with Dutch water-quality and crop-protection regulations linked to IPM.
- Help farmers combine CAP eco-schemes with national energy and environmental incentives.
- Promote collective approaches for biodiversity strips and water management.

**Lithuania – Wheat Production**

- Support farmers in integrating no-tillage systems with precision farming technologies.

- Assist smaller farms in accessing investment support for variable-rate fertilisation and digital tools.
- Advise on combining CAP support with national renewable-energy schemes for solar investments.
- Promote demonstration farms and peer-learning activities for conservation agriculture.

**Denmark – Pig Production**

- Support investment planning for slurry management, ventilation technologies and biogas systems.
- Help farmers navigate Danish biogas tender schemes and cooperative models.
- Promote integration between livestock farms and protein-crop production systems.
- Provide practical advice on energy-efficiency technologies and emissions reduction strategies.

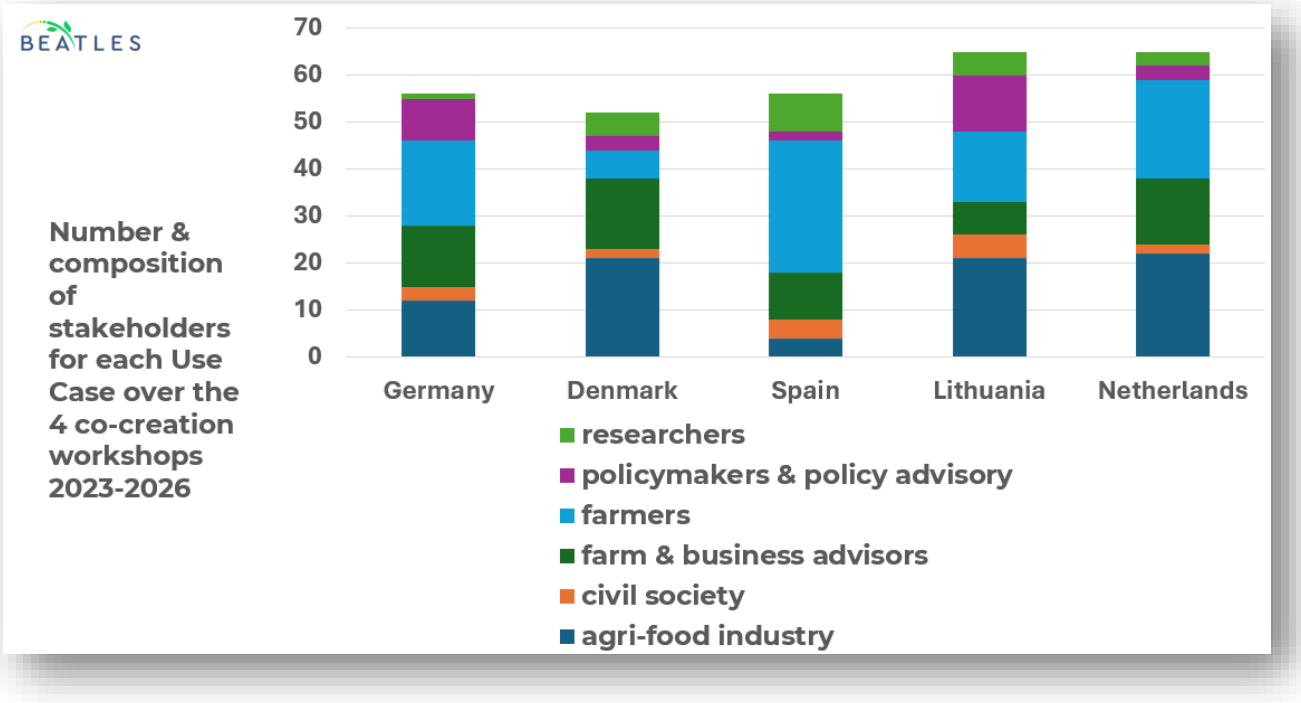
These recommendations show that advisors increasingly need to combine technical expertise, investment planning, behavioural support and policy guidance to facilitate long-term CSA transitions adapted to local farming systems.

### Co-creation Activities: Evidence from the Use Cases

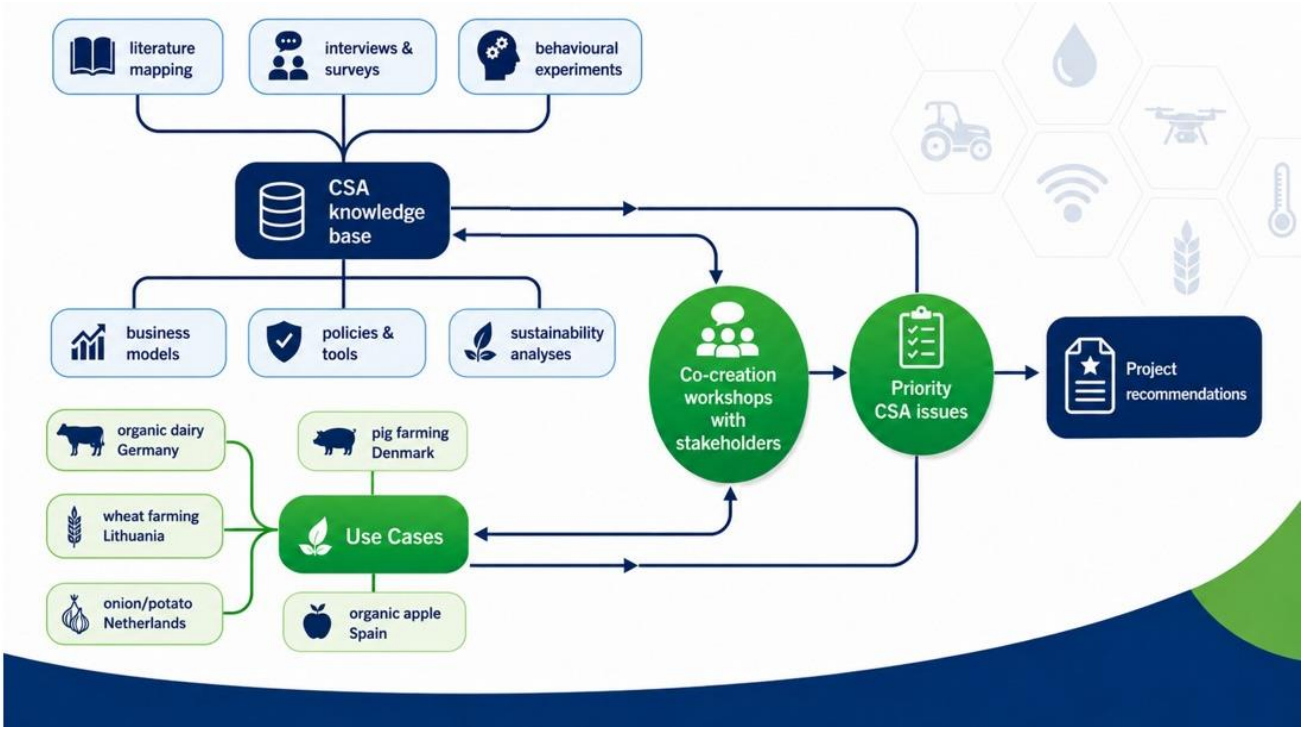
Co-creation activities formed a central methodological component of the BEATLES project, enabling continuous collaboration between farmers, researchers, advisors, policymakers, businesses and civil society organisations across the five project Use Cases. Through Living Lab approaches and participatory workshops, the project created spaces for joint problem identification, knowledge exchange and the co-development of transition pathways towards Climate-Smart Agriculture.

Over the course of the project, 20 multi-stakeholder workshops involving more than 250 participants were organised across the five agricultural systems studied by BEATLES. These activities identified key “lock-ins” limiting CSA adoption, including fragmented policy frameworks, insufficient advisory support, weak coordination among stakeholders, limited financing and low consumer awareness. At the same time, the workshops highlighted important “levers” for transition, such as increasing climate awareness, digitalisation opportunities, sustainability-driven market demand and the potential role of CAP reform in supporting systemic change. The co-creation process also demonstrated the value of place-based and participatory approaches for improving the relevance and applicability of research outcomes.

*Overview participation in Use Cases co-creation activities*




*BEATLES co-creation process*



## Co-creation Activities: Evidence from the EU Multi-Actor Working Group

The BEATLES EU Multi-Actor Working Group established a structured European policy-learning and dialogue platform to support the transition towards Climate-Smart Agriculture (CSA). Bringing together policy makers, researchers, advisory organisations, civil society actors and agri-food stakeholders, the Working Group created a space for mutual learning, evidence validation and collaborative reflection on the future of sustainable agri-food systems across Europe.

Through stakeholder mapping, targeted engagement, expert consultations and participatory policy discussions, the project implemented a progressive co-creation process linking BEATLES research findings with real policy debates and implementation challenges. Around 1,600 stakeholders were mapped during the project, while more than 120 policy-relevant actors directly participated in the three EU Multi-Actor Working Group workshops organised between 2024 and 2025.

The Working Group involved experts from 21 EU Member States, including representatives from EU institutions, national and regional public authorities, CAP-related bodies, advisory services, research organisations and agri-food networks. Three major workshops focused respectively on:

- CAP reform and Climate-Smart Agriculture implementation,
- the co-design of policy solutions and scaling pathways for CSA towards 2030 and 2040,
- and fairness in EU agri-food systems and value chains.

The methodology of the three workshops progressively evolved from a broad webinar-style dialogue to more focused and strategic collaborative formats. The process moved from an initial Policy Lab approach aimed at presenting and validating early BEATLES findings, to a more solution-oriented Policy Hackathon focused on the co-design of policy pathways for Climate-Smart Agriculture, and finally to a more specialised Policy Working Group dedicated to strategic reflection on fairness and future EU agri-food policies. This methodological evolution was accompanied by progressively smaller and more targeted groups of participants, allowing for deeper exchanges, more operational discussions and increasingly strategic policy-oriented collaboration.

The co-creation process directly contributed to the development and validation of BEATLES policy recommendations, policy briefs and the CSA Policy Toolkit. It also highlighted the importance of structured multi-actor dialogue, territorial adaptation and participatory governance in supporting more inclusive, operational and long-term transitions towards Climate-Smart Agriculture across Europe.

## Policy recommendations and tools

One of the central contributions of the BEATLES project has been the development of a comprehensive **policy-oriented framework designed to support the future implementation of Climate-Smart Agriculture (CSA) across Europe**. Building on four years of behavioural research, sustainability assessment, co-creation activities and policy analysis, the project translated its findings into a practical set of policy recommendations and operational tools aimed at supporting policymakers, Managing Authorities and public administrations involved in future agricultural transition planning.

The work developed under Work Package 5 carried out by AEIDL was conceived not simply as a policy analysis exercise, but as a practical and implementation-oriented process connecting scientific evidence, territorial experiences and policy-making realities. Through a combination of literature reviews, policy mapping, behavioural evidence, stakeholder consultations and co-creation activities, BEATLES developed a coherent methodological framework aimed at strengthening institutional readiness and supporting the **operationalisation of Climate-Smart Agriculture under future CAP and National and Regional Partnership Plan (NRPP) frameworks for the 2028–2034 programming period**.

A key element of the work consisted of analysing how existing policy instruments already support — or fail to support — the adoption of CSA practices across Europe. **The project assessed 25 Climate-Smart Agriculture practices across the five BEATLES Use Cases and identified 28 CAP interventions associated with these practices**, covering eco-schemes, agri-environmental and climate commitments, investment measures, advisory support, sectoral interventions and direct payments.

The analysis worked directly with the **official CAP Strategic Plan intervention fiches and EU intervention catalogue**, taking into account amendments introduced during the implementation period. For each intervention, detailed information was extracted regarding:

- eligibility and conditionality requirements;
- type of supported CSA practices;
- implementation logic and targeting mechanisms;
- payment structures and duration;
- administrative and governance requirements;
- links between Pillar I and Pillar II instruments;
- budgetary relevance within national CAP Strategic Plans.

The mapping exercise demonstrated that support for CSA transitions currently relies on highly fragmented combinations of CAP and non-CAP instruments, often characterised by limited coherence, complex eligibility conditions and uneven implementation across Member States.

The 28 CAP interventions identified were mainly linked to:

- eco-schemes supporting biodiversity, soil management and precision farming;
- agri-environment-climate commitments promoting long-term environmental transitions;
- investment support measures for renewable energy, precision agriculture and infrastructure;
- advisory and knowledge-transfer interventions;
- sectoral interventions for specific value chains;
- complementary farm sustainability and risk-management instruments.

| Direct payments | Rural Development |
|---|---|
| **Eco-schemes:**<br>• Diverse plant production (DK)<br>• Cultivation of diverse crops with at least five main crop species in arable farming, including leguminous crops with a minimum share of 10 percent (DE)<br>• Extensification of the total permanent grassland of the holdings (DE)<br>• Integrated grassland and wetland management (LT)<br>• Extensive wetland (LT)<br>• Arable land – Non simultaneous conservation farming technologies (no-tillage) (LT)<br>• Carbon agriculture: green cover and inert cover on woody crops on flat land (ES), medium slope land (ES) and steep sloping land (ES)<br>• Climate and living environment (NL)<br>• Agroecology: Biodiversity spaces in croplands and permanent crops (ES)<br>• Carbon Farming and Agroecology: Extensive Grazing, Mowing and Biodiversity in Humid Grasslands and Mediterranean Grasslands (ES)<br>• Activities on arable land - Catch crops (LT) | **Envclim**:<br>• Organic farming (DE, ES)<br>• Management commitments to: Climate change mitigation (DE); Animal welfare (DE); Integrated production (ES); Sustainable crop commitments (ES); Maintenance or improvement of habitats and traditional farming activities that preserve biodiversity (ES); Soil improvement and erosion control practices (ES); Commitments for the promotion and sustainable management of grassland (ES); Protection of birdlife (ES)<br>• Agricultural Nature and Landscape Management (NL)<br><br>**Invest**:<br>• Environmental and climate-friendly technology (DK);<br>• Development of small to medium-sized farms (LT);<br>• Productive investment for farm modernisation (NL);<br>• Investments in agricultural holdings (LT, ES);<br>• Non- productive investments on agricultural holdings (NL) and in non-agricultural holdings (NL)<br>• Investments in tangible and intangible assets, as well as other actions (ES) |
| **Sectoral** Fruit and Vegetables (ES, NL) | |
| **BISS** (LT, DE, ES, DK; NL) | |

**In parallel, the analysis also examined complementary non-CAP instruments relevant for CSA transitions mainly on energy and protein crops support**, including:

- renewable energy subsidy schemes;
- protein crop and feed strategies;
- biogas and circular bioeconomy programmes;
- tax incentives for green investments;
- regional energy and climate initiatives;
- innovation and digitalisation support mechanisms.

The assessment revealed important differences between Member States regarding the level of support, intervention design, implementation conditions and budget allocation associated with CSA practices. In many cases, successful adoption pathways depend on combinations of instruments across both Pillar I and Pillar II, particularly when practices require long-term investment, experimentation or progressive transition phases.

This work also revealed that support for CSA transitions currently depends on highly fragmented combinations of CAP and non-CAP instruments, often characterised by limited coherence, complex eligibility requirements and uneven implementation across Member States. The project identified important differences in the design, budget allocation and operational conditions of interventions supporting CSA practices, particularly regarding longer-term transition pathways requiring investment, advisory support and behavioural change mechanisms.

At the core of the BEATLES policy outcomes is the development of the **Climate-Smart Agriculture Policy Toolkit**, conceived as a practical suite of tools supporting policymakers across the full policy cycle — from diagnosis and planning to implementation and monitoring. The toolkit follows a diagnosis–design–monitoring logic and includes three complementary operational tools.

The first tool is the **CSA Policy Readiness and Enabling Conditions Checklist**, designed as a self-assessment framework helping policymakers evaluate whether the institutional, governance, financial and advisory conditions necessary for CSA transitions are actually in place. Structured around 12 dimensions — including governance, financing, AKIS integration, digitalisation, farmer adoption dynamics, social inclusion and monitoring systems — the tool supports the identification of policy gaps, reform priorities and investment needs while helping build national or regional CSA roadmaps. Importantly, the tool integrates behavioural dimensions such as farmer segmentation, trust, social norms and adoption barriers into policy planning processes.

The second tool is the **CSA Intervention Design Tool for NRPP Programming (2028–2034)**, conceived as an integrated transition package builder helping policymakers move beyond isolated policy measures towards more coherent and long-term CSA transition pathways. Following a step-by-step logic, the tool supports the identification of territorial challenges, farming system characteristics, adoption barriers, intervention logics and the most effective combinations of CAP and non-CAP instruments. The methodology promotes the design of integrated transition packages. In practice, the tool is designed to support future agri-environmental and climate actions, green investments, and broader transition planning under the future NRPP framework.

A central concept developed through this tool is the idea of **progressive transition pathways**. BEATLES proposes that CSA adoption should not be addressed through fragmented annual measures, but through sequenced transition phases combining different policy instruments over time. The first phase focuses on experimentation and risk reduction through eco-schemes, advisory support and demonstration activities; the second phase supports consolidation and integration of practices into farm management systems through agri-environmental commitments and landscape programmes; while the third phase focuses on scaling and structural transformation through investments, renewable energy programmes, protein strategies and value-chain development.

The third tool is the **CSA Performance Monitoring Tool for NRPP Implementation**, designed to help policymakers monitor whether CSA transitions are effectively occurring on the ground and whether interventions are delivering expected behavioural, environmental and socio-economic outcomes. The monitoring framework is structured around key transition dimensions, including adoption of CSA practices, environmental and climate performance, socio-economic transition, behavioural change and advisory uptake, and governance transformation. Rather than creating additional reporting burdens, the tool builds on existing CAP performance indicators and Annex I monitoring systems while identifying where complementary CSA indicators may be required.

In parallel to the toolkit, **the policy recommendations developed within BEATLES aim to support a more coherent, behaviourally informed and operational transition towards Climate-Smart Agriculture across Europe.** The recommendations are structured across EU and Member State governance levels and are intended to support the future CAP and NRPP programming framework.

**The recommendations focus on the following strategic priorities:**

1. **Strengthening horizontal and territorial policy coherence for CSA adoption;**
2. **Promoting adaptive and integrated NRPP governance systems;**
3. **Integrating fairness and supporting fair transition pathways for farmers;**
4. **Supporting vulnerable farmers, territories and value chains;**
5. **Enhancing behavioural approaches;**

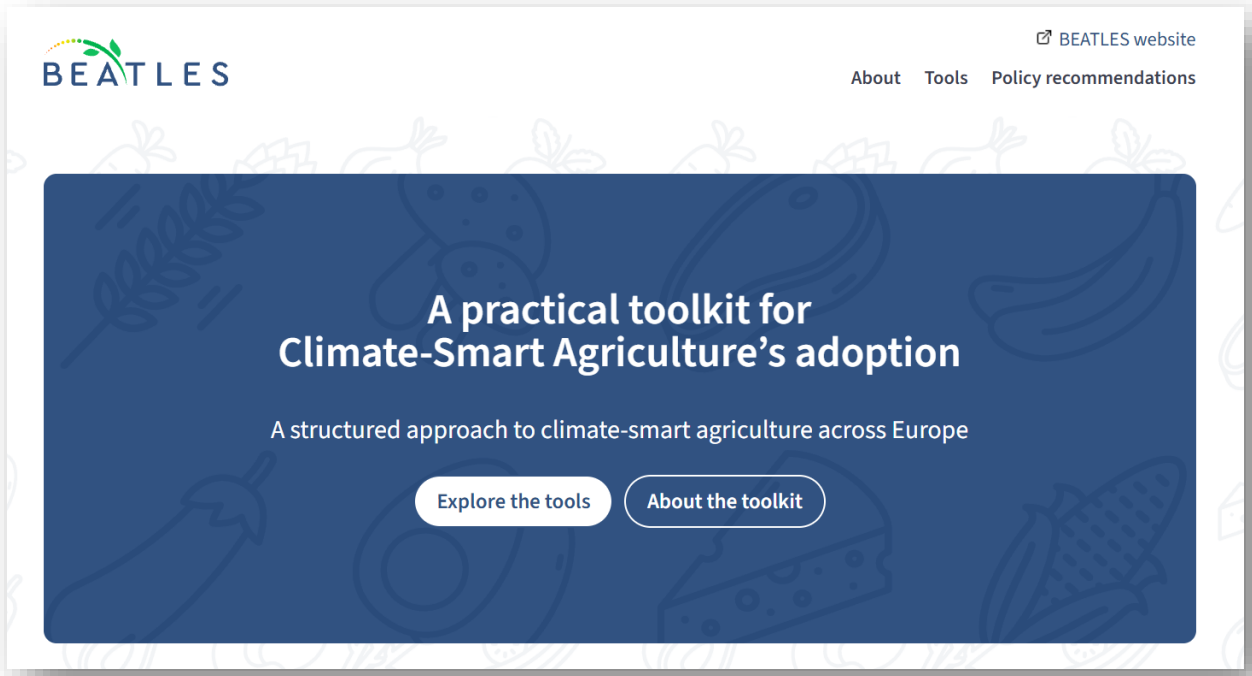
6. **Improving the green architecture of CAP interventions;**
7. **Facilitating financial sequencing and long-term investment stability;**
8. **Simplifying CAP implementation and reducing administrative burdens;**
9. **Strengthening advisory systems and Agricultural Knowledge and Innovation Systems (AKIS);**
10. **Improving territorial monitoring and climate transition assessment;**
11. **Promoting digitalisation and interoperability of governance systems;**
12. **Aligning agricultural transition pathways with long-term EU climate and sustainability objectives.**

**Each recommendation is supported by a detailed technical fiche** including:

- policy objectives and rationale;
- implementation challenges addressed;
- evidence base and strategic alignment;
- proposed operational actions;
- implementation pathways and governance considerations;
- policy instruments and financing needs;
- risks and mitigation measures;
- monitoring indicators and expected outcomes.

Together, the recommendations, policy briefs, consultations and operational tools developed by BEATLES aim to strengthen institutional readiness and provide practical support for the design, implementation and monitoring of Climate-Smart Agriculture transitions across Europe.

This framework of recommendations is complementedby **policy insights at Use Case level,** providing contextualised evidence from Member States, available in BEATLES Deliverable 5.1 and through the practical online CSA Toolkit (www.climatesmartagri.eu).




**At the heart of Climate-Smart Agriculture are three interconnected pillars:**

### Productivity

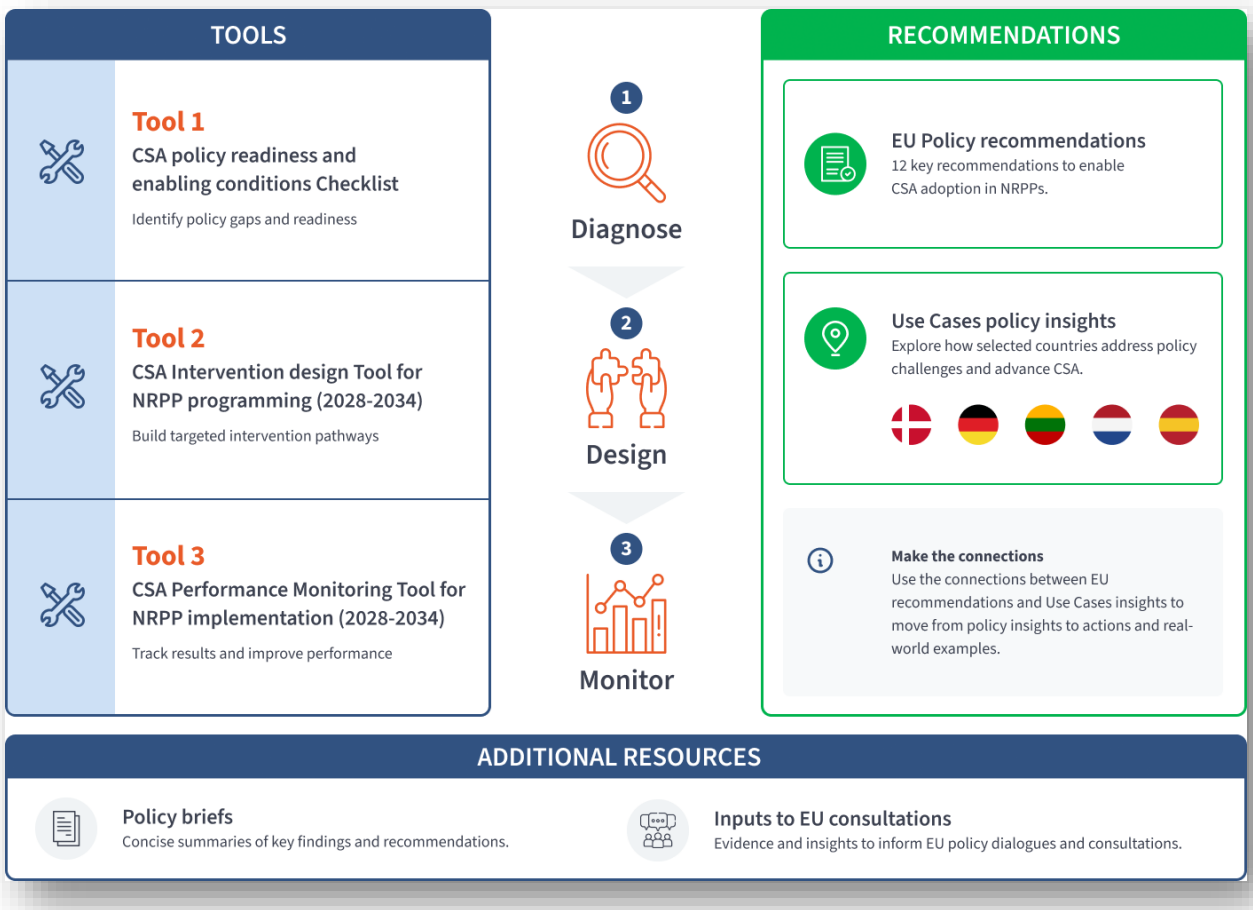
Sustainably improving agricultural productivity, food security, farm viability, and rural livelihoods.

### Adaptation

Strengthening the resilience of farming systems, territories, and value chains to climate variability and extreme events.

### Mitigation

Reducing greenhouse gas emissions while promoting carbon sequestration, resource efficiency, and sustainable land management.




## Main policy recommendations for Climate-Smart Agriculture (CSA)

One of the main contributions of the BEATLES project has been the formulation of operational and implementation-oriented policy recommendations to **support the integration of Climate-Smart Agriculture (CSA) into the future CAP and National and Regional Partnership Plans (NRPPs) for the 2028–2034 programming period**. The recommendations are grounded in behavioural evidence, sustainability assessments, CAP Strategic Plan analysis, co-creation activities and policy dialogue processes developed throughout the project.

A central conclusion of the project is that **CSA adoption cannot rely on isolated measures or short-term incentives alone**. Effective transitions **require integrated policy pathways combining CAP and non-CAP instruments**, including agricultural policy, renewable energy schemes, protein strategies, green investment support, innovation funding and territorial governance mechanisms.

The BEATLES analysis identified a recurring **implementation logic across CAP Strategic Plans in relation to CSA adoption**. Eco-schemes under direct payments were found to function primarily as entry-level instruments supporting experimentation and low-risk adoption of practices such as cover crops, no-tillage systems, crop diversification, biodiversity strips and integrated pest management. Agri-environmental and climate commitments (AECMs) under rural development interventions were more strongly associated with medium- and long-term management transitions, including organic farming, wetland management, extensive grazing systems and

sustainable irrigation practices. Investment measures were identified as critical for supporting more capital-intensive transitions, including precision fertilisation technologies, slurry management systems, livestock ventilation technologies and precision agriculture equipment.

Based on these findings, BEATLES recommends introducing **multi-annual transition pathways** structured around three progressive phases:

- **Entry phase**: experimentation and risk reduction through eco-schemes, advisory support and demonstration activities;
- **Consolidation phase**: integration of CSA practices into farm management systems through AECMs, organic schemes and landscape management programmes;
- **Scaling phase**: structural transformation through CAP investment measures, renewable energy programmes, protein strategies and value-chain investments.

The project also highlights that future NRPPs should move towards integrated intervention ecosystems rather than fragmented policy instruments. This implies **systematically combining agri-environmental and climate actions (AECAs), green investment schemes, farm stewardship systems, renewable energy programmes and advisory services** within coherent transition packages adapted to territorial and farming system realities.

Another key recommendation concerns policy coherence and adaptive governance. BEATLES proposes the introduction of **mandatory Policy Coherence Assessments and Policy Coherence Indicators (PCI) within NRPPs** in order to identify inconsistencies between CAP interventions and other national policy instruments influencing agricultural transitions, particularly in the fields of energy, fertilisers, taxation, protein crops and climate policy. The project further recommends that NRPPs should function as adaptive governance systems rather than static programming documents, integrating continuous monitoring, learning and policy adjustment mechanisms.

**Behaviourally-informed policymaking constitutes another core recommendation emerging from the project.** Experimental evidence generated within BEATLES demonstrated that CSA adoption is strongly influenced by risk perception, trust, advisory systems, peer-learning mechanisms and social norms. The project therefore recommends integrating behavioural approaches into future CAP implementation, including:

- **Individual Farm Assessment (IFA) tools;**
- **farmer-type segmentation methodologies;**
- **behavioural indicators within monitoring systems;**
- **progressive risk-reduction incentives instead of one-off payments;**
- **demonstration farms and peer-learning networks.**

The project identified four broad **farmer profiles** — environmentalists, constrained farmers, indifferents and traditionalists — requiring differentiated support approaches adapted to varying levels of risk tolerance, knowledge, financial capacity and willingness to adopt CSA practices.

BEATLES also stresses the importance of **strengthening Agricultural Knowledge and Innovation Systems (AKIS), advisory services and behavioural communication capacities**. The recommendations call for increased integration between advisory systems, digital tools, peer-learning structures and territorial governance mechanisms to facilitate long-term behavioural change and implementation capacity.

From a **territorial governance perspective,** the project recommends aligning interventions with agro-ecological and socio-economic realities **through stronger territorial differentiation of measures and the systematic use of NUTS-3 territorial assessments**. BEATLES proposes conducting territorial coherence assessments in order to identify implementation mismatches and improve alignment between farm-level interventions and landscape-level governance processes.

The project further recommends **strengthening CSA-ready monitoring systems** linked to the future EU Performance Framework. Building on the analysis of Annex I of COM(2025)545, BEATLES proposes the introduction of complementary CSA indicators capable of monitoring adoption dynamics, behavioural change and territorial resilience, including:

- R-CSA1: Share of farms adopting at least one Climate-Smart Agriculture practice;
- R-CSA2: Landscape-level CSA adoption rate at NUTS-3 level;
- R-CSA3: Reduction in climate vulnerability indices;
- R-CSA4: Share of advisory or training beneficiaries reporting behavioural change within 12 months.

The recommendations also emphasise the need to **improve interoperability between farm-level data systems, territorial monitoring frameworks and the Farm Sustainability Data Network (FSDN)** in order to strengthen evidence-based programming and implementation monitoring.

Overall, BEATLES concludes that Climate-Smart Agriculture transitions require long-term, territorially differentiated and behaviourally informed governance approaches combining CAP and non-CAP instruments within coherent policy ecosystems capable of supporting structural transformation across European agri-food systems.

### Articles and Papers

Throughout the project, a series of articles and publications have been produced and are collected here:

Publication #1: Drivers and barriers to the adoption of precision irrigation technologies in olive and cotton farming—Lessons from Messenia and Thessaly regions in Greece

Authors: Konstantina Kakkavou, Marilena Gemtou, and Spyros Fountas

Publication #2: Review on the contribution of farming practices and technologies toward climate-smart agricultural outcomes in a European context

Authors: Kassa Tarekegn Erekalo, Søren Marcus Pedersen, Tove Christensen, Sigrid Denver, Marilena Gemtou, Spyros Fountas, and Gohar Isakhanya

Publication #3: Business strategies towards climate-smart agriculture in Europe: A literature review

Authors: Gohar Isakhanyan, Christopher Jr. Galgo, Marilena Gemtou, and Søren Marcus Pedersen

Publication #4: Farmers' Transition to Climate-Smart Agriculture: A Systematic Review of the Decision-Making Factors Affecting Adoption

Authors: Marilena Gemtou, Konstantina Kakkavou, Evangelos Anastasiou, Spyros Fountas, Soren Marcus Pedersen, Gohar Isakhanyan, Kassa Tarekegn Erekalo, and Serafin Pazos-Vidal

Publication #5: Drivers and barriers to climate-smart agricultural practices and technologies adoption: Insights from stakeholders of five European food supply chains

Authors: Søren Marcus Pedersen, Kassa Tarekegn Erekalo, Tove Christensen, Sigrid Denver, Marilena Gemtou, Spyros Fountas, Gohar Isakhanyan, Arno Rosemarin, Nelson Ekane, LiseLotte Puggaard, Magdalena Nertinger, Harm Brinks, Diana Pusko, and Jon Bienzobas Adrian

Publication #6: Smart Farming Technologies and Sustainability (Book chapter)

Authors: Marilena Gemtou, Blanca Casares Guillén, and Evangelos Anastasiou

Publication #7: Understanding the behavioral factors influencing farmers' future adoption of climate-smart agriculture: A multi-group analysis

Authors: Kassa Tarekegn Erekalo, Marilena Gemtou, Marcel Kornelis, Søren Marcus Pedersen, Tove Christensen, and Sigrid Denver

Publication #8: Harvesting Value! Exploring How Climate- Smart Agriculture Practices Change Farm Business Models in Europe

Authors: Christopher Galgo Jr., Gohar Isakhanyanm Jos Bijman, Verena Otter, and Marilena Gemtou

Publication #9: Consumers' Willingness to Pay a Premium for Climate- Friendly Food Production: The Role of Production Method Information and Social Norms

Authors: Kassa Tarekegn Erekalo, Tove Christensen, Sigrid Denver, Marilena Gemtou, and Spyros Fountas

Publication #10: Sowing the seeds of change: unveiling farmer types to promote climate-smart agriculture adoption in Europe

Authors: Marilena Gemtou, Marcel Kornelis, Gohar Isakhanyan, Søren Marcus Pedersen, Spyros Fountas, Liselotte Puggaard, Jon Bienzobas Adrian, and Alexia Izco Zabalza

Publication #11: The Effect of Climate Smart Agricultural (CSA) Practices in Sustainability: A Case Study Focusing on Wheat Cultivation in Lithuania

Authors: Fotini Drosou, Tryfon Kekes, Linas Didžiulevicius, Christos Boukouvalas, Nickolaos M. Panagiotou, and Magdalini Krokida

Publication #12: Enhancing the Sustainability of Apple Farming Utilizing Climate-Smart Agricultural (CSA) Practices

Authors: Tryfon Kekes, Fotini Drosou, Georgia Frakolaki, Christos Boukouvalas, Nickolaos M. Panagiotou, Jon Bienzobas, Alexia Zabalza, and Magdalini Krokida

Publication #13: Behavioral responses to regulatory push and market pull instruments: Experimental evidence from Danish agriculture

Authors: Kassa Tarekegn Erekalo, Tove Christensen, Sigrid Denver, Søren Marcus Pedersen

Article #1: Drivers and barriers to climate-smart agricultural practices and technologies adoption: Insights from stakeholders of five European food supply chains

Authors: Kassa Tarekegn Erekalo, Tove Christensen, Sigrid Denver, Søren Marcus Pedersen, Marilena Gemtou, Spyros Fountas

Article #2: European consumer typology: Tailored Strategies and Policies based on consumers' traits

Authors: Marcel Kornelis and Marilena Gemtou

Practice Abstract #1: Business strategies towards ClimateSmart Agriculture in Europe

Authors: Gohar Isakhanyan, Christopher Jr. Galgo, Marilena Gemtou, and Søren Marcus Pedersen

**Disclaimer**

This dossier of results has been produced by AEIDL (European Association for Innovation in Local Development), partner of the Horizon Europe BEATLES project, to help external experts participating in the roundtable, as well as policy stakeholders and commentators, understand the work carried out over the four years of the project and its main outcomes.

AEIDL is responsible for the (funded by the European Union under GA no. 101060645) and responsible for developing EU policy recommendations and tools that guide policy formulations that enable a transition to fair, inclusive, sustainable climate-smart practices and behaviours.

The BEATLES project is coordinated by the Agricultural University of Athens.