SMART CSA

Co-funded by the European Union

Sustainable Futures:
Smart Technologies in Urban & Peri-Urban Permaculture & CSA

Erasmus + KA220-VET: Cooperation
Partnerships in Vocational Education & Training

Grand Agreement n°:
2025-1-FR01-KA220-VET-000355866

TERRA SUD · ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΕΛΟΠΟΝΝΗΣΟΥ UNIVERSITY of PELOPONNESE · OLYMPIC TRAINING & CONSULTING · PfSD Partners for Skills Development · Vihreä Pourusmäki · REGIONALNA RAZVOJNA AGENCIJA BAČKA · syncnify

Executive Summary

This consolidated report synthesizes findings from partner countries regarding the development of sustainable urban and peri-urban agriculture (UPA), with a focus on Community-Supported Agriculture (CSA), permaculture, and the integration of smart technologies. Across all countries, there is a clear trend toward increased interest in sustainable and locally embedded food systems. CSA and permaculture are recognized as viable approaches to improving environmental sustainability, strengthening producer–consumer relationships, and enhancing resilience to climate change. However, their level of development varies significantly. Countries such as France demonstrate well-established and institutionalized systems, while Cyprus and Finland exhibit more fragmented or niche developments. Bulgaria, Greece, and Serbia represent intermediate cases, characterized by growing adoption but persistent structural barriers.

EU policy frameworks, including the European Green Deal, Farm to Fork Strategy, Biodiversity Strategy, and CAP 2023–2027, provide a strong enabling environment. Nevertheless, the absence of targeted national policies specifically addressing CSA, permaculture, and UPA remains a common gap. Smart technologies are increasingly recognized as key enablers of efficiency, sustainability, and innovation. Their application ranges from basic digital tools and communication platforms to advanced precision agriculture systems. However, adoption remains uneven due to cost, limited digital skills, and lack of tailored solutions for small-scale farmers. Key challenges identified across countries include fragmented governance, limited access to funding, weak knowledge transfer mechanisms, and insufficient integration of research and practice. At the same time, strong opportunities exist through EU funding, growing consumer demand for local food, and emerging innovation ecosystems.

The comparative analysis reveals five key findings. First, the level of development of CSA, permaculture, and urban agriculture differs substantially across partner countries, with France demonstrating the highest degree of institutionalization and integration. Second, smart technologies are increasingly recognized as important enablers of sustainability and efficiency, although adoption remains uneven due to financial, technical, and institutional barriers. Third, stakeholder collaboration and governance quality strongly influence the success and scalability of sustainable agricultural initiatives. Fourth, economic resilience is closely linked to the diversification of income streams, short supply chains, and strong producer–consumer relationships. Fifth, social and environmental benefits often emerge faster than policy and market adaptations, highlighting the importance of community-driven innovation. Based on these findings, priority actions include strengthening policy support for CSA and urban agriculture, improving access to funding and advisory services, promoting context-specific technological innovation, enhancing knowledge transfer mechanisms, and fostering stronger multi-stakeholder collaboration at local, regional, and national levels. The report concludes that the transition toward sustainable and smart agricultural systems requires integrated, multi-actor approaches combining policy support, technological innovation, and community engagement.

The SMART-CSA Project

SMART-CSA is an Erasmus+ project that responds to the growing need for more sustainable, resilient and technologically informed approaches to farming in urban and peri-urban areas. The project unites organisations from across Europe with expertise in agriculture, vocational education, digital learning, regional development and stakeholder engagement. Its aim is to connect established practices such as permaculture and Community-Supported Agriculture with smart farming technologies, while giving farmers, trainers and learners the practical skills needed to apply these approaches in real working environments.

During the project, the partners will carry out research, review relevant policies, visit farming sites and consult with stakeholders to better understand current needs and promising practices. These findings will guide the development of short digital learning modules, training videos, practical workshops, field visits and a dedicated online platform. The project will also create a training and certification framework for sustainable agricultural skills and share its results through webinars, national events and a final European conference, helping the knowledge produced reach educators, farmers, local authorities and other organisations working in the agri-food sector.

The SMART-CSA Partnership

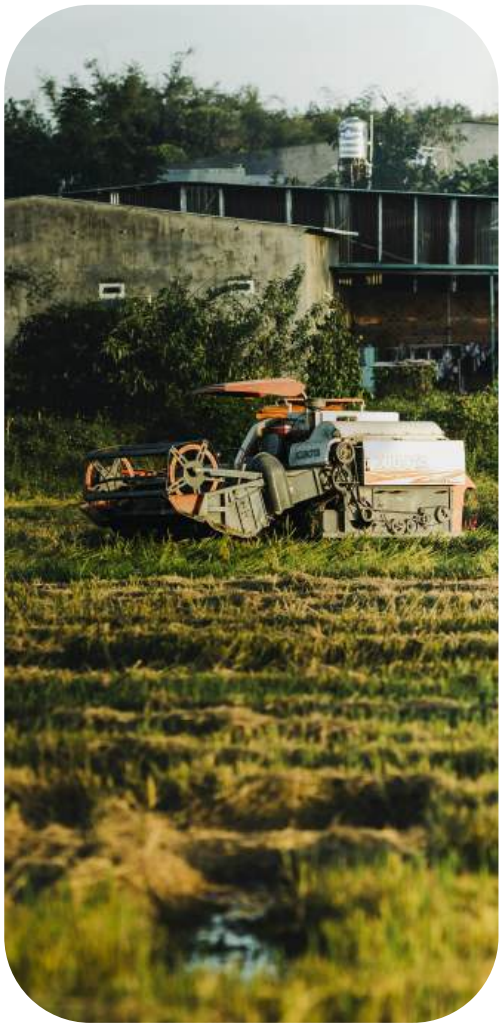
Co-funded by the European Union

Grant Agreement Number: 2025-1-FR01-KA220-VET-000355866.
Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the Agence Erasmus+ France / Education Formation. Neither the European Union nor the Agence Erasmus+ France / Education Formation can be held responsible for them.

List of Abbreviations

Abbreviation	Full Term
AMAP	Association pour le Maintien d'une Agriculture Paysanne
CAP	Common Agricultural Policy
CSA	Community-Supported Agriculture
EU	European Union
GDP	Gross Domestic Product
ICT	Information and Communication Technologies
IoT	Internet of Things
NGO	Non-Governmental Organisation
R&D	Research and Development
SDGs	Sustainable Development Goals
UPA	Urban and Peri-Urban Agriculture
UoP	University of Peloponnese
OP	Olympic Training
PFSD	Partners for Skills Development
RDA	Regional Development Agency
VP	Vihreä Pourusmäkiry
AUP	Agricultural University of Plovdiv
GHG	Greenhouse Gas
AI	Artificial Intelligence
GIS	Geographic Information Systems
SMEs	Small and Medium-sized Enterprises

Table of Contents



1. Introduction

Urban and peri-urban agriculture (UPA) has emerged as a critical component of sustainable food systems across Europe and partner countries, responding to a convergence of global and regional challenges. Accelerating urbanization, climate change, biodiversity loss, and increasing disruptions in global supply chains have highlighted the vulnerability of conventional agri-food systems and the urgent need for more resilient, localized, and sustainable alternatives. Within this context, UPA represents not only a mode of food production but also a multifunctional system that contributes to environmental sustainability, social cohesion, economic diversification, and urban resilience.

Across the countries analyzed in this report, France, Bulgaria, Greece, Serbia, Cyprus, and Finland, the role and development of UPA vary significantly, reflecting differences in policy frameworks, institutional capacity, socio-economic conditions, and technological adoption. France stands out as a leading example where UPA is fully integrated into urban planning and public policy. Initiatives such as large-scale rooftop farming and municipal food strategies demonstrate how cities can actively incorporate agriculture into spatial planning and climate adaptation policies.

In contrast, Bulgaria and Greece exhibit a more bottom-up development trajectory, where UPA is driven largely by civil society initiatives, small-scale farmers, and EU-supported programmes rather than strong national policy frameworks. Serbia represents a transitional case, where alignment with European Union standards and strategies is progressing, yet practical implementation remains constrained by institutional capacity and structural challenges such as land fragmentation and limited advisory services. Cyprus, on the other hand, is characterized by an early-stage and fragmented UPA landscape, where initiatives are primarily small-scale and driven by private actors or community efforts, with limited policy support. Finland presents a distinct model: while classical urban agriculture remains relatively limited, the country demonstrates strong development in what is referred to as "diverse local agriculture", a system of small-scale, locally embedded production closely connected to urban consumers, supported by advanced digitalization and innovation ecosystems.

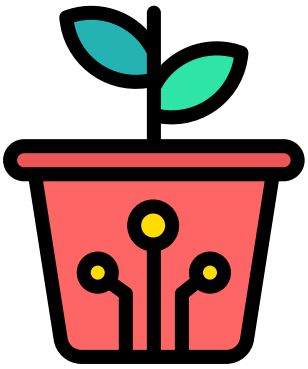
Within this broader UPA framework, Community-Supported Agriculture (CSA) and permaculture play a central role in advancing sustainable and resilient food systems. CSA models establish direct, trust-based relationships between producers and consumers, often through subscription systems that share risks and benefits. This model is highly developed in France, where AMAP networks represent a mature and institutionalized form of CSA, supported by strong civic engagement and policy alignment. In Bulgaria and Greece, CSA is expanding but remains less structured, often operating through informal or semi-formal arrangements. Serbia demonstrates emerging CSA practices, typically integrated into hybrid farming systems, while Cyprus shows limited but growing adoption. In Finland, CSA exists as a niche model within a broader landscape of diversified local agriculture, reflecting both potential and structural constraints.

Permaculture, as a design-based approach grounded in ecological principles, complements CSA by promoting regenerative practices such as soil restoration, biodiversity enhancement, and efficient resource use. Across all countries, permaculture principles are increasingly recognized as relevant for climate adaptation and sustainable land management. However, their level of formal recognition and integration into policy and practice varies. France and Greece show relatively higher visibility of permaculture within agro ecological movements, while Bulgaria demonstrates growing interest through grassroots initiatives and educational programmes. In Serbia and Cyprus, permaculture is present but remains limited in scale and institutional support. In Finland, permaculture principles are often applied in practice, even if not explicitly labelled as such, reflecting a broader trend toward regenerative agriculture.

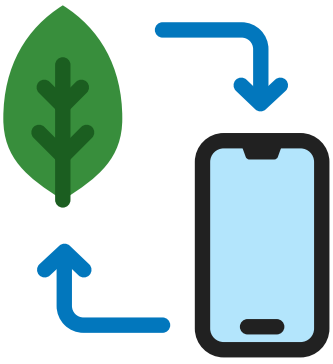
The integration of smart technologies represents a key dimension of innovation within UPA, CSA, and permaculture systems. Technologies such as environmental sensors, precision irrigation systems, digital platforms for CSA coordination, and farm management software have the potential to significantly enhance efficiency, resource use, and resilience. However, adoption patterns differ markedly across countries. France and Finland lead in the integration of smart technologies, supported by strong digital infrastructure, innovation ecosystems, and policy incentives. Bulgaria and Greece demonstrate moderate adoption, often linked to EU-funded projects and pilot initiatives. In contrast, Serbia and Cyprus face substantial barriers, including high costs, limited digital skills, and insufficient access to training and support services.

Importantly, the relevance of smart technologies extends beyond productivity gains. In the context of CSA and permaculture, these technologies can facilitate better coordination between producers and consumers, improve transparency, and support data-driven decision-making in small-scale farming systems. Nevertheless, the analysis across countries indicates that technological innovation alone is insufficient. Its effectiveness depends on accessibility, usability, and alignment with the realities of small and medium-sized farms, particularly in contexts where financial and human resources are limited.

The development of UPA, CSA, and permaculture systems is closely linked to key European policy frameworks, which provide both strategic direction and financial support. The European Green Deal establishes the overarching vision of climate neutrality and sustainability, while the Farm to Fork Strategy outlines specific targets for reducing environmental impacts and promoting sustainable food systems. The EU Biodiversity Strategy reinforces the importance of ecosystem restoration and sustainable land use, and the Common Agricultural Policy (CAP) 2023-2027 provides the main financial instrument supporting agricultural transformation.



While all countries analyzed are influenced by these frameworks (either directly or through alignment processes in the case of Serbia), their translation into national and local policies varies significantly. France demonstrates a high degree of policy integration, effectively linking EU objectives with national strategies and local implementation. Bulgaria and Greece show strong alignment but face challenges in coordination and administrative efficiency. Finland aligns well with sustainability and digitalization goals but lacks targeted instruments for small-scale and CSA-oriented systems. Serbia is progressing in aligning with EU policies but requires stronger institutional capacity for implementation. Cyprus, despite formal alignment, lacks specific policies addressing CSA and urban agriculture, limiting the structured development of these systems.



Overall, the comparative analysis highlights that the transition toward sustainable urban and peri-urban agriculture is not uniform across countries. It is shaped by a complex interplay of policy frameworks, institutional structures, stakeholder dynamics, and technological capabilities. Countries with stronger policy coherence, effective governance, and integrated innovation systems, such as France, demonstrate more advanced and scalable models. In contrast, countries with fragmented governance and limited institutional support, such as Cyprus and Serbia, face significant barriers despite evident potential. Bulgaria and Greece occupy an intermediate position, characterized by dynamic development and strong societal interest, but requiring further policy refinement and institutional strengthening. Finland represents a unique case where technological advancement and innovation coexist with structural challenges related to scale and policy alignment. This report builds on these insights to analyze the current state, challenges, and opportunities for UPA, CSA, and permaculture across partner countries, with a particular focus on the role of smart technologies in enabling sustainable and resilient food systems.

1.1 Methodological Approach & Evidence Synthesis

This report represents the consolidated outcome of Activities A2.1, A2.2, A2.3 and A2.4 implemented under Work Package 2 and applies a comparative, multi-method and evidence-based analytical approach to assess the development of sustainable urban and peri-urban agriculture (UPA), Community-Supported Agriculture (CSA), permaculture, and smart agricultural technologies across the partner countries: Bulgaria, France, Greece, Serbia, Cyprus, and Finland. The analytical framework combines policy analysis, stakeholder assessment, empirical field research, and participatory consultation methods in order to provide both descriptive and strategic insights into the current state and future development pathways of sustainable agricultural systems.

The report synthesizes findings from the following activities:

- **A2.1 Literature and Policy Review** provided the conceptual and policy foundation of the analysis, including assessment of European and national policy frameworks related to sustainable agriculture, agroecology, CSA, permaculture, digitalization, and climate resilience.
- **A2.2 Stakeholder Mapping and Engagement** contributed to the identification and analysis of key actors involved in sustainable agricultural systems, including public institutions, farmers, civil society organizations, research institutions, technology providers, and consumers. This activity supported the governance and stakeholder ecosystem analysis presented in Chapters 3 and Chapter 8.
- **A2.3 Field Data Collection and Site Visits** provided empirical evidence concerning operational models, technological adoption, market structures, environmental practices, and community engagement across the partner countries. The field research enabled comparative analysis of real-world practices and informed the case studies presented in Chapter 5.
- **A2.4 Expert Workshops and Seminars** contributed participatory and practice-oriented insights through consultation with stakeholders from all six partner countries. The workshops involved approximately 120 participants representing academia, public authorities, farmers, NGOs, innovation actors, and practitioners. Workshop discussions supported the validation of analytical findings and informed the development of the strategic recommendations presented in Chapter 9.

The report applies a comparative cross-country synthesis approach, combining qualitative thematic analysis with triangulation of evidence from policy documents, stakeholder consultations, field observations, and workshop discussions. This approach enables identification of both common European trends and country-specific dynamics influencing the development of CSA, permaculture, and smart urban and peri-urban agriculture systems. Particular attention was given to the interaction between policy frameworks, governance structures, technological innovation, market development, and social engagement in shaping sustainable agricultural transitions. The resulting analysis therefore aims not only to assess current conditions but also to provide actionable strategic guidance adaptable across diverse national and regional contexts.

2. Policy and Literature Landscape

2.1 Overview of EU & National Policies Relevant to CSA & Permaculture

The development of Community-Supported Agriculture (CSA), permaculture, and sustainable urban and peri-urban agriculture (UPA) across Europe is shaped by a multilayered policy environment that combines European Union frameworks with national and local strategies. This policy landscape establishes both the enabling conditions and the structural constraints influencing the adoption and scaling of sustainable agricultural practices. At the European level, the European Green Deal provides the overarching strategic framework, positioning agriculture as a central pillar in achieving climate neutrality and environmental sustainability by 2050. Within this framework, the Farm to Fork Strategy (2020) serves as a key operational roadmap, promoting the transition toward fair, healthy, and environmentally sustainable food systems. Its targets, such as reducing pesticide use by 50%, increasing organic farming to 25% of EU agricultural land, and strengthening short supply chains, are directly aligned with the principles underpinning CSA and permaculture.

Complementing this, the EU Biodiversity Strategy for 2030 emphasizes ecosystem restoration, soil health, and the protection of pollinators, all of which resonate strongly with permaculture practices that prioritize biodiversity and regenerative land management. The Common Agricultural Policy (CAP) 2023–2027 translates these strategic objectives into financial and regulatory instruments, including eco-schemes, rural development measures, and support for innovation and digitalization. Despite this shared European framework, the translation of these policies into national contexts varies significantly across the countries analyzed. France represents the most advanced case of policy integration, where EU strategies are effectively operationalized through a comprehensive national policy architecture. Instruments such as agroecology-focused legislation, climate strategies, and urban food policies create a coherent and supportive environment for CSA, permaculture, and UPA. Municipal initiatives, particularly in major cities, further reinforce this integration by embedding agriculture into urban planning and climate adaptation strategies.

In contrast, Bulgaria and Greece demonstrate strong alignment with EU policy objectives but face challenges in implementation. Both countries have incorporated CAP priorities into their national strategies, supporting organic farming, innovation, and rural development. However, administrative complexity, fragmented governance structures, and limited coordination between policy levels reduce the effectiveness of these frameworks. As a result, while CSA and permaculture are expanding, their development is often driven more by grassroots initiatives and project-based funding than by systematic policy support. Serbia presents a distinct case as an EU candidate country. Its policy landscape shows strong strategic alignment with EU frameworks, reflected in national strategies addressing agriculture, climate change, and rural development. However, the gap between policy design and implementation remains significant. Limited institutional capacity, underdeveloped advisory systems, and structural constraints such as land fragmentation hinder the practical uptake of sustainable agricultural models, including CSA and permaculture.

Cyprus, while formally aligned with EU policies, lacks dedicated frameworks specifically targeting CSA, permaculture, or urban agriculture. National policies primarily focus on broader environmental and agricultural objectives, such as water management and climate adaptation. Consequently, the development of CSA and UPA remains largely informal and driven by private actors or local initiatives, with limited institutional support and coordination. Finland, on the other hand, demonstrates strong alignment with EU sustainability and digitalization goals but reveals a different type of policy gap. While national strategies emphasize climate-smart agriculture, innovation, and digital transformation, they are primarily designed for larger-scale production systems. This creates a structural mismatch for small-scale, diversified models such as CSA and permaculture, which operate outside mainstream agricultural frameworks despite being closely aligned with policy objectives.

Overall, the comparative analysis indicates that while EU policies provide a strong and coherent strategic direction, their effectiveness depends heavily on national and local implementation capacities. Countries with integrated, multi-level policy frameworks, such as France, are better positioned to scale sustainable agricultural practices. In contrast, countries with fragmented or misaligned policy environments, such as Cyprus and Serbia, face significant challenges in translating policy ambition into practice, while Bulgaria, Greece, and Finland occupy intermediate positions with both opportunities and structural constraints.

2.2 Key Policy Drivers, Opportunities & Gaps

The transition toward sustainable urban and peri-urban agriculture, CSA, and permaculture is driven by a combination of environmental, economic, and social factors that are increasingly reflected in policy priorities across Europe. However, the strength and coherence of these drivers, as well as the extent to which they translate into practical opportunities, vary across countries. One of the most significant drivers across all analyzed countries is the growing urgency of climate change mitigation and adaptation. Increasing frequency of extreme weather events, water scarcity (particularly in Cyprus and Greece), and soil degradation (notably in Serbia and parts of Bulgaria) are pushing policymakers to priorities sustainable land management practices. In this context, permaculture and agroecological approaches are gaining recognition as effective tools for enhancing resilience and reducing environmental impacts.

A second key driver is the need to strengthen food system resilience. Disruptions in global supply chains, particularly in the aftermath of recent global crises, have highlighted the importance of local food production and short supply chains. This has contributed to growing policy interest in CSA models, which provide stable, localized food systems based on direct producer–consumer relationships. France has been particularly successful in leveraging this driver through well-established CSA networks and supportive policy frameworks, while Bulgaria and Greece are increasingly recognizing its potential, albeit with less institutional backing.

Consumer demand for sustainable, local, and transparent food systems represents another important driver. Across all countries, there is a noticeable increase in awareness and interest in organic products, local sourcing, and environmentally friendly practices. This trend is particularly strong in France and Finland, where consumer engagement plays a central role in supporting CSA and diversified local agriculture. In Bulgaria and Greece, demand is growing but remains uneven, while in Serbia and Cyprus it is still developing and often constrained by economic factors and market structures.

These drivers create a range of opportunities for the expansion of CSA, permaculture, and UPA. One of the most significant opportunities lies in the use of sustainable public procurement, which can create stable markets for local producers. France has made notable progress in this area by integrating local and organic food into public catering systems. Bulgaria and Greece have begun exploring similar approaches, but implementation remains limited. In Serbia and Cyprus, public procurement is still underdeveloped as a tool for supporting local food systems. Another key opportunity is the increasing availability of EU funding and innovation programmes, which support sustainable agriculture, digitalization, and rural development. Bulgaria and Greece have particularly benefited from such funding, driving the expansion of pilot projects and innovation initiatives. Serbia also has access to pre-accession funds, but administrative barriers limit their effective utilisation. Cyprus faces similar challenges, while Finland has effectively leveraged innovation funding to support digital solutions in agriculture.

Despite these opportunities, significant policy gaps persist across all countries. One of the most common issues is the lack of targeted policies specifically addressing CSA and urban agriculture. While these models are indirectly supported through broader frameworks, their absence from formal policy categories limits access to tailored funding, land-use planning, and institutional support. This gap is most pronounced in Cyprus and Serbia, but is also evident in Bulgaria, Greece, and Finland. Administrative complexity represents another major barrier, particularly in Bulgaria and Greece, where bureaucratic procedures can discourage participation in funding programmes and hinder the development of small-scale initiatives. In Serbia and Cyprus, the problem is compounded by weaker institutional capacity and limited advisory services, reducing the ability of farmers to access and implement available support mechanisms.

Infrastructure and logistics also remain underdeveloped, especially in relation to short supply chains. Many countries lack efficient systems for storage, distribution, and coordination, limiting the scalability of CSA and local food networks. This issue is less pronounced in France, where more developed infrastructure supports short supply chains, but remains a significant constraint in Bulgaria, Greece, Serbia, and Cyprus. Finally, a critical gap across all countries is the insufficient integration of research, innovation, and practice. While research institutions play an important role in generating knowledge, the transfer of this

knowledge to farmers and practitioners is often weak. Finland demonstrates relatively strong performance in this area, particularly in digital innovation, while Bulgaria and Greece show moderate progress. Serbia and Cyprus face more significant challenges due to limited advisory systems and weaker institutional linkages While the policy landscape across Europe provides strong drivers and significant opportunities for the development of CSA, permaculture, and UPA, persistent structural gaps continue to limit their full potential. Addressing these gaps, particularly in relation to policy targeting, administrative efficiency, infrastructure, and knowledge transfer, will be essential for enabling the transition toward more sustainable and resilient food systems.

2.3 Trends in Sustainable Urban & Peri-Urban Agriculture

The analysis of policy frameworks and empirical evidence across partner countries reveals several key trends shaping the development of sustainable urban and peri-urban agriculture. These trends reflect broader transformations in food systems, driven by environmental pressures, technological innovation, and changing societal values. One of the most significant trends is the institutionalization of urban agriculture, particularly in countries with strong policy frameworks. France exemplifies this development, where UPA is no longer a marginal activity but an integrated component of urban policy, supported by municipal strategies, land-use planning, and public investment. In contrast, Bulgaria and Greece are in earlier stages of institutionalization, where urban agriculture is gaining recognition but remains largely driven by local initiatives and project-based activities. Serbia and Cyprus show limited institutionalization, while Finland focuses less on urban agriculture per se and more on locally embedded farming systems connected to urban markets.

A second important trend is the expansion of CSA and short supply chains, which strengthen the relationship between producers and consumers. This trend is most advanced in France, where CSA networks are well-established and widely recognized. Bulgaria and Greece are experiencing growing interest in CSA models, supported by increasing consumer demand and EU funding. Serbia shows emerging CSA initiatives, often integrated into broader agroecological practices, while Cyprus remains at an early stage. Finland presents a unique case where CSA exists but remains niche, embedded within a broader system of diverse local agriculture.

The adoption of agroecological and regenerative practices represents another key trend. Across all countries, there is increasing recognition of the importance of soil health, biodiversity, and sustainable resource management. Permaculture principles are being applied in various forms, from small-scale experimental farms in Cyprus to more structured agroecological systems in France and Greece. Bulgaria demonstrates growing interest in regenerative practices, while Serbia is gradually incorporating such approaches into its

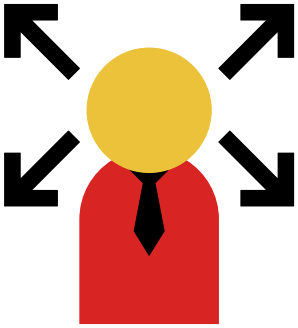
agricultural systems. Finland, although not explicitly focused on permaculture, applies similar principles through diversified and sustainable farming practices. Most of the regenerative farms are "normal" farms in the countryside, supplying the usual chain stores and mills. All UPA of course work in ecologically sustainable and/or regenerative ways, just not "officially" most of the time. Technological innovation is also reshaping the landscape of sustainable agriculture. The integration of smart technologies, including sensors, digital platforms, and precision agriculture tools, is becoming increasingly important for improving efficiency and resilience. France and Finland are at the forefront of this trend, with well-developed digital ecosystems and strong support for innovation. Bulgaria and Greece are adopting these technologies at a moderate pace, often through pilot projects and EU-funded initiatives. Serbia and Cyprus face greater challenges in adoption due to cost, limited digital skills, and insufficient infrastructure.

There is a growing emphasis on the social dimension of agriculture, particularly in relation to community engagement, education, and social inclusion. CSA models, community gardens, and urban farming initiatives are increasingly recognized not only for their economic and environmental benefits but also for their role in strengthening social cohesion and promoting sustainable lifestyles. This trend is particularly visible in France and Finland, where community-based approaches are well-established, and is gaining momentum in Bulgaria and Greece. In Serbia and Cyprus, social initiatives are emerging but remain limited in scale. Overall, these trends highlight a gradual but uneven transition toward more sustainable, resilient, and socially embedded food systems. Countries with stronger policy integration and innovation capacity are advancing more rapidly, while others face structural challenges that slow down progress. Nevertheless, the convergence of policy support, technological development, and societal demand suggests significant potential for further growth across all partner countries.

3. Stakeholders & Governance

3.1 Stakeholder Ecosystem Structure in Partner Countries

The transition toward sustainable urban and peri-urban agriculture (UPA), Community-Supported Agriculture (CSA), and permaculture is inherently multi-actor, requiring coordinated engagement across a diverse range of stakeholders. Across all partner countries, France, Bulgaria, Greece, Serbia, Cyprus, and Finland, the stakeholder ecosystem includes public authorities, primary producers, research and academic institutions, private sector actors, civil society organizations, and emerging technology providers. However, the structure, level of integration, and effectiveness of these ecosystems vary significantly.



France demonstrates the most advanced and structured stakeholder ecosystem. Public authorities at national, regional, and municipal levels play a proactive role in shaping and supporting sustainable agriculture through policy design, funding mechanisms, and urban planning. Producers are well integrated into organized networks, particularly through CSA systems such as AMAPs, while research institutions and innovation actors actively contribute to knowledge generation and implementation. Civil society organizations further strengthen this ecosystem by facilitating community engagement and promoting sustainable consumption.

In comparison, Bulgaria and Greece exhibit moderately developed stakeholder ecosystems characterized by active participation from a wide range of actors but weaker coordination mechanisms. In both countries, producers, particularly small and medium-sized farmers, form the backbone of sustainable agriculture initiatives, often supported by NGOs and research institutions. However, interactions between stakeholders are frequently project-based and lack long-term institutional integration. Public authorities play an important role, particularly through EU-funded programmes, but their engagement with grassroots initiatives remains inconsistent.

Serbia and Cyprus present more fragmented stakeholder ecosystems. In Serbia, while a wide range of actors is present, including policymakers, farmers, research institutions, and international organizations, the connections between them are relatively weak. Institutional structures exist, but coordination and knowledge transfer mechanisms are underdeveloped. Cyprus shows a similar pattern, where stakeholders operate largely in isolation, with limited collaboration and integration. Civil society and private initiatives play a particularly important role in both countries, compensating for the lack of strong institutional support. Finland represents a distinct case. The stakeholder ecosystem is relatively broad but characterized by loose connections rather than strong institutional integration. Producers are central actors, often operating independently or within informal networks. Research institutions and innovation actors are highly developed, particularly in digitalization, but their interaction with small-scale farmers is not always well aligned. Public authorities provide a supportive framework, yet existing policies are often better suited to larger-scale agriculture, creating a gap between institutional support and practical needs.

The comparative analysis reveals that while all countries possess the necessary stakeholder groups, the degree of coordination and integration is a critical differentiating factor. Countries with stronger, more connected ecosystems, such as France, demonstrate more advanced and scalable models, while those with fragmented structures, such as Serbia and Cyprus, face significant challenges in implementing and expanding sustainable agricultural practices.

3.2 Roles and Interactions Between Stakeholders

The effectiveness of stakeholder ecosystems depends not only on their composition but also on the nature and quality of interactions between actors. Across the analyzed countries, these interactions reveal both common patterns and significant differences. Primary producers are central to all systems, serving as the main implementers of sustainable practices, including CSA and permaculture. In France, farmers are well integrated into organized networks and benefit from strong institutional support, enabling them to actively participate in shaping food systems. In Bulgaria and Greece, farmers demonstrate high levels of interest and engagement but often operate under financial and institutional constraints, limiting their influence on policy and decision-making processes. In Serbia and Cyprus, farmers face additional challenges, including limited access to advisory services and funding, further reducing their capacity to adopt innovative practices. In Finland, producers play a central role within local food systems but often operate independently, relying on direct relationships with consumers rather than institutional support.

Public authorities hold significant influence across all countries, as they are responsible for policy design, funding allocation, and regulatory frameworks. In France, public authorities are highly engaged and play a strategic role in integrating agriculture into broader policy domains such as urban planning and climate adaptation. In Bulgaria and Greece, public authorities are important actors but often operate within fragmented governance systems, leading to inconsistencies in implementation. In Serbia and Cyprus, the role of public authorities is more limited, with weaker engagement in promoting CSA and UPA. Finland demonstrates a supportive but less interventionist approach, focusing on creating enabling conditions rather than direct involvement. Research and academic institutions are key contributors to knowledge generation, innovation, and capacity building. In France and Finland, these institutions are strongly integrated into the agricultural system and actively collaborate with farmers and policymakers. In Bulgaria and Greece, research institutions play an important role but face challenges in translating knowledge into practice. This gap is more pronounced in Serbia and Cyprus, where limited interaction between research and practitioners reduces the impact of scientific knowledge on agricultural practices.

Civil society organizations and NGOs serve as important connectors within the stakeholder ecosystem. In Bulgaria and Greece, they play a particularly significant role in promoting sustainable agriculture, supporting farmers, and facilitating community engagement. In Serbia and Cyprus, NGOs often compensate for weak institutional support by providing training, networking opportunities, and advocacy. In France, civil society is well integrated into the system, while in Finland, it contributes to community-based initiatives and knowledge exchange. Technology providers and innovation actors are emerging as increasingly important stakeholders. Their role is most developed in France and Finland, where digitalization and innovation are integral to agricultural systems. In Bulgaria and Greece, technology providers are gaining importance, particularly through EU-funded projects. In Serbia and Cyprus, their presence is still limited, and adoption of smart technologies remains constrained by financial and knowledge barriers. The analysis of interactions highlights a common imbalance across countries: actors with high influence, such as policymakers, are not always closely connected to those with high practical engagement, such as farmers. This gap is smallest in France and largest in Serbia and Cyprus, with Bulgaria, Greece, and Finland occupying intermediate positions.

3.3 Influence–Interest Analysis and Engagement Dynamics

Understanding the dynamics of stakeholder engagement requires analyzing both the level of influence and the degree of interest among different actors. Across all countries, distinct patterns emerge that shape the development of sustainable agricultural systems. Actors with high influence and high interest, such as policymakers and leading research institutions, play a crucial role in shaping strategic directions and funding priorities. In France, this group is highly active and closely connected to implementation processes, contributing to effective governance. In Bulgaria and Greece, these actors are influential but less consistently engaged with grassroots initiatives. In Serbia and Cyprus, their influence remains significant, but their engagement is often limited, reducing the effectiveness of policy implementation. Finland demonstrates a balanced but less intensive engagement pattern, with strong institutional capacity but less direct involvement in small-scale systems.

Actors with high interest but lower influence, particularly farmers, NGOs, and community groups, are central to the practical implementation of sustainable agriculture. Across all countries, these stakeholders demonstrate strong motivation to adopt sustainable practices and engage in CSA and permaculture initiatives. However, their ability to influence policy decisions is limited, particularly in Bulgaria, Greece, Serbia, and Cyprus. In France, this gap is less pronounced due to stronger institutional integration, while in Finland, producers maintain a degree of autonomy through direct market relationships. Technology providers represent a category of emerging influence and growing interest. Their role is expanding across all countries as digitalization becomes increasingly important. France and Finland show the highest levels of integration of technology providers into the agricultural ecosystem, while Bulgaria and Greece are in a transitional phase. Serbia and Cyprus lag behind, with limited adoption and weaker connections between technology developers and end-users.

Economic actors, including agri-businesses and retailers, exhibit moderate influence and variable interest. Their engagement depends largely on market incentives and profitability. In France, they are more actively integrated into sustainable value chains, while in other countries their role is less pronounced or more fragmented. Overall, the influence–interest analysis highlights a key structural challenge: the misalignment between those who shape policies and those who implement them. Addressing this imbalance is essential for improving governance effectiveness and enabling the scaling of sustainable agricultural practices.

3.4 Challenges and Enabling Factors in Stakeholder Collaboration

The effectiveness of stakeholder ecosystems is shaped by a combination of challenges and enabling factors that influence collaboration and governance outcomes. One of the most significant challenges across all countries is the fragmentation of governance structures. This issue is particularly pronounced in Serbia and Cyprus, where limited coordination between stakeholders reduces the effectiveness of policy implementation and innovation uptake. Bulgaria and Greece also experience fragmentation, although to a lesser extent, while France demonstrates a more integrated governance model. Finland, although less fragmented, faces challenges related to the alignment of institutional frameworks with small-scale agricultural realities. Administrative complexity represents another major barrier, especially in Bulgaria and Greece, where bureaucratic procedures can limit access to funding and discourage participation in support programmes. In Serbia and Cyprus, administrative barriers are compounded by weaker institutional capacity and limited advisory services, further constraining the development of sustainable agriculture.

Knowledge gaps and weak knowledge transfer mechanisms are common challenges across countries. While research institutions generate valuable knowledge, its dissemination and practical application are often insufficient. This gap is most evident in Serbia and Cyprus, while Bulgaria and Greece show moderate progress. France and Finland demonstrate stronger performance, particularly in integrating research, innovation, and

practice. Limited digital skills and access to technology also hinder the adoption of smart agricultural solutions, particularly in Serbia and Cyprus. Bulgaria and Greece face similar challenges, although EU-funded projects are helping to address these gaps. France and Finland, with more advanced digital ecosystems, experience fewer barriers in this area. At the same time, several enabling factors support the development of stakeholder ecosystems. High levels of stakeholder motivation are evident across all countries, with strong interest in sustainability, innovation, and collaboration. This is particularly important in contexts where institutional support is limited, as it drives grassroots initiatives and community-based solutions.

The presence of research institutions, universities, and NGOs provides a strong foundation for knowledge generation and capacity building. In Bulgaria and Greece, these actors play a key role in supporting farmers and promoting sustainable practices. In France and Finland, their integration into the broader system enhances innovation and implementation. EU funding and policy frameworks also act as critical enablers, providing financial support and strategic direction for sustainable agriculture. Countries that are more effective in leveraging these resources, such as France, Bulgaria, and Greece, demonstrate more advanced development, while Serbia and Cyprus face challenges in accessing and utilizing available funding. In conclusion, the comparative analysis of stakeholders and governance highlights that effective collaboration, strong institutional integration, and robust knowledge transfer systems are essential for advancing sustainable urban and peri-urban agriculture. Countries that successfully align these elements are better positioned to scale CSA, permaculture, and smart technology solutions, while those facing fragmentation and structural constraints require targeted interventions to unlock their potential.

4. Smart Technologies and Innovation

4.1 Typology of Smart Technologies in CSA, Permaculture and UPA

The integration of smart technologies into urban and peri-urban agriculture (UPA), Community-Supported Agriculture (CSA), and permaculture systems represents a critical dimension of innovation, enabling increased efficiency, resilience, and sustainability. Across the analyzed countries, smart technologies encompass a wide spectrum of tools and solutions, which can be broadly categorized into four main groups: environmental monitoring systems, precision agriculture technologies, digital platforms, and farm management and decision-support systems. Environmental monitoring technologies, including sensors for soil moisture, temperature, and nutrient levels, as well as climate monitoring devices, are among the most widely applied innovations. These technologies are particularly relevant in water-scarce regions such as Cyprus and Greece, where efficient resource management is essential. In France and Finland, such systems are more advanced and often integrated into automated farm operations, enabling real-time data collection and analysis. In contrast, Bulgaria and Serbia demonstrate more limited and project-based use of these technologies, often dependent on external funding and pilot initiatives.

Precision agriculture technologies, such as automated irrigation systems, drone-based monitoring, and GPS-guided machinery, contribute to optimizing input use and reducing environmental impact. France stands out in this category, with advanced applications in both urban and peri-urban contexts, including hydroponic and aeroponic systems in rooftop farms. Finland also demonstrates strong capabilities in precision agriculture, supported by a well-developed digital infrastructure. Bulgaria and Greece show moderate adoption, primarily in more commercially oriented farms, while Serbia and Cyprus face constraints due to high investment costs and limited access to technical expertise.

Digital platforms play a central role in facilitating CSA models and short supply chains. These platforms support communication between producers and consumers, manage subscriptions, coordinate deliveries, and enhance transparency. France has well-established digital ecosystems supporting CSA networks, significantly reducing transaction costs and improving efficiency. Finland also demonstrates strong use of digital tools, particularly for communication and logistics. Bulgaria and Greece are increasingly adopting such platforms, though often in fragmented and less standardized forms. In Serbia and Cyprus, digital platforms are emerging but remain underutilized, reflecting broader challenges in digital literacy and infrastructure. Farm management and decision-support systems provide tools for planning, monitoring, and optimizing farm operations. These systems are particularly relevant for improving productivity and sustainability in diversified farming systems typical of CSA and permaculture. Finland demonstrates strong performance in this area, with widespread use of digital tools for farm planning and administration. France also shows advanced adoption, often integrated with other technologies. Bulgaria and Greece exhibit moderate use, while Serbia and Cyprus face significant barriers related to cost, training, and accessibility.

4.2 Applications and Adoption Across Partner Countries

The practical application and adoption of smart technologies vary significantly across the partner countries, reflecting differences in infrastructure, policy support, economic capacity, and digital skills. France represents the most advanced case, where smart technologies are systematically integrated into both urban and peri-urban agricultural systems. Large-scale urban farms utilize hydroponics, aeroponics, and automated irrigation systems, while digital platforms streamline CSA operations and logistics. The strong alignment between policy support, research institutions, and private sector innovation enables widespread adoption and continuous technological development. Finland also demonstrates a high level of technological adoption, particularly in the context of digitalization. Farmers widely use digital tools for communication, logistics, and farm management, supported by strong national infrastructure and innovation policies. However, unlike France, the application of these technologies is often focused on improving efficiency in small-scale, diversified farming systems rather than scaling urban agriculture.

Bulgaria and Greece show moderate adoption levels, characterized by a mix of traditional practices and emerging technological solutions. In both countries, smart technologies are often introduced through EU-funded projects, pilot initiatives, and research collaborations. While this has led to increased awareness and experimentation, adoption remains uneven, particularly among small-scale farmers who face financial and knowledge constraints. Nevertheless, both countries demonstrate strong potential for growth, supported by increasing interest in innovation and sustainability. Serbia presents a transitional case, where the adoption of smart technologies is gradually increasing but remains limited in scope. Farmers often rely on basic tools such as soil monitoring and digital communication platforms, while more advanced technologies are less common due to cost barriers and limited access to training. The lack of well-developed advisory systems further constrains the dissemination and effective use of technological solutions. Cyprus faces similar challenges, with technology adoption remaining relatively low. While there is recognition of the potential benefits of smart technologies, particularly in addressing water scarcity and climate adaptation, the high cost of equipment, limited digital

skills, and fragmented support systems hinder widespread implementation. Adoption is typically confined to small-scale pilot projects and individual initiatives. The comparative analysis highlights that technological adoption is not solely determined by availability but is strongly influenced by enabling conditions such as policy support, infrastructure, and capacity building. Countries with integrated innovation ecosystems, such as France and Finland, demonstrate higher levels of adoption, while those with structural constraints, such as Serbia and Cyprus, require targeted interventions to unlock their potential.

4.3 Benefits and Impacts of Smart Technologies

The integration of smart technologies into CSA, permaculture, and UPA systems generates a wide range of benefits, spanning environmental, economic, and social dimensions. However, the extent to which these benefits are realized varies across countries. From an environmental perspective, smart technologies contribute to resource efficiency and sustainability. Precision irrigation systems reduce water consumption, which is particularly important in water-scarce regions such as Cyprus and Greece. Soil monitoring technologies enable better nutrient management, reducing the need for chemical inputs and supporting soil health. These benefits are most evident in France and Finland, where advanced technologies are widely implemented (in Finland for large-scale agriculture), but are also emerging in Bulgaria and Greece through pilot projects. In Serbia and Cyprus, environmental benefits are more limited due to lower levels of adoption.

Economically, smart technologies enhance productivity and operational efficiency. Digital platforms reduce transaction costs and improve coordination in CSA systems, while farm management tools support better planning and risk management. France demonstrates strong economic benefits through well-developed digital ecosystems and market integration. Finland also shows positive outcomes, particularly in improving efficiency in small-scale farming. Bulgaria and Greece experience moderate economic benefits, while Serbia and Cyprus are still in the early stages of realizing these advantages. Socially, smart technologies support transparency, communication, and community engagement, particularly in CSA models. Digital platforms enable direct interaction between producers and consumers, strengthening trust and participation.

This is particularly evident in France, where CSA networks are highly developed, and in Finland, where digital tools facilitate strong producer–consumer relationships. In Bulgaria and Greece, these benefits are emerging, while in Serbia and Cyprus they remain limited due to lower adoption levels. Importantly, the benefits of smart technologies are closely linked to their accessibility and usability. In contexts where technologies are adapted to the needs of small-scale farmers and supported by training and advisory services, their impact is significantly greater. This is clearly demonstrated in France, while in other countries, the lack of such support limits the realization of potential benefits.

4.4 Barriers to Adoption of Smart Technologies

Despite their potential, the adoption of smart technologies in sustainable agriculture faces several barriers, which vary in intensity across countries but share common characteristics. One of the most significant barriers is the high cost of technologies, particularly for small and medium-sized farms. This issue is most pronounced in Serbia and Cyprus, where limited financial resources and access to funding restrict investment in advanced technologies. Bulgaria and Greece face similar challenges, although EU funding programmes partially mitigate these constraints. In contrast, France and Finland benefit from stronger financial support mechanisms and innovation ecosystems, reducing the impact of cost barriers. Another key challenge is the lack of digital skills and technical knowledge among farmers. This barrier is particularly evident in Serbia and Cyprus, where limited training opportunities and advisory services hinder the effective use of technologies. Bulgaria and Greece also face skills gaps, although ongoing projects and educational initiatives are helping to address them. France and Finland demonstrate higher levels of digital literacy, supported by well-developed education and training systems.

Limited access to advisory services and knowledge transfer mechanisms further constrains adoption. In countries where extension services are weak or underdeveloped, farmers lack the support needed to implement and maintain technological solutions. This issue is particularly critical in Serbia and Cyprus, while Bulgaria and Greece show moderate capacity. France and Finland, with stronger advisory systems, are better positioned to support technology adoption. Infrastructure limitations, including poor digital connectivity and lack of integrated systems, also affect adoption, particularly in rural and peri-urban areas. While Finland and France benefit from strong digital infrastructure, Bulgaria, Greece, Serbia, and Cyprus face varying degrees of limitation, affecting the scalability of smart solutions. Finally, a significant barrier across all countries is the lack of technologies tailored to small-scale and diversified farming systems. Many existing solutions are designed for large-scale industrial agriculture and are not easily adaptable to CSA and permaculture contexts. This mismatch is particularly evident in Finland, where despite strong technological capacity, many tools are not suited to the needs of diverse local agriculture.

4.5 Future Innovation Pathways

Looking forward, the development of smart technologies in sustainable agriculture will depend on addressing existing barriers and aligning innovation with the needs of diverse farming systems. A key priority across all countries is the development of affordable, accessible, and user-friendly technologies tailored to small-scale and community-based agriculture. This is particularly important for Bulgaria, Greece, Serbia, and Cyprus, where cost and usability are major constraints. France and Finland, while more advanced, also benefit from innovations that simplify technology and improve integration.

Another critical pathway is the strengthening of knowledge transfer and capacity building systems. Expanding training programmes, advisory services, and peer-to-peer learning networks will be essential for enabling farmers to adopt and effectively use smart technologies. This is particularly relevant in Serbia and Cyprus, but also important in Bulgaria, Greece and Finland. The promotion of co-creation and participatory innovation represents an important opportunity.

Engaging farmers, researchers, and technology providers in the design and development of solutions ensures that technologies are relevant, practical, and widely adopted. Finland, with its emphasis on co-creation, provides a valuable model in this regard. The integration of smart technologies into broader policy and funding frameworks is essential for scaling innovation. Aligning technological development with EU and national policies, and ensuring access to funding, will support the transition toward more sustainable and resilient food systems. France demonstrates strong performance in this area, while other countries can benefit from more targeted and coordinated approaches.

The comparative analysis of smart technologies and innovation highlights both the transformative potential of digital and technological solutions and the structural challenges that limit their adoption. Countries with strong policy support, infrastructure, and knowledge systems, such as France and Finland, demonstrate more advanced and integrated use of technologies. In contrast, countries with financial, institutional, and capacity constraints, such as Serbia and Cyprus, face significant barriers despite clear potential. Bulgaria and Greece occupy an intermediate position, where increasing adoption and innovation are evident, but further efforts are needed to ensure scalability and inclusiveness. The successful integration of smart technologies into CSA, permaculture, and UPA systems will depend on aligning innovation with the realities of small-scale farming, strengthening stakeholder collaboration, and ensuring that technological solutions are accessible, affordable, and user-centred.

5. Field Research & Case Studies

5.1 Overview of Field Research Across Partner Countries

Field research conducted across the partner countries provides critical insights into how policies, stakeholder dynamics, and technological innovations are translated into practice within urban and peri-urban agriculture (UPA), Community-Supported Agriculture (CSA), and permaculture systems. While policy analysis outlines the enabling environment, field research reveals the actual operational realities, highlighting both successful models and persistent constraints. Across all six countries, France, Bulgaria, Greece, Serbia, Cyprus, and Finland, field observations confirm that sustainable agricultural practices are increasingly present but vary significantly in scale, structure, and level of integration.

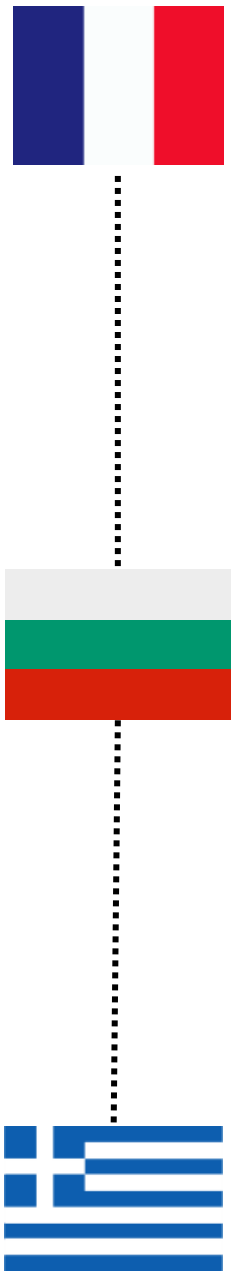
France demonstrates the most advanced and diversified field applications, with large-scale urban farms, well-organized CSA networks, and strong integration of smart technologies. Bulgaria and Greece show a growing number of initiatives, often driven by civil society and supported by EU-funded projects, but with more limited scalability. Serbia and Cyprus are characterized by smaller, fragmented initiatives, often operating in isolation and facing structural constraints. Finland presents a distinct model, where field practices are embedded within diverse local agriculture systems rather than formal urban agriculture frameworks.

A key cross-country observation is that field-level innovation often outpaces policy development, particularly in Bulgaria, Greece, Serbia, and Cyprus, where practitioners adopt sustainable practices despite limited institutional support. In contrast, France demonstrates strong alignment between policy and practice, while Finland shows a unique situation where innovation is present but not always recognized within formal policy categories.

5.2 Case Studies by Country

France: Integrated Urban Agriculture and Advanced CSA Systems

France provides some of the most advanced examples of urban and peri-urban agriculture in Europe. Field research highlights large-scale projects such as rooftop farms and urban micro-farms integrated into city environments. These systems often utilize hydroponic and aeroponic technologies, enabling high productivity within limited urban spaces. CSA models in France, particularly through AMAP networks, demonstrate strong organizational structure and long-term sustainability. Farmers and consumers engage in stable, trust-based relationships, supported by digital platforms that facilitate logistics and communication. These systems are further reinforced by public policies promoting local food systems and sustainable procurement. Compared to other countries, France stands out for its high level of integration between technology, policy, and community engagement, enabling scalability and long-term viability.



Bulgaria: Emerging CSA and Permaculture Initiatives

Field research in Bulgaria reveals a growing number of small-scale farms adopting permaculture principles and CSA models. These initiatives are often characterized by diversified production, including vegetables, herbs, and fruit cultivation, with a focus on organic and regenerative practices. Many Bulgarian farms rely on direct sales and informal CSA arrangements, reflecting both opportunities and constraints. While there is strong motivation among producers to adopt sustainable practices, access to funding, certification, and market infrastructure remains limited. Compared to France, Bulgarian initiatives are less structured and operate on a smaller scale. However, compared to Serbia and Cyprus, Bulgaria demonstrates stronger development, supported by active NGOs, research institutions, and participation in EU-funded projects.

Greece: Hybrid Agro ecological Systems

In Greece, field research highlights the emergence of hybrid systems combining traditional agricultural practices with modern agro ecological approaches and smart technologies. These systems often include diversified production, water-efficient irrigation methods, and integration of renewable energy solutions. CSA initiatives are present but remain less formalized than in France. They are often linked to local food networks and solidarity-based initiatives, reflecting strong community engagement but limited institutional support. Compared to Bulgaria, Greece demonstrates similar levels of development but often shows greater integration of technology, particularly in irrigation and energy systems. Compared to France, however, the scale and institutionalization remain significantly lower.

Recent field visits conducted in the Peloponnese further illustrate the diversity of sustainable agricultural practices and the challenges faced by small-scale producers in Greece. Two representative case studies, an organic vegetable farm in Kalamata and an organic nomadic beekeeping enterprise in Arcadia, demonstrate how sustainability is increasingly driven by individual commitment, local knowledge, and gradual technological innovation.

The Katsou Farm in Kalamata represents a family-operated organic farming enterprise producing olives, tomatoes, peppers, potatoes and other vegetables under certified organic management. The farm combines traditional cultivation methods with environmentally responsible production practices while maintaining direct contact with consumers through local organic markets. Although advanced digital technologies are not yet implemented, the farmer expressed strong interest in adopting affordable smart farming solutions such as environmental sensors, greenhouse monitoring systems and electronic pest traps. The case demonstrates that many small organic producers recognise the potential of digital technologies but require financial support, advisory services and practical training before adoption becomes economically feasible. The field visit also highlighted several structural barriers affecting the long-term viability of organic farming in Greece. These include increasing production costs, labour shortages caused by seasonal workforce constraints, climate-related risks such as heat waves and hailstorms, and insufficient consumer awareness regarding the added value of certified organic products. Despite these obstacles, the farm has successfully developed consumer trust through high product quality, environmental stewardship and transparent production practices, illustrating the importance of social capital within Community-Supported Agriculture and local food systems.

A second field visit to the Stagakis organic beekeeping enterprise in Arcadia demonstrated the application of sustainable beekeeping practices combined with selective smart technology adoption. The enterprise manages approximately 120 organically certified beehives using environmentally friendly production methods, including natural Varroa control, chemical-free hive management and careful preservation of honey quality throughout processing. Unlike many traditional farms, this enterprise has adopted digital hive monitoring through electronic weighing systems equipped with temperature and humidity sensors. These technologies allow remote monitoring of colony performance, reduce unnecessary travel, improve operational efficiency and lower environmental impacts while supporting better management decisions. The beekeeping case also illustrates broader challenges affecting sustainable agricultural enterprises in Greece, including rising transportation costs, insufficient financial support, market competition from imported and adulterated honey products, and inadequate infrastructure for mobile beekeeping. Nevertheless, the enterprise demonstrates how combining traditional ecological knowledge with targeted digital technologies can improve both environmental sustainability and business resilience. The experience further highlights the importance of stronger policy support, specialised advisory services, consumer education and improved market regulation to enhance the competitiveness of sustainable agricultural production.

Together, these two additional case studies reinforce the overall findings of the Greek field research. They demonstrate that sustainability transitions are primarily driven by highly committed farmers who successfully integrate traditional ecological knowledge with gradual technological innovation. They also confirm that wider adoption of smart technologies in Greece will depend not only on technological availability but also on improved access to finance, advisory support, training programmes and stronger consumer awareness regarding the value of sustainably produced food.

Serbia: Transitional Farming Systems

Field research in Serbia reveals a transitional landscape where conventional farming practices are gradually being combined with sustainable and regenerative approaches. Farms often integrate crop rotation, composting, and basic water management techniques, reflecting an incremental adoption of CSA and permaculture principles. CSA models are emerging but remain limited in scale and structure. Farmers primarily rely on direct sales and local markets, with limited use of digital platforms or formal subscription systems. Compared to Bulgaria and Greece, Serbia demonstrates slower development, largely due to structural challenges such as fragmented land ownership, limited advisory services, and restricted access to funding. However, compared to Cyprus, Serbia shows slightly more advanced integration of sustainable practices.

Cyprus: Small-Scale Ecological Farming Under Resource Constraints

Field research in Cyprus highlights small-scale farming systems that emphasize ecological practices, particularly in response to water scarcity and climatic constraints. Techniques such as composting, natural fertilization, and water-efficient irrigation are commonly observed. CSA models are largely informal, with direct producer–consumer relationships forming the primary market mechanism. The lack of structured CSA networks and limited policy support constrain the scalability of these initiatives. Compared to all other countries, Cyprus shows the lowest level of institutionalization and technological integration, although the ecological orientation of farming practices is strong. This reflects both the challenges and potential of the local context.

Finland: Diverse Local Agriculture and Digital Integration

Field research in Finland reveals a distinct model centered on diverse local agriculture rather than traditional urban agriculture. Farms are typically small-scale and diversified, combining production, education, and community engagement. Digital tools are widely used for communication, logistics, and farm management, reflecting Finland's strong digital infrastructure. However, advanced precision technologies are less common in small-scale systems due to cost and complexity. Compared to France, Finland shows similar levels of technological advancement but operates at a smaller scale and with less focus on urban integration. Compared to Bulgaria, Greece, Serbia, and Cyprus, Finland demonstrates stronger digitalization but faces challenges related to policy alignment with small-scale models.

5.3 Cross-Country Comparative Analysis of Field Practices

A comparative analysis of field research across the six countries reveals several important patterns.

1. **First**, there is a clear gradient in the level of system maturity. France represents the most advanced and integrated model, followed by Finland in terms of technological innovation. Bulgaria and Greece occupy an intermediate position, with growing but still fragmented systems. Serbia and Cyprus remain at earlier stages of development, with limited scalability and institutional support.
2. **Second**, scale and organization differ significantly. French systems are often large-scale and well-organized, supported by formal networks and policy frameworks. In contrast, initiatives in Bulgaria, Greece, Serbia, and Cyprus are predominantly small-scale and decentralized. Finland combines small-scale production with strong organizational efficiency through digital tools.
3. **Third**, technology integration varies widely. France and Finland demonstrate advanced use of smart technologies, while Bulgaria and Greece show moderate adoption. Serbia and Cyprus remain limited in this regard, highlighting the importance of financial and knowledge resources in enabling technological uptake.
4. **Fourth**, market structures and business models differ across countries. France benefits from well-developed CSA systems and institutional markets, while other countries rely more heavily on direct sales and informal arrangements. Finland demonstrates diversified business models, including education and community-based activities.

The Greek case studies further demonstrate that successful sustainability transitions frequently originate from individual farmer initiatives rather than institutional programmes. While digital technologies remain less widespread than in France or Finland, the selective adoption of affordable monitoring technologies, particularly in organic beekeeping, illustrates the considerable potential for smart agriculture when combined with traditional ecological knowledge and locally adapted production systems. These findings reinforce the importance of targeted financial incentives, advisory support and digital capacity building for small-scale producers. Resilience and adaptability are key features across all countries, although expressed differently. In France and Finland, resilience is supported by strong systems and infrastructure. In Bulgaria, Greece, Serbia, and Cyprus, resilience is often driven by the adaptability and innovation of individual farmers and communities.

5.4 Key Lessons from Field Research

The field research highlights several important lessons for the development of sustainable agriculture systems.

- **Integration is critical**. Countries that successfully integrate policy, technology, and stakeholder engagement, such as France, demonstrate more advanced and scalable systems.

- Small-scale systems have strong potential but require support Bulgaria, Greece, Serbia, Cyprus, and Finland all demonstrate that small-scale, diversified farming systems can contribute significantly to sustainability, but require better access to funding, knowledge, and markets;
- **Technology must be context-specific.** The effectiveness of smart technologies depends on their alignment with local conditions and the needs of farmers. High-tech solutions are not always suitable for small-scale systems without adaptation;
- **Community engagement is a key driver.** CSA and local food networks play a crucial role in building trust, ensuring market stability, and promoting sustainable practices across all countries;
- **Knowledge transfer is essential for scaling.** Bridging the gap between research and practice remains a major challenge, particularly in Serbia and Cyprus, but also in Bulgaria and Greece.

Field research confirms that sustainable urban and peri-urban agriculture is developing across all partner countries, but at different speeds and with varying levels of integration. France and Finland demonstrate more advanced and structured systems, while Bulgaria and Greece show strong potential for growth. Serbia and Cyprus face significant structural challenges but also demonstrate emerging practices that can be further developed. The insights gained from field research provide a critical foundation for understanding how sustainable agricultural models operate in practice and highlight the importance of aligning policy, innovation, and stakeholder engagement to achieve long-term impact.

6. Economic Models & Market Development

6.1 Overview of Economic Models in CSA, Permaculture & UPA

The economic viability of urban and peri-urban agriculture (UPA), Community-Supported Agriculture (CSA), and permaculture systems is a central determinant of their sustainability and scalability. Across the partner countries, France, Bulgaria, Greece, Serbia, Cyprus, and Finland, a diverse range of economic models has emerged, reflecting differences in market structures, policy environments, consumer behaviour, and levels of institutional support. At the core of these systems is a shift away from conventional, commodity-based agriculture toward short supply chains, direct marketing, and value-based production models. CSA represents one of the most distinctive economic approaches, based on pre-paid subscriptions and shared risk between producers and consumers. This model enhances income stability for farmers while fostering stronger community engagement and transparency.

France demonstrates the most advanced and institutionalized economic models, particularly through well-established CSA systems such as AMAPs. These systems provide predictable revenue streams, reduce market uncertainty, and are often complemented by public procurement schemes and local food policies. In contrast, Bulgaria and Greece show a hybrid economic landscape, where CSA models coexist with traditional direct sales and informal market structures. Serbia and Cyprus rely more heavily on direct sales and local markets, reflecting both the absence of structured CSA systems and limited institutional support. Finland presents a diversified model, where income streams are often combined across production, services, and community-

based activities but also have pure CSA systems operating too. The comparative analysis highlights that countries with more structured economic models, such as France, achieve greater stability and scalability, while those relying on informal or fragmented systems, such as Serbia and Cyprus, face higher levels of economic uncertainty.

6.2 CSA-Based Economic Models & Subscription Systems

CSA models represent a key innovation in agricultural economics, fundamentally reshaping the relationship between producers and consumers. These systems are based on advance payments, where consumers subscribe to receive regular shares of farm produce, thereby sharing both risks and benefits with farmers. France stands out as the leading example of CSA implementation, with highly organized AMAP networks that operate across the country. These systems are characterized by formal agreements, regular deliveries, and strong consumer commitment. The high level of organization ensures financial stability for farmers and reduces dependency on volatile market prices. Digital platforms further enhance efficiency by managing subscriptions, logistics, and communication. In Bulgaria and Greece, CSA models are expanding but remain less formalized. Many initiatives operate on a semi-structured basis, with flexible subscription arrangements and limited contractual frameworks. While this allows for adaptability, it also introduces uncertainty in income stability. However, growing consumer interest in local and sustainable food is driving the gradual development of more structured CSA systems in both countries.

Serbia and Cyprus demonstrate early-stage CSA development. In these contexts, direct relationships between producers and consumers exist but are rarely formalized into subscription-based systems. Farmers often rely on informal agreements or one-time sales, limiting the financial stability typically associated with CSA models. The lack of institutional recognition and support further constrains the development of structured CSA systems. Finland presents a niche but functional CSA model, often integrated into broader diversified farming systems. While CSA is not widespread, it is supported by strong consumer trust and effective use of digital tools. Finnish CSA initiatives tend to operate on smaller scales but demonstrate high levels of efficiency and community engagement. The comparative analysis shows that the level of formalization and institutional support is a key factor determining the success of CSA economic models, with France and Finland leading, Bulgaria and Greece progressing, and Serbia and Cyprus requiring targeted development.

6.3 Direct Sales, Short Supply Chains & Local Markets

Direct sales and short supply chains are central components of sustainable agricultural systems across all countries, providing farmers with greater control over pricing, reducing intermediaries, and strengthening local economies. France demonstrates a highly developed system of short supply chains, supported by both CSA networks and institutional frameworks such as farmers' markets and public procurement. These systems are well integrated and supported by infrastructure, logistics, and policy incentives, enabling efficient distribution and market access. In Bulgaria and Greece, direct sales play a dominant role in economic models. Farmers commonly sell products through local markets, farm-gate sales, and informal networks. While these channels provide flexibility and immediate income, they often lack scalability and stability due to limited infrastructure and coordination.

Serbia and Cyprus rely heavily on direct sales, reflecting the absence of structured market systems and limited institutional support. In these countries, local markets are often fragmented, and logistical challenges—such as transportation and storage—restrict market expansion. However, strong local demand for fresh and traditional products provides a foundation for future development. Finland combines direct sales with digital platforms

and community-supported models, creating efficient and transparent supply chains. The use of online tools for ordering and distribution enhances accessibility and reduces transaction costs, compensating for the smaller scale of production. Across all countries, the effectiveness of short supply chains depends on the availability of infrastructure, coordination mechanisms, and consumer engagement. France and Finland demonstrate more efficient systems, while Bulgaria, Greece, Serbia, and Cyprus face challenges related to logistics and scalability.

6.4 Diversification & Hybrid Economic Models

Diversification is a key strategy for enhancing the economic resilience of farms engaged in CSA, permaculture, and UPA. Across all partner countries, farmers increasingly combine multiple income streams to reduce risk and improve financial sustainability. France demonstrates advanced diversification, where farms often integrate production with additional activities such as education, agro tourism, processing, and direct marketing. These diversified models are supported by policy frameworks and market demand, enabling farms to operate as multifunctional enterprises. In Bulgaria and Greece, diversification is growing but remains less structured. Farmers often supplement income through secondary activities such as small-scale processing, on-farm sales, or participation in local food events. However, limited access to investment and training constrains the expansion of diversified models.

Serbia shows moderate diversification, often driven by necessity rather than strategic planning. Farmers may engage in multiple activities to compensate for market instability, but these efforts are often fragmented and lack integration into a coherent business model. Cyprus demonstrates limited diversification, primarily due to structural constraints such as small market size, water scarcity, and limited institutional support. However, there is potential for growth in areas such as agritourism and niche products. Finland stands out for its highly diversified models, where farms commonly integrate production with services such as education, tourism, and community engagement. This approach enhances economic resilience and aligns well with the country's strong emphasis on local and sustainable food systems. The comparative analysis indicates that diversification is a critical factor for economic resilience, with France and Finland leading in structured approaches, while other countries show varying levels of development.

6.5 Market Development, Consumer Behavior & Demand Trends

Market development is closely linked to consumer behavior, which plays a crucial role in shaping the viability of sustainable agricultural systems. Across all countries, there is a growing demand for local, organic, and sustainably produced food, although the strength and consistency of this demand vary. France demonstrates the most mature market environment, where consumer awareness and willingness to pay for sustainable products are high. This supports the expansion of CSA, local markets, and organic production. Public policies and awareness campaigns further reinforce consumer engagement. In Finland, consumer demand is also strong, particularly for local and high-quality products. Digital platforms facilitate access to local food, while high levels of trust between producers and consumers support stable market relationships.

Bulgaria and Greece show increasing consumer interest, particularly among urban populations. However, price sensitivity remains a limiting factor, affecting the scalability of premium products and CSA models. Market development is therefore uneven, with strong potential but significant constraints. Serbia and Cyprus exhibit lower levels of consumer awareness and purchasing power, which limits demand for higher-value sustainable products. Traditional food systems remain dominant, although there is a gradual shift toward local and organic product. Overall, the analysis highlights that consumer behavior is a key driver of market development, with France and Finland demonstrating more mature markets, Bulgaria and Greece showing growth potential, and

Serbia and Cyprus requiring further development of awareness and purchasing capacity.

6.6 Financial Sustainability & Access to Funding

Access to funding is a critical factor influencing the development of economic models in sustainable agriculture. Across all countries, farmers rely on a combination of EU funding, national programmes, and private investment. France benefits from well-developed funding mechanisms, including CAP support, national programmes, and local initiatives. These resources enable investment in infrastructure, technology, and innovation. Bulgaria and Greece rely heavily on EU funding, particularly through rural development programmes and innovation projects. While these funds provide important support, administrative complexity often limits accessibility. Serbia has access to pre-accession funds, but utilization remains limited due to institutional and administrative barriers. Cyprus faces similar challenges, with limited absorption capacity and lack of targeted funding for CSA and UPA.

Finland demonstrates effective use of funding, particularly in supporting innovation and digitalization. However, funding instruments are not always tailored to small-scale and community-based systems. The comparative analysis shows that the effectiveness of funding depends not only on availability but also on accessibility and alignment with local needs. The analysis of economic models and market development highlights the diversity of approaches across partner countries, as well as the structural factors influencing their success. France leads with highly organized and diversified economic systems, while Finland demonstrates innovative and resilient models based on diversification and digitalization. Bulgaria and Greece show strong potential but require improved coordination and support. Serbia and Cyprus face significant challenges related to market development, funding access, and institutional support. The transition toward sustainable agricultural systems depend on the ability to develop stable, diversified, and locally embedded economic models, supported by effective policies, infrastructure, and consumer engagement.

6.7 Prescriptive CSA Business Model Framework for Sustainable Urban & Peri-Urban Agriculture

The comparative analysis conducted across the partner countries demonstrates that Community-Supported Agriculture (CSA) represents one of the most promising economic and social models for strengthening sustainable urban and peri-urban agriculture systems. While existing CSA initiatives vary considerably in scale, formalisation, and institutional support, several common structural components can be identified and translated into a transferable and adaptable business model framework suitable for different national contexts. The proposed framework builds upon the empirical findings of the field research, stakeholder consultations, and expert workshops conducted under Activities A2.1–A2.4 and aims to support the long-term economic, environmental, and social sustainability of CSA initiatives.

Value Proposition

The core value proposition of CSA systems is based on the delivery of locally produced, environmentally sustainable, and socially embedded food products through direct producer–consumer relationships. CSA models generate value not only through food provision but also through:

- Increased transparency and trust;
- Strengthened local food security;
- Reduced environmental impacts through short supply chains;
- Enhanced community engagement;
- Support for regenerative and agroecological practices; and

1

- Increased resilience to climate and market disruptions.

Across all partner countries, consumers increasingly associate CSA systems with quality, sustainability, traceability, and social responsibility.

Revenue Streams

The analysis demonstrates that financially resilient CSA systems rely on diversified revenue structures. The primary revenue mechanism remains subscription-based or seasonal membership models, where consumers commit to regular payments in exchange for periodic product deliveries.

Additional revenue streams may include:

- Direct farm-gate sales;
- Farmers' markets;
- Online sales platforms;
- Educational workshops and training activities;
- Agritourism and community events;
- Processing of value-added products;
- Public procurement partnerships; and
- Participation in innovation and sustainability projects.

Countries with more advanced systems, particularly France and Finland, demonstrate higher levels of economic resilience due to greater diversification of income sources.

Cost Structure

The principal cost categories identified across partner countries include:

- Labour costs;
- Land access and rental;
- Infrastructure and equipment;
- Irrigation and energy;
- Logistics and distribution;
- Certification and compliance;
- Digital platforms and communication tools; and
- Investment in smart agricultural technologies.

Small-scale producers in Bulgaria, Greece, Serbia, and Cyprus identified financial constraints and infrastructure costs as particularly significant barriers during stakeholder consultations and expert workshops.

Producer–Consumer Relationship Design

A defining feature of CSA systems is the establishment of long-term, trust-based relationships between producers and consumers. Effective CSA models typically include:

- Shared risk and shared benefit mechanisms;
- Regular communication and transparency;
- Participatory governance approaches;
- Community events and educational activities;
- Digital coordination platforms; and
- Direct involvement of consumers in seasonal planning and farm activities.

Workshop participants across several partner countries emphasized that strengthening social engagement and consumer participation is essential for improving long-term CSA stability and market resilience.

Smart Technology Integration Pathways

Smart technologies can significantly improve the operational efficiency, sustainability, and scalability of CSA systems when adapted to the realities of small-scale agriculture.

Relevant technologies include:

- Precision irrigation systems;
- Soil and climate monitoring sensors;
- Farm management software;
- Digital subscription and logistics platforms;
- Mobile applications for producer–consumer communication; and
- Data-driven resource management tools.

The analysis demonstrates that successful technology adoption depends on affordability, accessibility, digital literacy, and the availability of advisory and training support systems.

Country Adaptation Pathways

The implementation of CSA business models requires adaptation to national institutional, economic, and technological conditions.

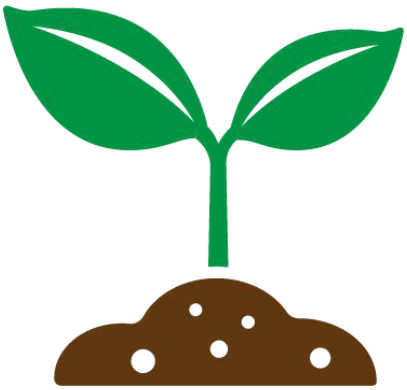
- France demonstrates advanced and highly institutionalized CSA systems focused on scaling, diversification, and technological integration.
- Bulgaria and Greece show strong development potential but require improved logistics, policy coordination, and formalisation of CSA structures.
- Serbia and Cyprus require stronger institutional support, improved access to funding, and enhanced advisory and training systems.
- Finland demonstrates strong digital integration and diversification potential, although policy frameworks remain better adapted to larger-scale agricultural systems.

The proposed CSA business model framework highlights the importance of combining economic viability, community engagement, environmental sustainability, and technological innovation in order to develop resilient and scalable sustainable food systems across diverse European contexts.

7. Social & Environmental Impacts

7.1 Overview of Social & Environmental Contributions

Urban and peri-urban agriculture (UPA), Community-Supported Agriculture (CSA), and permaculture systems generate a wide range of social and environmental impacts that extend beyond food production. Across all partner countries, France, Bulgaria, Greece, Serbia, Cyprus, and Finland, these systems contribute to ecological sustainability, social cohesion, and local economic resilience. However, the scale, measurability, and institutional recognition of these impacts vary significantly. France demonstrates the most advanced integration of social and environmental objectives into agricultural systems, supported by policy frameworks and measurable indicators.



Finland also shows strong performance, particularly in environmental sustainability and community engagement, although impacts are often embedded within broader local agriculture systems rather than explicitly framed as UPA. Bulgaria and Greece exhibit moderate but growing impacts, driven largely by grassroots initiatives. Serbia and Cyprus show emerging contributions, with strong potential but limited measurement and institutional support. A key cross-country observation is that social and environmental benefits are often more advanced than economic and policy frameworks, particularly in countries where grassroots initiatives drive innovation. This highlights the intrinsic value of CSA and permaculture as socially embedded and environmentally oriented systems.

7.2 Environmental Impacts: Soil, Biodiversity & Resource Use

One of the most significant contributions of CSA, permaculture, and UPA systems is their positive impact on environmental sustainability. Across all countries, these practices promote improved soil health, enhanced biodiversity, and more efficient use of natural resources. Soil health improvement is a common outcome, particularly in systems applying permaculture and agroecological principles. Practices such as composting, crop rotation, mulching, and reduced chemical input contribute to increased soil fertility and long-term productivity.

France and Finland demonstrate the most measurable outcomes in this area, supported by monitoring systems and research integration. Bulgaria and Greece show moderate improvements, often driven by organic farming practices, while Serbia and Cyprus demonstrate emerging but less systematically measured impacts. Biodiversity enhancement is another key environmental benefit. CSA and permaculture systems typically involve diversified production, including multiple crop species and integration of natural habitats. France provides strong examples of biodiversity-friendly farming, often linked to policy incentives. Greece and Bulgaria also demonstrate positive impacts, particularly in small-scale farms. Serbia and Cyprus show biodiversity benefits primarily through traditional and low-input farming practices. Finland, although less focused on permaculture explicitly, supports biodiversity through sustainable land management and diversified agriculture.

Resource efficiency, particularly in water and energy use, is critical across all countries. This is especially important in Greece and Cyprus, where water scarcity is a major challenge. In these contexts, farmers adopt water-efficient irrigation systems and soil moisture conservation techniques. France and Finland demonstrate advanced resource management through the integration of smart technologies. Bulgaria and Serbia show moderate improvements, often constrained by limited access to technology and infrastructure. Environmental impacts are strongest in countries where sustainable practices are supported by policy frameworks and technology integration, while in other contexts they rely more on traditional knowledge and individual initiatives.

7.3 Climate Change Mitigation & Adaptation

CSA, permaculture, and UPA systems contribute significantly to both climate change mitigation and adaptation, although the extent of their impact varies across countries. From a mitigation perspective, these systems reduce greenhouse gas emissions through lower reliance on synthetic inputs, shorter supply chains, and reduced transportation distances. France demonstrates strong mitigation potential through integrated urban agriculture systems and local food networks. Finland also contributes through efficient and low-input farming practices. Bulgaria and Greece show moderate mitigation impacts, while Serbia and Cyprus are at earlier stages of recognizing and measuring these contributions.

In terms of adaptation, sustainable agricultural practices enhance resilience to climate variability. Soil improvement, water conservation, and diversified cropping systems help farmers cope with extreme weather events and changing climatic conditions. This is particularly evident in Greece and Cyprus, where adaptation is a necessity due to water scarcity and rising temperatures. Serbia also demonstrates adaptive practices, particularly in response to soil degradation and climate variability. France and Finland, while less exposed to extreme conditions, still integrate adaptation strategies through policy and technological innovation. The comparative analysis shows that adaptation is often more developed than mitigation, particularly in countries facing immediate climate challenges, while mitigation benefits are more evident in countries with integrated policy and monitoring systems.

7.4 Social Impacts: Community Engagement & Social Inclusion

One of the defining characteristics of CSA and UPA systems is their strong social dimension. Across all countries, these systems contribute to community building, social inclusion, and increased awareness of sustainable practices. Community engagement is particularly strong in CSA models, where direct relationships between producers and consumers foster trust and shared responsibility. France demonstrates the highest level of community integration, with well-established networks and active participation. Finland also shows strong community engagement, supported by digital tools and local food movements. Bulgaria and Greece exhibit growing engagement, particularly in urban areas, while Serbia and Cyprus show emerging but less structured community networks.

Social inclusion is another important impact, as UPA and CSA initiatives often involve vulnerable groups, including unemployed individuals, migrants, and people with limited access to resources. France provides examples of socially inclusive urban agriculture projects, while Bulgaria and Greece demonstrate similar initiatives at a smaller scale. Serbia and Cyprus show potential for social inclusion but lack structured programmes. Finland integrates social aspects through community-based activities and education. Education and awareness are key outcomes across all countries. CSA and permaculture systems serve as platforms for learning about sustainable agriculture, nutrition, and environmental stewardship. France and Finland demonstrate strong integration of education into agricultural systems, while Bulgaria and Greece show increasing activity in this area. Serbia and Cyprus are developing such initiatives but face resource constraints.

7.5 Food Security, Local Resilience & Public Health

Sustainable agricultural systems also contribute to food security and local resilience, particularly by strengthening local supply chains and reducing dependence on global markets. France demonstrates strong food system resilience through well-developed CSA networks and local procurement systems. Finland also shows high resilience, supported by efficient logistics and strong local production. Bulgaria and Greece improve food security at the local level, particularly in urban areas, although national-level impact remains limited. Serbia and Cyprus show emerging contributions, with local initiatives playing a key role in improving access to fresh and local food. From a public health perspective, CSA and UPA systems promote access to fresh, nutritious, and minimally processed food. This is particularly important in urban environments, where access to healthy food can be limited. France and Finland show strong alignment between agriculture and public health objectives, while Bulgaria and Greece demonstrate growing awareness. Serbia and Cyprus show potential but require further integration of health considerations into agricultural policies.

7.6 Measurement & Evaluation of Impacts

A key challenge across all countries is the measurement and evaluation of social and environmental impacts. While qualitative benefits are widely recognised, quantitative data and systematic monitoring remain limited. France and Finland demonstrate more advanced monitoring systems, supported by research institutions and policy frameworks. Bulgaria and Greece show moderate progress, often linked to project-based evaluations. Serbia and Cyprus face significant challenges in this area, with limited data collection and analysis. The lack of standardized indicators and methodologies makes it difficult to compare impacts across countries and to integrate them into policy decision-making. This highlights the need for improved monitoring systems and better integration of research and practice.

The analysis of social and environmental impacts highlights the significant contributions of CSA, permaculture, and UPA systems to sustainability, resilience, and community well-being. While France and Finland demonstrate more advanced and measurable impacts, Bulgaria and Greece show strong potential, and Serbia and Cyprus are in earlier stages of development. Across all countries, the social and environmental benefits of sustainable agriculture are clear, but their full potential can only be realized through improved policy support, better measurement systems, and stronger integration with economic and technological frameworks.

8. Key Challenges & Opportunities

8.1 Overview of Systemic Challenges & Opportunities

The development of sustainable urban and peri-urban agriculture (UPA), Community-Supported Agriculture (CSA), permaculture, and smart technologies across the partner countries is shaped by a complex interplay of structural challenges and emerging opportunities. While the previous sections have highlighted progress and innovation, this section synthesizes the main constraints and enabling factors that determine the scalability and long-term sustainability of these systems. Across all countries, France, Bulgaria, Greece, Serbia, Cyprus, and Finland, common challenges include governance fragmentation, limited access to funding, uneven adoption of smart technologies, and weak knowledge transfer systems. At the same time, significant opportunities arise from European policy frameworks, growing consumer demand for sustainable food, and the increasing role of innovation and digitalization.

A key cross-country finding is that the balance between challenges and opportunities is strongly influenced by governance capacity and policy coherence. Countries with integrated systems, such as France, are better able to leverage opportunities and mitigate challenges, while those with fragmented structures, such as Serbia and Cyprus, face greater barriers despite similar external conditions.

8.2 Structural & Institutional Challenges

One of the most persistent challenges across all countries is the fragmentation of governance systems. This issue is particularly pronounced in Serbia and Cyprus, where weak coordination between policymakers, farmers, and support organizations limits the effectiveness of agricultural policies and programmes. Bulgaria and Greece also experience fragmentation, although to a lesser extent, with overlapping responsibilities between institutions and limited integration between national and local levels. France demonstrates a more coherent governance model, where policies are aligned across levels, while Finland shows functional but less integrated systems.

Administrative complexity and bureaucratic barriers represent another major constraint, especially in Bulgaria and Greece. Complex procedures for accessing funding and complying with regulations can discourage small-scale farmers from participating in support programmes. In Serbia and Cyprus, administrative challenges are compounded by limited institutional capacity, further restricting access to resources. France and Finland, with more streamlined administrative systems, experience fewer barriers in this regard. A further structural challenge is the lack of targeted policies for CSA, permaculture, and urban agriculture. Although these approaches are supported indirectly through broader agricultural and environmental policies, their absence as distinct policy categories limit their visibility and access to tailored funding.

This gap is particularly evident in Cyprus and Serbia, but also affects Bulgaria, Greece, and Finland. France represents a partial exception, where agroecology and local food systems are more explicitly recognized.

8.3 Economic & Market-Related Challenges

Economic sustainability remains a critical challenge for many sustainable agriculture initiatives. One of the main issues is the limited development of structured markets for CSA and local food systems. While France benefits from well-established CSA networks and institutional support, other countries rely more heavily on informal market arrangements. In Bulgaria and Greece, farmers often depend on direct sales and local markets, which provide flexibility but lack stability and scalability. Serbia and Cyprus face even greater challenges, with fragmented market structures, limited infrastructure, and lower consumer purchasing power. Finland, although more advanced in terms of diversification and digitalisation, also faces constraints related to the small scale of production and market reach.

Access to funding and investment is another key challenge. While EU funding provides important support, its accessibility varies significantly. Bulgaria and Greece benefit from EU programmes but face administrative barriers. Serbia and Cyprus struggle with limited absorption capacity and institutional support. Finland uses funding effectively but lacks instruments tailored to small-scale systems. France, with its more developed funding ecosystem, is better positioned to support innovation and scaling. Price competitiveness also presents a challenge, particularly in countries with lower purchasing power. Sustainable products often have higher production costs, making them less accessible to a broader consumer base in Bulgaria, Serbia, and Cyprus. This limits market expansion and the financial viability of small-scale initiatives.

8.4 Technological & Innovation Barriers

The uneven adoption of smart technologies represents a significant constraint across partner countries. While France and Finland demonstrate advanced integration of digital tools and precision agriculture, other countries face substantial barriers. The high cost of technology is a major limiting factor, particularly in Serbia and Cyprus, where financial resources are limited. Bulgaria and Greece also face cost-related challenges, although EU-funded projects help mitigate them. France and Finland benefit from stronger financial support and innovation ecosystems. Limited digital skills and technical knowledge further restrict adoption. This issue is most pronounced in Serbia and Cyprus, where training and advisory services are underdeveloped. Bulgaria and Greece show moderate capacity, while France and Finland demonstrate higher levels of digital literacy. Another important barrier is the lack of technologies tailored to small-scale and diversified farming systems. Many available solutions are designed for large-scale agriculture and are not easily adaptable to CSA and permaculture contexts. This challenge affects all countries, including Finland, where technological capacity is high but alignment with small-scale systems remains limited.

8.5 Social & Knowledge-Related Challenges

Social and knowledge-related factors also play a critical role in shaping the development of sustainable agriculture systems. One of the key challenges is the gap between research and practice, which limits the effective transfer of knowledge to farmers. In France and Finland, this gap is relatively small due to strong integration between research institutions and practitioners. In Bulgaria and Greece, knowledge transfer is improving but remains inconsistent. In Serbia and Cyprus, limited advisory services and weak institutional linkages significantly constrain the dissemination of knowledge and innovation. Another challenge is uneven levels of awareness and engagement among consumers. While France and Finland demonstrate high levels of

awareness and participation in sustainable food systems, Bulgaria and Greece show growing but uneven engagement. In Serbia and Cyprus, lower levels of awareness and purchasing power limit consumer demand for sustainable products. Limited organizational capacity among farmers and communities affects the development of structured CSA systems and collaborative initiatives. This issue is particularly relevant in Serbia and Cyprus, where informal practices dominate, but also affects Bulgaria and Greece to a lesser extent.

8.6 Opportunities for Development & Scaling

Despite these challenges, significant opportunities exist across all countries for advancing sustainable agriculture systems. One of the most important opportunities is the strong support provided by European policy frameworks and funding programmes. The European Green Deal, Farm to Fork Strategy, and CAP 2023-2027 create a favorable environment for sustainable practices, providing both strategic direction and financial resources. Countries that effectively leverage these frameworks—such as France, Bulgaria, and Greece—demonstrate more advanced development. The growing consumer demand for local, organic, and sustainable food represents another major opportunity. This trend is particularly strong in France and Finland but is also gaining momentum in Bulgaria and Greece. Even in Serbia and Cyprus, there is increasing interest in local food systems, creating potential for market expansion.

Technological innovation and digitalisation offer significant potential for improving efficiency, transparency, and coordination. While adoption remains uneven, the increasing availability of affordable and user-friendly technologies can support wider uptake, particularly if combined with training and advisory services. The development of hybrid economic models and diversification strategies also provides opportunities for enhancing resilience. Integrating production with services such as education, tourism, and community engagement can create additional income streams and strengthen local economies. Finally, community-based approaches and social innovation represent a powerful driver of change. CSA networks, urban farming initiatives, and local food movements demonstrate strong potential for scaling sustainable practices, particularly when supported by policy and institutional frameworks.

8.7 Strategic Implications of Challenges & Opportunities

The interaction between challenges and opportunities highlights several important strategic implications.

1. **First**, policy coherence and governance integration are critical enablers. Countries that align policies across levels and sectors are better able to leverage opportunities and address challenges effectively.
2. **Second**, targeted support for small-scale and community-based systems is essential. CSA, permaculture, and UPA often operate outside mainstream agricultural frameworks and require tailored policies and funding mechanisms.
3. **Third**, investment in knowledge transfer and capacity building is a key priority. Strengthening advisory services, training programmes, and collaboration between research and practice can significantly enhance adoption of sustainable practices and technologies.
4. **Fourth**, market development and consumer engagement must be strengthened. Expanding access to local food systems and increasing awareness can drive demand and support economic sustainability.
5. **Fifth**, innovation must be inclusive and context-specific. Technologies and business models need to be adapted to local conditions and the needs of diverse farming systems to ensure broad adoption and impact.

The analysis of challenges and opportunities reveals that the transition toward sustainable agriculture systems are both complex and dynamic. While significant barriers remain, particularly in countries with weaker institutional frameworks, there are also strong drivers and opportunities that can support further development.

France and Finland are well positioned to lead innovation and scaling, while Bulgaria and Greece have strong potential for growth with improved coordination and support. Serbia and Cyprus require targeted interventions to overcome structural constraints and unlock their potential. Ultimately, the successful development of CSA, permaculture, and UPA systems will depend on the ability to transform challenges into opportunities through integrated, multi-level, and collaborative approaches.

9. Strategic Recommendations

9.1 Overview & Strategic Approach

Building on the analysis of policy frameworks, stakeholder dynamics, technological development, field practices, economic models, and identified challenges, this section outlines strategic recommendations to support the development and scaling of sustainable urban and peri-urban agriculture (UPA), Community-Supported Agriculture (CSA), permaculture, and smart technologies across the partner countries.

The recommendations are structured across four key dimensions:

1. Policy and governance
2. Practice and capacity building
3. Innovation and technology
4. Market and economic development

A cross-country perspective is maintained throughout, recognizing that while some recommendations are broadly applicable, their prioritization and implementation will vary depending on national contexts. France represents a benchmark for integrated systems, Bulgaria and Greece require optimization and scaling, Finland requires better alignment with small-scale models, while Serbia and Cyprus need foundational development and targeted support.

9.2 Policy & Governance Recommendations

9.2.1 Develop Targeted Policy Frameworks for CSA, Permaculture & UPA

A key recommendation across all countries is the development of explicit policy recognition and targeted frameworks for CSA, permaculture, and urban agriculture. Currently, these systems are often indirectly supported through broader agricultural and environmental policies, which limits their visibility and access to tailored instruments.

- **France** should continue strengthening integrated frameworks and scaling successful models across regions.
- **Bulgaria and Greece** need to formalize CSA and UPA within national strategies to move beyond project-based development.
- **Serbia and Cyprus** require foundational policy development, including legal recognition and strategic prioritization of these systems.
- **Finland** should adapt existing policies to better support small-scale and community-based agriculture.

9.2.2 Improve Multi-Level Governance & Institutional Coordination

Effective governance requires stronger coordination between national, regional, and local authorities, as well as between sectors such as agriculture, environment, and urban planning.

- **France** provides a model of integrated multi-level governance that can be adapted by other countries.
- **Bulgaria and Greece** should focus on improving coordination between ministries and local authorities.
- **Serbia and Cyprus** need to strengthen institutional capacity and establish clearer governance structures.
- **Finland** should enhance alignment between policy frameworks and local implementation.

9.2.3 Simplify Administrative Procedures & Improve Access to Funding

Stakeholders participating in the national expert workshops consistently identified administrative complexity and limited accessibility of funding mechanisms as major barriers for small-scale producers and CSA initiatives, particularly in Bulgaria, Greece, Serbia, and Cyprus. Participants emphasized the need for simplified application procedures, improved advisory support, and funding instruments better adapted to diversified and community-based agricultural systems. Administrative complexity remains a major barrier, particularly for small-scale farmers and CSA initiatives.

- **Bulgaria and Greece** should prioritize simplification of funding procedures and reduce bureaucratic burdens.
- **Serbia and Cyprus** need to improve institutional capacity to facilitate access to EU and national funding.
- **France and Finland** should continue optimizing administrative systems while ensuring inclusiveness for smaller actors.

9.3 Practice & Capacity Building Recommendations

9.3.1 Strengthen Knowledge Transfer & Advisory Systems

Bridging the gap between research and practice is essential for scaling sustainable agriculture.

- **France and Finland** should continue integrating research and practice, focusing on innovation transfer.
- **Bulgaria and Greece** need to strengthen advisory services and expand training programmes.
- **Serbia and Cyprus** require significant investment in extension services and capacity building.

Key actions include:

- Establishing farmer training programmes
- Supporting peer-to-peer learning networks
- Enhancing collaboration between universities and practitioners

9.3.2 Promote Education & Skills Development in Sustainable Agriculture

Workshop discussions across all partner countries highlighted growing demand for practical training related to agroecology, digital agriculture, CSA management, and sustainable entrepreneurship. Participants emphasized that future educational programmes should combine technical, environmental, business, and social competencies in order to support the long-term resilience of sustainable agricultural systems. Education plays a crucial role in supporting long-term transformation. All countries should integrate CSA, permaculture, and agroecology into formal and informal education systems.

- **Finland and France** can lead in developing advanced training models.

- **Bulgaria, Greece, Serbia, and Cyprus** should expand vocational training and community-based education initiatives.

9.3.3 Support Community-Based & Social Innovation Initiatives

CSA and UPA are inherently social systems that benefit from strong community engagement.

- **France** should continue supporting large-scale community networks.
- **Bulgaria and Greece** should scale existing grassroots initiatives.
- **Serbia and Cyprus** need to prioritize community-building as a foundation for system development.
- **Finland** should strengthen community engagement within its diversified agriculture model.

9.4 Innovation & Technology Recommendations

9.4.1 Develop Affordable & Context-Specific Technologies

Technological solutions must be adapted to the needs of small-scale and diversified farming systems.

- **France and Finland** should focus on optimizing and simplifying existing technologies.
- **Bulgaria and Greece** need to expand access to affordable tools through funding and training.
- **Serbia and Cyprus** require low-cost, user-friendly solutions as a priority.

9.4.2 Enhance Digital Skills & Technological Literacy

Expert workshop participants repeatedly stressed that digital literacy represents a critical enabling factor for the adoption of smart agricultural technologies. This challenge was particularly visible among small-scale producers and older farming populations, especially in Serbia, Cyprus, Bulgaria, and Greece. Digital skills are essential for adopting smart technologies.

- **Serbia and Cyprus** should prioritize basic digital training programmes.
- **Bulgaria and Greece** should expand intermediate-level training linked to EU projects.
- **France and Finland** should focus on advanced digital competencies and innovation.

9.4.3 Promote Co-Creation & Participatory Innovation

Engaging farmers in the development of technologies ensures relevance and adoption.

- **Finland** provides a strong model of co-creation that can be adapted by other countries.
- **All countries** should promote collaboration between farmers, researchers, and technology providers.

9.5 Market & Economic Development Recommendations

9.5.1 Strengthen CSA Models & Short Supply Chains

Stakeholders from all six partner countries emphasized the importance of strengthening direct producer–consumer relationships in order to improve market stability, transparency, and local food resilience. Workshop discussions confirmed that CSA systems represent not only an economic model but also a social mechanism for strengthening trust and community engagement. Developing structured CSA systems is key to improving economic stability.

- **France** should continue scaling and innovating CSA models.
- **Bulgaria and Greece** should formalize and expand CSA networks.

- **Serbia and Cyprus** should focus on establishing basic CSA structures.
- **Finland** should expand niche CSA models within its diversified system.

9.5.2 Support Diversification & Hybrid Business Models

Diversification enhances resilience and income stability.

- **France and Finland** can further develop multifunctional farm models.
- **Bulgaria and Greece** should support diversification through training and funding.
- **Serbia and Cyprus** should prioritize diversification as a survival and growth strategy.

9.5.3 Develop Local Markets & Sustainable Public Procurement

Public procurement represents a powerful tool for market development.

- **France** provides a strong example of integrating local food into public systems.
- **Bulgaria and Greece** should expand public procurement initiatives.
- **Serbia and Cyprus** need to develop basic frameworks for local market support.
- **Finland** should strengthen links between local producers and public institutions.

9.5.4 Increase Consumer Awareness & Demand for Sustainable Food

Consumer behavior is a key driver of market development.

- **France and Finland** should continue leading awareness initiatives.
- **Bulgaria and Greece** should expand education and promotion campaigns.
- **Serbia and Cyprus** need targeted efforts to build consumer awareness and trust.

9.6 Cross-Country Strategic Priorities

Based on the comparative analysis, countries can be grouped into strategic categories:

Advanced Systems (France)

- Focus on scaling, optimization, and innovation leadership
- Strengthen export of best practices

Intermediate Systems (Bulgaria, Greece)

- Improve coordination and policy targeting
- Scale existing initiatives and strengthen markets

Innovation-Oriented but Niche (Finland)

- Align policies with small-scale systems
- Expand CSA and UPA integration

Emerging Systems (Serbia, Cyprus)

- Develop foundational frameworks
- Invest in capacity building and infrastructure
- Prioritize awareness and institutional development

9.7 Implementation Considerations

To ensure effective implementation of these recommendations, several cross-cutting considerations should be taken into account:

- **Multi-actor collaboration** is essential for aligning policies, practices, and innovation
- **Flexibility and adaptability** are needed to reflect national and local contexts
- **Long-term commitment** is required to achieve systemic transformation
- **Monitoring and evaluation** systems should be strengthened to track progress

The strategic recommendations highlight that the successful development of CSA, permaculture, UPA, and smart technologies requires an integrated and context-sensitive approach. While countries differ in their starting points and capacities, all have opportunities to advance through targeted policy support, strengthened stakeholder collaboration, and investment in innovation and capacity building. France and Finland are well positioned to lead and innovate, Bulgaria and Greece can scale and consolidate their progress, and Serbia and Cyprus can build foundational systems that enable long-term development.

10. Conclusions

The analysis presented in this report demonstrates that urban and peri-urban agriculture (UPA), Community-Supported Agriculture (CSA), permaculture, and smart technologies are increasingly recognized as key components of sustainable and resilient food systems across Europe and partner countries. While these approaches share common principles, localization, sustainability, community engagement, and resource efficiency, their level of development and integration varies significantly across the countries analyzed: France, Bulgaria, Greece, Serbia, Cyprus, and Finland.

A central finding of this report is that the transition toward sustainable agricultural systems is not determined solely by resource availability or policy ambition, but by the degree of integration between policy frameworks, stakeholder ecosystems, technological innovation, and market development. Countries that demonstrate strong alignment across these dimensions are better positioned to scale and sustain their systems. France emerges as the most advanced and comprehensive model among the partner countries. Its success is rooted in a high level of policy coherence, strong multi-level governance, well-organized stakeholder networks, and effective integration of smart technologies. CSA systems such as AMAPs are institutionalized, urban agriculture is embedded in planning strategies, and public policies actively support sustainable food systems. This integrated approach enables scalability, stability, and measurable environmental and social impacts.

Finland presents a distinct but equally important model, characterized by strong digitalization, innovation capacity, and diversified local agriculture. While UPA and CSA are less prominent in formal terms, the underlying principles of sustainability, local food systems, and community engagement are well developed. However, a key limitation lies in the misalignment between policy instruments and the needs of small-scale, community-based systems, which constrains the broader expansion of CSA and permaculture. Bulgaria and Greece occupy an intermediate position, demonstrating dynamic development and significant potential. In both countries, sustainable agricultural practices are expanding, driven by EU funding, civil society engagement, and growing consumer demand. However, their progress is constrained by fragmented governance, administrative complexity, and limited coordination between stakeholders. CSA systems are emerging but remain less formalized, and technological adoption is uneven. With improved policy targeting and institutional integration, these countries are well positioned to scale their systems effectively.

Serbia and Cyprus represent emerging systems with clear potential but significant structural challenges. In both countries, sustainable agricultural practices are present at the grassroots level, often driven by motivated individuals and communities. However, limited institutional support, weak advisory systems, fragmented markets, and low levels of technological adoption restrict scalability. The absence of targeted policy frameworks for CSA and urban agriculture further limits development. Addressing these foundational issues is essential for unlocking the potential of these systems. Across all countries, the report highlights several cross-cutting insights. First, CSA and permaculture are not only agricultural practices but socio-economic systems that strengthen relationships between producers and consumers, enhance community resilience, and contribute to environmental sustainability. Their success depends on trust, participation, and long-term engagement, which cannot be achieved through policy measures alone.

Second, smart technologies represent a critical enabler but not a standalone solution. While digital tools, sensors, and precision agriculture technologies can significantly improve efficiency and resource management, their impact depends on accessibility, affordability, and alignment with the needs of small-scale farmers. Countries with strong innovation ecosystems, such as France and Finland, demonstrate the benefits of integrated technological systems, while others require targeted support to overcome financial and knowledge barriers. Third, economic sustainability remains a key challenge, particularly in countries where market structures are underdeveloped. Structured CSA models, diversified income streams, and strong local markets are essential for ensuring financial viability. France provides a leading example, while other countries rely more heavily on informal or fragmented systems that limit scalability. Fourth, social and environmental impacts are among the strongest outcomes of sustainable agricultural systems, often exceeding economic and institutional development. Across all countries, CSA and UPA contribute to soil health, biodiversity, climate resilience, community engagement, and food security. However, these impacts are not always systematically measured or integrated into policy frameworks, highlighting the need for improved monitoring and evaluation systems. Finally, the report underscores that the future of sustainable agriculture lies in integrated, multi-actor, and place-based approaches. No single solution, whether policy, technology, or market intervention, is sufficient on its own. Instead, successful systems are those that combine supportive policies, engaged stakeholders, accessible technologies, and strong local markets.

Looking forward, the transition toward sustainable and resilient food systems will depend on the ability of countries to address existing challenges while leveraging emerging opportunities. France and Finland are well positioned to lead innovation and share best practices, while Bulgaria and Greece can scale their systems through improved coordination and policy support. Serbia and Cyprus require targeted interventions to build foundational structures and enable long-term development. The findings of this report also provide an important foundation for the subsequent activities under Work Package 3 related to curriculum and educational programme development. The comparative analysis identified several priority competency areas requiring further educational support, including smart agriculture technologies, digital literacy, CSA management, agroecological practices, sustainable entrepreneurship, stakeholder collaboration, and climate-resilient agricultural systems.

The insights generated through stakeholder consultations, field research, and expert workshops will contribute directly to the design of future training modules and capacity-building activities aimed at supporting farmers, students, professionals, and community actors engaged in sustainable urban and peri-urban agriculture across the partner countries. In conclusion, CSA, permaculture, UPA, and smart technologies collectively represent a transformative pathway toward more sustainable, inclusive, and resilient food systems. While progress across partner countries is uneven, the overall trajectory is positive, and the potential for further development is substantial. Realizing this potential will require continued commitment, collaboration, and innovation at all levels—from local communities to European policy frameworks.

RESOURCES AND ADDITIONAL READING

- Agroberichten Buitenland, Serbia food sovereignty, 2025. https://www.agroberichtenbuitenland.nl/actueel/nieuws/2025/05/16/serbia-food-sovereginty
- Agroberichten Buitenland. (2022). Bulgaria's reforms and investments in the digitalization and innovation of agriculture within country's National Recovery and Resilience Plan. Retrieved from report. agroberichtenbuitenland.nl
- Agroecologia (2024). Petrera Permaculture Land, https://agroecologymap.org/pt-BR/locations/petrera-permaculture-land
- Anonymous, (2022). Nationwide Climate Change Survey: Perceptions, Threats and Challenges for a New Environmental Culture, "DIANEOSIS" Think Group Study. 2022. (In Greek). Available online: https://www.dianeosis.org/wp-content/uploads/2022/06/climatechange_survey.pdf (accessed on 22 November 2025).
- Arabatzis, G.; Christopoulou, O. (2003). Afforestation of agricultural land as a measure of management and development of rural areas. Sustain. World, 6, 643–650.
- Assessing the Economic and Ecological Outcomes of Sustainable Agriculture in Bulgaria. (2025). Bulgarian Journal of Agricultural Economics and Management, 70(1), 12–34.
- Assessing the Economic and Ecological Outcomes of Sustainable Agriculture in Bulgaria. (2025). Bulgarian Journal of Agricultural Economics and Management, 70(1), 12–34
- Aza, N., (2017). Christina Georgiou-Pantelis Gabriel: A couple unlike any other, LIKE TEAM, (in Greek).https://like.philenews.com/celebrity/synantiseis/christina-georgioy-pantelis-gavriil-ena-zeygari-alliotiko-ap-ta-alla/
- Bachev, H., & Terziev, D. (2016). Environmental sustainability of agricultural farms in Bulgaria. Journal of Environmental Management and Tourism, 8(5), … [doi:10.14505/jemt.v8.5(21).02] journals.aserspublishing.eu
- Bachev, H., & Terziev, D. (2016). Environmental sustainability of agricultural farms in Bulgaria. Journal of Environmental Management and Tourism, 8(5), 12–34. https://doi.org/10.14505/jemt.v8.5(21).02
- Bešić, C.; Ćoćaklo, D.; Bakator, M.; Vidas Bubanja; Stanisavljev, S. Agriculture 5.0 potential and the application of advanced technologies in Serbia. Original Article, 2025; doi:10.59267/ekoPolj2502599BUDC 338.431:004(497.11).
- BIOSELENA Foundation. (n.d.). Organic agriculture and capacity building in Bulgaria. Sofia: BIOSELENA Foundation.
- BIOSELENA Foundation. (n.d.). Organic agriculture and capacity building in Bulgaria. Sofia: BIOSELENA Foundation.
- BTA. (2024, March 22). Green Deal implementation "significantly delayed", says head of agriculture unit in Bulgaria's representation in Brussels. BTA. bta.bg
- BTA. (2025, February 20). Organic Production Plan until 2030 endorsed by Agriculture Minister. BTA. bta.bg
- COMPANIES REGISTRY, (2025). Permaculture Designs Cyprus, https://companiesregistry.cy/company-details/permaculture-designs-cyprus-53230/
- Consilium. (2024, June 17). Nature restoration law: Council gives final green light (Press release). Retrieved from Consilium website. Съвет на Европейския съюз
- Consilium. (n.d.). Greening agriculture. Retrieved from https://www.consilium.europa.eu/en/policies/greening-agriculture/ Съвет на Европейския съюз
- Council of the European Union. (2021, December 2). Council adopts fairer, greener and more performance-based farming policy for 2023-2027 (Press release). Retrieved from Consilium website. Съвет на Европейския съюз
- Cyprus Economic and Competitiveness Council (2020). Improving the competitiveness of the agricultural sector (in Greek)
- Cyprus International Institute of Management, (2022). Μετάβαση κυπριακής οικονομίας σε πράσινο μοντέλο βιώσιμης ανάπτυξης, (Greek)
- Djurdjević, V.; Stosic, B.; Tošić, M.; Lazić, I.; Putniković, S.; Stosic, T.; Tošić, I. Analysis of recent trends and spatiotemporal changes of droughts over Serbia using high-resolution gridded data. Faculty of Physics, Institute for Meteorology, University of Belgrade; Departamento de Estatística e Informatica, Universidade Federal Rural de Pernambuco, Brazil.
- Doitchinova, J., & Stoyanova, Z. (2024). Regional aspects of transformations in agriculture: The case of the Republic of Bulgaria. Sustainability, 16(23), 10711. https://doi.org/10.3390/su162310711
- Đokić, D.; Zekić, S.; Jurjević, Ž.; Matkovski, B. Drivers of technical efficiency in agriculture in the Western Balkans and New EU Member States. Custos E @Gronegócio 2020, 16, 2–15.

RESOURCES AND ADDITIONAL READING

- Economic and business magazine "Kerdos" (2018). Digital agriculture is now a reality in Cyprus, https://eurokerdos.cyprustimes.com/etairika-nea/i-psifiaki-georgia-einai-pleon-gegonos-kai-stin-kypro/
- Economides, G.; Papandreou, A.; Sartzetakis, E. Xepapadeas, A. (2000). The Economics of Climate Change; Bank of Greece: Athens, Greece,
- EEA. (2023). Area under organic farming in Bulgaria. Copenhagen: European Environment Agency.Mundus Bulgaria. (2023). Top 10 best practices in urban agriculture in Bulgaria. Sofia: Mundus Bulgaria. Nikolova, M., Slaveva, K., & Pavlov, P. (2025). Organic agriculture in the Republic of Bulgaria: A model for sustainable development and diversification of agricultural business. Sustainability, 17(7), 3249. https://doi.org/10.3390/su17073249Otouzbirov, R., Atanasova, T., & Nencheva, I. (2019). Sustainable development of organic farming in Bulgaria – state and opportunities. Central European Review of Economics and Management, 3(2), 45–61. https://doi.org/10.29015/cerem.747
- EIT Food. (2025). Training on regenerative agriculture in Bulgaria. Leuven: EIT Food.
- ElBeheiry, N., & Balog, R. S. (2022). Technologies driving the shift to smart farming: A review. IEEE Sensors Journal, 23(3), 1752-1769.
- Erjavec, E.; Mortensen, K.; Volk, T.; Rednak, M.; Eberlin, R.; Ludvig, K. Gap analysis and recommendations. In Agricultural Policy and European Integration in Southeastern Europe; Volk, T., Erjavec, E., Mortensen, K., Eds.; Food and Agricultural Organization of the United Nations: Budapest, Hungary, 2014; pp. 39–60.
- EU Soil Strategy for 2030 – Brussels, 17.11.2021.
- EUR-Lex. (2024). Regulation (EU) 2024/1991 of the European Parliament and of the Council on Nature Restoration. Retrieved from EUR-Lex. EUR-Lex
- European Commission (2020). Handbook on Sustainable Urban Development Strategies, EUR 29990 EN, Publications Office of the European Union, Luxembourg, 2020, Fioretti, C., Pertoldi, M., Busti, M. and Van Heerden, S. (eds.), Luxembourg, (in Greek)
- European Commission (2021). Commission communication: action plan for the development of organic production in the EU, https://agriculture.ec.europa.eu/farming/organic-farming/organic-action-plan_en
- European Commission, Directorate-General for Environment. (2025). The nature restoration regulation (Public. Office of the EU). Retrieved from https://op.europa.eu/en/publication-detail/-/publication/cd10f41c-fd61-11ef-b7db-01aa75ed71a1/language-enon Publications Office of the EU
- European Commission, Executive Agency for Climate, Infrastructure and Environment (CINEA). (2023, July 12). New Nature Restoration Law boosts biodiversity and climate action across Europe. Retrieved from CINEA website. cinea.ec.europa.eu
- European Commission. (2020). The Farm to Fork Strategy. Retrieved from https://food.ec.europa.eu/system/files/2020-06/comm_oc_20200617_pres1.pdf Food Safety
- European Commission. (2022). The Commission approves the CAP Strategic Plans of Bulgaria and Romania. Retrieved from European Commission media release. Agriculture and rural development
- European Commission. (2023). CAP Strategic Plans – Finland. https://agriculture.ec.europa.eu/cap-my-country/cap-strategic-plans/finland_en
- European Commission. (2025). At a glance: Bulgaria's CAP Strategic Plan (2023–2027). Retrieved from European Commission website. Agriculture and rural development+1
- European Commission. (n.d.). Biodiversity – Agriculture and environmental sustainability. Retrieved from European Commission website. Agriculture and rural development
- European Commission. (n.d.). Sustainable agricultural practices and methods. Retrieved from Agriculture and Rural Development site. Agriculture and rural development
- European Environment Agency. (2023). Area under organic farming in Bulgaria. Copenhagen: EEA. Retrieved from https://www.eea.europa.eu/en/europe-environment-2025/countries/bulgaria/area-under-organic-farming
- European Parliament. (2024, February 23). Nature restoration: Parliament adopts law to restore 20% of EU's land and sea (Press release). Retrieved from European Parliament website. Европейски парламент
- Eurostat, (2025). Area under organic farming, https://ec.europa.eu/eurostat/web/products-datasets/-/sdg_02_40
- FAO-Serbia cooperation agreement, 2023-2025. https://www.fao.org/europe/news/detail/fao-and-serbia-commit-to-build-sustainable-agrifood-systems/en

RESOURCES AND ADDITIONAL READING

- Giua, C., Materia, V. C., & Camanzi, L. (2022). Smart farming technologies adoption: Which factors play a role in the digital transition?. Technology in Society, 68, 101869.
- Government Portal, (2020). Cyprus National Strategy for sustainable operational programs of producer organizations in the fruit and vegetable sector, Nicosia (Greek)
- Government Portal, (2023). Strategic Plan for the Common Agricultural Policy 2023-2027, Nicosia (in Greek)
- Helsingin kaupunki. (Referenced 25.11.2025) Gardening in the city https://www.hel.fi/en/culture-and-leisure/outdoor-activities-parks-and-nature-destinations/parks/gardening-in-the-city
- IPARD Programme (EU Instrument for Pre-Accession Assistance for Rural Development). https://ipard.rs/konkursi
- Karagiorgas, I. (2025). Water resources: Urgent need for action in Cyprus—Serious weaknesses in water management, (in Greek), euronews, https://gr.euronews.com/green/2025/11/11/water-shortage-anagki-lipsis-metrwn-stin-cyprus
- Kotseva-Tikova, M. (2024). The Green Deal of Bulgaria. European Journal of Public Policy, 4. ejpp
- Kyriakopoulos, G. L., Sebos, I., Triantafyllou, E., Stamopoulos, D., & Dimas, P. (2023). Benefits and synergies in addressing climate change via the implementation of the common agricultural policy in Greece. Applied Sciences, 13(4), 2216
- Low-Carbon Development Strategy of the Republic of Serbia 2023–2030, adopted 07.06.2023.
- LUKE. (Referenced 25.11.2025) Digital Innovation Hub for Agriculture www.luke.fi/en/digital-innovation-hub-for-agriculture
- Manolaki, P., & Vogiatzakis, I. N. (2017). Ecosystem services in a peri-urban protected area in Cyprus: a rapid appraisal. Nature Conservation, 22, 129-146.
- Marcikić Horvat, A.; Matkovski, B.; Zekić, S.; Radovanov, B. Technical efficiency of agriculture in Western Balkan countries undergoing the process of EU integration. Agric. Econ. 2020, 66, 65–73.
- Maurya, P., Goswami, M., Nautiyal, S., Prakash, S., Gupta, A. K., & Sathish, A. (2024). Resource Flow in Peri-urban Agroecosystem: an Assessment from Circular Economy Perspective. Circular Economy and Sustainability, 4(2), 1093-1114.
- MDPI, Sustainable agriculture and local food systems in Serbia. https://www.mdpi.com/2071-1050/12/11/4686
- MEP Radan Kanev. (2024, February 28). European Nature Restoration Law beneficial for Bulgaria – will provide funding for Maritsa Iztok mines restoration. B2B Magazine. B2B Magazine
- Ministry of Agriculture, Rural Development and Environment (2017). National Strategy for Adaptation to Climate Change, Department of Environment, Nicosia (in Greek)
- Ministry of Agriculture, Rural Development and Environment (2020). Strategy and Action Plan for Biodiversity in Cyprus, Department of Environment, Nicosia (in Greek)
- Ministry of Agriculture, Rural Development and Environment (2023). CAP Strategic Plan 2023-2027, (in Greek)
- Ministry of Agriculture, Serbia, Organic production statistics. https://stips.minpolj.gov.rs/srl/vest/organska-proizvodnja-u-srbiji-na-tek-085-odsto-povrsina
- Ministry of Environment & Water (MOEW), Bulgaria. (2023, June 20). EU Ministers achieved agreement on the Nature Restoration Regulation. MOEW Press Center. Министерство на околната среда и водите
- Ministry of Finance, Bulgaria. (2024). Bulgarian National Recovery and Resilience Plan (NRRP) — Green Bulgaria pillar: Sustainable agriculture component (RRP document). Министерство на транспорта и съобщенията
- Mundus Bulgaria. (2023). Top 10 best practices in urban agriculture in Bulgaria. Sofia: Mundus Bulgaria.
- Mundus Bulgaria. (2023). Top 10 best practices in urban agriculture in Bulgaria. Sofia: Mundus Bulgaria.
- National agricultural subsidies / incentive schemes. https://uap.gov.rs/subsidies-in-agriculture/
- National Inventory Report of Greece for Greenhouse and Other Gases for the Years 1990–2018; Greece—National Inventory Report (NIR); Hellenic Ministry of Environment and Energy: Athens, Greece, 2020.
- Nikolaou, A. (2025). Cypriot agriculture is changing—New strategy for sustainable development and competitiveness—How €455 million in funds are being utilized, Philenews. (in Greek)
- Nikolić, M. M.; Vučković, D. J.; Mihailović, N. Ž. Cooperation between agricultural extension services and cooperatives – the state and possibilities. University of Belgrade, Faculty of Agriculture, Belgrade, Serbia; Cooperative Union of Serbia, Belgrade, Serbia.

RESOURCES AND ADDITIONAL READING

- Nikolova, M., Slaveva, K., & Pavlov, P. (2025). Organic agriculture in the Republic of Bulgaria: A model for sustainable development and diversification of agricultural business. Sustainability, 17(7), 3249. https://doi.org/10.3390/su17073249
- Otouzbirov, R., Atanasova, T., & Nencheva, I. (2019). Sustainable development of organic farming in Bulgaria – state and opportunities. Central European Review of Economics and Management, 3(2), 45–61. https://doi.org/10.29015/cerem.747
- Otouzbirov, R., Atanasova, T., & Nencheva, I. (2019). Sustainable development of organic farming in Bulgaria – state and opportunities. Central European Review of Economics and Management, 3(2), 45–61. https://doi.org/10.29015/cerem.747
- Otouzbirov, R., Atanasova, T., & Nencheva, I. (year). Sustainable development of organic farming in Bulgaria – state and opportunities. Central European Review of Economics and Management. https://doi.org/10.29015/cerem.747 ojs.wsb.wroclaw.pl
- Pe'er, G.; Lakner, S. (2020). The EU's common agricultural policy could be spent much more efficiently to address challenges for farmers, climate, and biodiversity. One Earth, 3, 173–175.
- Petrov, D. P. (2025). Adaptation of Bulgarian agricultural holdings in the context of the Green Deal. Economic Thought Journal, 70(2), 197–212. etj.iki.bas.bg
- Radović, G.; Subić, J.; Pejanović, V. Analysis of implementation of the IPARD II Program in Serbia. Review Article; doi: 10.59267/ekoPolj24031017RUDC 332.146:330.322(497.11).
- Republic of Cyprus (2024). National Action Plan for the Promotion of the Circular Economy 2021-2027, Nicosia (in Greek)
- Republic of Cyprus (2025a). Cyprus Recovery and Resilience Plan (in Greek)
- Republic of Cyprus (2025b). Audit of the Water Development Department, Audit Service, Water Development Department, special report: EU-EY 41/2025, (in Greek)
- Roussou, E., & Panagidis, A. (2024). Land Development and Urban Governance in Cyprus. In PROCEEDINGS of the INTERNATIONAL CONFERENCE on CHANGING CITIES VI.
- Ruokavirasto (2023) Miksi maataloutta ja maaseutua tuetaan? https://www.ruokavirasto.fi/globalassets/tuet/miksi-maataloutta-ja-maaseutua-tuetaan.pdf
- Sassenrath, G. F., Heilman, P., Luschei, E., Bennett, G. L., Fitzgerald, G., Klesius, P., ... & Zimba, P. V. (2008). Technology, complexity, and change in agricultural production systems. Renewable Agriculture and Food Systems, 23(4), 285-295.
- Serbia Competitive Agriculture Project (SCAP). https://scap.rs/en
- Serbian Agency for Agrifood Industry (RAS). https://ras.gov.rs/sector/agri-food-industry
- Serbian Ministry of Environmental Protection, Low-Carbon Development Strategy. https://www.ekologija.gov.rs/saopstenja/vesti/vlada-republike-srbije-usvojila-strategiju-niskougljenicnog-razvoja-do-2030-godine
- Sharma, V., Tripathi, A. K., & Mittal, H. (2022). Technological revolutions in smart farming: Current trends, challenges & future directions. Computers and Electronics in Agriculture, 201, 107217
- Strategy for Agriculture and Rural Development of the Republic of Serbia 2014–2024, adopted 12.08.2014.
- Strategy for Water Management of the Republic of Serbia until 2034, adopted 18.01.2017.
- Strategy of Sustainable Urban Development of the Republic of Serbia until 2030, adopted 13.06.2019.
- Štrbac, M.; Manojlovic, M.; Ciric, V.; Đuric, S.; Cabilovski, R.; Petkovic, K.; Kovacevic, D.; Vijuk, M. Fertility status and soil quality assessment of Chernozem and Stagnosol soils under organic farming practices. Faculty of Agriculture, University of Novi Sad.
- Terziev, V., & Arabska, E. (2016). Sustainable rural development through organic production and community-supported agriculture in Bulgaria. Bulgarian Journal of Agricultural Science, 22, 527–535.
- Tolimir, N.; Maslovarić, M.; Čolić, S.; Simić, D.; Tomić, V.; Stanković, S. The importance of knowledge transfer in agriculture for rural development in Serbia. 3rd International Symposium on Biotechnology, DOI: 10.46793/SBT30.03NT, Proceedings, 2025.
- Tošović-Stevanović, A.; Ristanović, V. Farm economy in Serbia – distribution channels of sustainable products. Original Article; doi: 10.59267/ekoPolj24041225TUDC 631.11:631.147(497.11).

RESOURCES AND ADDITIONAL READING

- VTT Technical Research Centre of Finland. (2021). Food System Innovation Strategy 2023-2035. VTT. https://www.vttresearch.com/sites/default/files/2021-03/Food-research-and-innovation-strategy-for-Finland-2021-2035.pdf
- Vukelić, I.; Milošević, S.; Đurđević, D. et al. Sustainable transition of the Republic of Serbia: measuring capacity for circularity in agriculture and rural areas. Energ Sustain Soc 13, 34 (2023). https://doi.org/10.1186/s13705-023-00413-4
- Wageningen University Research, Opportunities for precision agriculture in Serbia. https://research.wur.nl/en/publications/opportunities-for-precision-agriculture-in-serbia
- Ympäristöministeriö (Ministry of Environment), 2022. Keskipitkän aikavälin ilmastopolitiikan suunnitelma -Kohti hiilineutraalia yhteiskuntaa 2035. https://julkaisut.valtioneuvosto.fi/server/api/core/bitstreams/01d1a3d4-a13d-43b5-a024-c7055d5b4cb8/content

The SMART-CSA Partnership

Co-funded by the European Union

Grant Agreement Number: 2025-1-FR01-KA220-VET-000355866.
Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the Agence Erasmus+ France / Education Formation. Neither the European Union nor the Agence Erasmus+ France / Education Formation can be held responsible for them.