

ORIGINAL ARTICLE

The Future of Organic Farm Types for Arable Land Crops in Romania

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Abstract: This document presents a comprehensive analysis of the current and future typologies of organic farm types for arable land crops in Romania. The study aims to define characteristic farm types for the years 2020 and 2035, focusing on both production-based and socio-economic key figures. The analysis includes a detailed description of the current farm types, both conventional and organic, and proposes a typology for future farms by 2035. The document outlines various strategies for farm expansion, diversification, and stabilization, considering factors such as land, labor, capital, and technology. It also discusses the potential transition pathways from 2020 to 2035 farm types, highlighting the structural changes required for this transition. The study emphasizes the importance of new technologies, digital transformation, and organic agricultural inputs in shaping the future of farming systems. Additionally, the document includes insights from a workshop held during 2024 and 2025, where experts and stakeholders discussed the future of organic farming in Romania. The findings suggest that all three major farm types identified have the potential to be consistent in 2035, with varying probabilities of transition based on different scenarios and strategies.

Keywords: Organic Farming; Arable Land Crops; Sustainable Agriculture; Agricultural Innovation.

JEL Classification: Q15; Q18; O13.

1. Introduction

Organic agriculture has become a central component of the European Union's transition toward more sustainable and resilient food systems, particularly in the context of the European Green Deal and the Farm to Fork Strategy. The EU target of reaching 25% organic agricultural land by 2030 has generated increasing interest in understanding the structural transformations required at national and regional levels, especially in countries with significant agricultural potential such as Romania. In this context, the Romanian arable farming sector represents a strategic domain due to its extensive land resources, export orientation, and growing but uneven organic farming adoption.

Despite the increasing policy attention dedicated to organic agriculture, limited research has focused on the future typologies of organic farm systems and their transition pathways in Eastern European countries. Existing studies mainly address current production performance, environmental impacts, or policy instruments, while foresight-oriented analyses exploring the evolution of farming systems toward 2035 remain relatively underdeveloped. This gap is particularly relevant for Romania, where structural duality, regional disparities, fragmented supply chains, and varying levels of technological adoption significantly influence the dynamics of organic conversion and farm development.

This paper aims to contribute to this debate by developing a comprehensive typology of current and future organic farm systems for arable land crops in Romania. The study identifies and characterizes three major farm categories based on production, structural, and socio-economic indicators, while also exploring their potential transition pathways toward 2035 under different policy and market-driven scenarios. The analysis integrates empirical farm data, foresight methodologies, expert consultations, workshops, and stakeholder perspectives in order to capture both quantitative and qualitative dimensions of agricultural transformation.

Particular attention is given to the role of digital transformation, innovative technologies, organic agricultural inputs, climate adaptation strategies, and evolving consumer demand in shaping future farming systems. The paper also examines how factors such as subsidies, market conditions, labour productivity, diversification, and value-chain integration may influence the future competitiveness and resilience of Romanian organic farms. By linking national realities with broader European foresight scenarios developed within the OrganicTargets4EU framework, the study provides a localized perspective on the future of organic agriculture in Romania and highlights possible strategic directions for policymakers, researchers, farmers, and innovation ecosystems.

The findings suggest that multiple transition pathways may coexist in the Romanian agricultural sector, depending on farm size, regional specialization, technological capacity, and market integration. While large-scale farms may continue to dominate export-oriented cereal production, medium and intensive organic farms appear more adaptable to diversification, agroecological practices, and value-added activities. The research emphasizes that the future development of Romanian organic farming will depend not only on policy support, but also on the capacity of farmers, institutions, and consumers to embrace innovation, cooperation, and long-term sustainability objectives.

This research is further contextualized within the innovation hub Bio Danubius (IH Bio Danubius), a regional agroecological innovation ecosystem functioning as a living laboratory for sustainable farming transitions in Romania. The hub integrates farmers, researchers, public authorities, and innovation actors to co-design and test pathways for organic and climate-resilient agriculture. By linking empirical farm typologies with dynamic transition assessment frameworks, such as the Horizon Europe Agroecology-TRANSECT initiative, the study moves beyond static descriptions of farming systems and explores how environmental, socio-economic, and technological factors interact to shape future agricultural trajectories.

The innovation hub perspective is particularly relevant in the Romanian context, where structural heterogeneity, fragmented value chains, climate pressures, and uneven technological adoption create multiple pathways for transition. In this regard, the present study combines foresight methodologies with innovation ecosystem thinking to investigate how different categories of farms may evolve under alternative scenarios and how regional hubs can accelerate this transformation.

2. Literature Review

Existing literature on foresight approaches for organic farming remains limited, particularly for Eastern European contexts and for the explicit development of future farm typologies. Most research on organic agriculture has focused on present-day performance, sustainability assessment, or policy evaluation, while fewer studies examine long-term transition pathways, structural change, and alternative system configurations.

Recent work begins to address this gap through Delphi methods, participatory scenario building, and structured foresight, highlighting the role of policy support, market dynamics, climate adaptation, and sustainability transitions in shaping future organic farming systems. In parallel, broader foresight research on food and agricultural systems has proposed typologies of quantitative scenario approaches and explored the distinction between exploratory and normative futures, offering useful conceptual tools for analyzing organic sector trajectories.

The literature reviewed suggests that research on the future of organic farming remains fragmented, but several studies provide useful foundations for developing a foresight-based typology of future farm systems. Moreno-Pérez and Blázquez-Soriano (2023) show that the future of organic farming is shaped by interacting drivers such as policy support, market dynamics, farm viability, and sustainability transitions, and that participatory scenario methods are effective for eliciting these uncertainties. Riera et al. (2025) contribute a broader methodological framework by distinguishing among types of quantitative foresight scenarios, thereby clarifying how exploratory and normative approaches can be used to structure future-oriented analysis. Hairo et al. (2017) further demonstrate that the organic sector is influenced by multiple uncertainties, especially policy and market conditions, reinforcing the need to treat future development as contingent rather than linear.

In addition, Barbieri et al. (2019) show that a large-scale expansion of organic farming would require substantial changes in crop rotations and would therefore alter the organization of farm systems at a structural level. This finding is important because it implies that future organic farms cannot be understood merely as current farms with different inputs, but rather as reconfigured production systems. Finally, OrganicTargets4EU provides an example of how scenario narratives and backcasting can be used to explore alternative pathways toward policy targets for organic farming at the European scale.

Taken together, these studies indicate that while explicit literature on typologies of future organic farms is still limited, related work on scenarios, foresight, and system transitions offers a strong conceptual basis for such an analysis. A logical progression from this literature is to move from identifying drivers of change, to examining alternative future pathways, and finally to classifying distinct types of future organic farm systems according to their structural, institutional, and strategic characteristics.

Recent developments in agroecological research emphasize the need to move beyond static sustainability assessments toward dynamic transition monitoring frameworks. Traditional tools such as the FAO Sustainability Assessment of Food and Agriculture systems (SAFA) provide valuable snapshots of environmental, economic, and social performance, but they are less suited to understanding how farming systems evolve over time.

The Horizon Europe project Agroecology-TRANSECT (Trans-disciplinary approaches for Systemic economic, Ecological and Climate change Transitions) proposes an alternative perspective based on co-innovation and dynamic multi-criteria assessment. Through its STREAM-T tool, developed by the Walloon Agricultural Research Centre and Wageningen University, the project evaluates not only the sustainability status of a farm, but also the speed, viability, and resilience of transition processes.

Unlike traditional auditing frameworks, STREAM-T explicitly analyses trade-offs and synergies between indicators. For example, replacing chemical weed management with mechanical weeding may improve biodiversity but increase fuel consumption, soil compaction, and labour requirements. Consequently, the sustainability of farming systems cannot be evaluated through isolated indicators but rather through interconnected socio-ecological dynamics.

This perspective is particularly relevant for Eastern European countries, where climate change, labor shortages, and fragmented value chains require adaptive and territorially embedded solutions. The integration of dynamic indicators into farm typology analysis therefore provides a more robust framework for exploring future transition pathways toward sustainable agriculture.

3. Methodology

This study adopted a mixed methods design that combined empirical data analysis, foresight methods, and participatory stakeholder consultation to define and validate typologies of existing and future organic farm systems for arable crops in Romania. The methodological strategy was structured in four interconnected phases, moving from the empirical characterization of current farm structures to the exploration and validation of future transition pathways.

Phase 1: Empirical farm categorization

The first phase consisted of constructing an empirical typology of Romanian arable farms using official statistical data. Farms were classified into three main types according to their structural and functional characteristics. The categorization was based on production indicators such as farm size, yield, and livestock integration, together with socio-economic variables including gross sales, labour use, subsidy levels, and asset value. This phase established the baseline typology of current farm systems and provided the structural reference point for subsequent foresight analysis.

Phase 2: European foresight framing

The second phase introduced a foresight perspective at the European level in order to identify plausible transition pathways for organic farming and to situate the Romanian analysis within broader sectoral dynamics. This phase drew on the OrganicTargets4EU scenario framework, which applies trend analysis, driving-force identification, Delphi surveys, and participatory scenario development to explore future pathways for organic farming. The project's scenario narratives show how contrasting policy and market conditions can shape organic sector development through 2030 and beyond, including futures driven by public support, consumer demand, digitalization, and crisis responses.

This European framing served two purposes. First, it identified key drivers and uncertainties relevant to organic farming transitions. Second, it provided a conceptual basis for linking national farm typologies to alternative future development trajectories. In this way, the foresight component made it possible to move beyond a static description of current structures and toward an analysis of possible future configurations.

Phase 3: Romanian adaptation and validation

The third phase adapted the European scenarios to the Romanian context through questionnaires, interviews, and a participatory workshop with stakeholders and experts. The

workshop focused on defining current and future organic farm typologies for arable crops, with particular attention to the 2035 horizon. It combined expert validation of the 2020 typology with group-based discussions on future farm forms and backcasting exercises designed to identify plausible transition pathways from present structures to future systems.

During the workshop, participants first reviewed the 2020 typology, which distinguished three major farm categories: large cereal structures, medium cereal structures, and intensive organic arable farms. They then worked in groups to characterize future farm types in qualitative and, where possible, quantitative terms, including farm size, crop rotation, livestock integration, labor requirements, economic performance, and investment needs. The scenario exercise used two contrasting futures: one centered on green public policy and another driven by consumer demand and market expansion. Participants assessed which farm types would be most likely under each scenario and what structural changes would be required to support them.

Phase 4: Perceived influence of transition factors

The final phase examined the perceived intensity of factors influencing farm evolution and organic conversion. This stage used questionnaires and interviews to capture stakeholder views on the relative importance of policy support, market conditions, conversion incentives, production constraints, and other drivers of farm growth and structural change. The objective was to identify which factors were seen as most influential in shaping a healthy and effective transition process toward organic farming.

The results of this phase informed the refinement of the final typology under both scenario contexts. In particular, they helped determine which farm types were likely to expand, specialize, stabilize, or reorganize under different combinations of policy support and market demand. This stakeholder-based validation strengthened the typology framework and improved its relevance for strategic planning and policy design.

To complement the foresight and participatory components, the study incorporates concepts inspired by the Agroecology-TRANSECT framework and its STREAM-T multi-criteria assessment approach. Particular attention is given to dynamic indicators that capture the interactions between environmental performance, socio-economic resilience, and technological adaptation. Three categories of indicators are considered.

First, environmental and climate indicators include the energy efficiency ratio, carbon dynamics, and functional biodiversity. These indicators evaluate the relationship between production outputs and energy consumption, monitor changes in soil organic carbon, and assess the capacity of farming systems to maintain ecological functions.

Second, socio-economic resilience indicators focus on labour burden and quality, knowledge autonomy, and net farm income stability. These indicators reflect the capacity of farms to cope with labour shortages, adopt innovative practices, and maintain economic viability under changing market and climate conditions.

Third, transversal analysis is used to identify synergies and trade-offs between indicators. For example, increasing the frequency of mechanical weeding may reduce chemical dependency but can simultaneously increase fuel consumption, soil compaction, and vulnerability to drought. Such interactions are represented as interconnected causal chains rather than isolated variables, allowing a more realistic understanding of transition dynamics.

4. Discussion

Based on the data collected, Romanian arable farms were classified into three major typologies: large cereal structures (Type A), medium-sized cereal structures (Type B), and intensive organic arable farms (Type C). This classification served as the basis for defining representative farm

types for both the current period and the projected horizons of 2030 and 2035. The typology integrates production-related indicators (e.g., farm size, land use, and productivity) with socio-economic characteristics (e.g., labour, assets, sales, and subsidies), providing a comprehensive framework for analysing structural dynamics within the sector.

Following the characterization of existing conventional and organic farm types, the study developed a prospective typology of future farms. A time horizon of 2035 was selected to capture potential transformations in farming systems, as it provides sufficient scope for significant structural, technological, and organizational changes to emerge, while remaining close enough to be perceived as realistic and relevant by sector stakeholders. In contrast, the year 2030 was considered too proximate to fully reflect the magnitude of changes associated with the transition towards more sustainable and organic production systems.

The workshop discussions focused on identifying potential transition pathways between the 2020 baseline typology and the projected farm configurations for 2035. Participants broadly agreed that all three farm types have the potential to remain viable and relevant within the future agricultural landscape. The analysis of transition pathways emphasized the structural adjustments required to support this evolution, particularly regarding the endowment, mobilization, and allocation of key production factors, including land, labour, capital, and technology. These factors were considered essential determinants of the capacity of farms to adapt to changing market conditions, policy frameworks, and sustainability requirements.

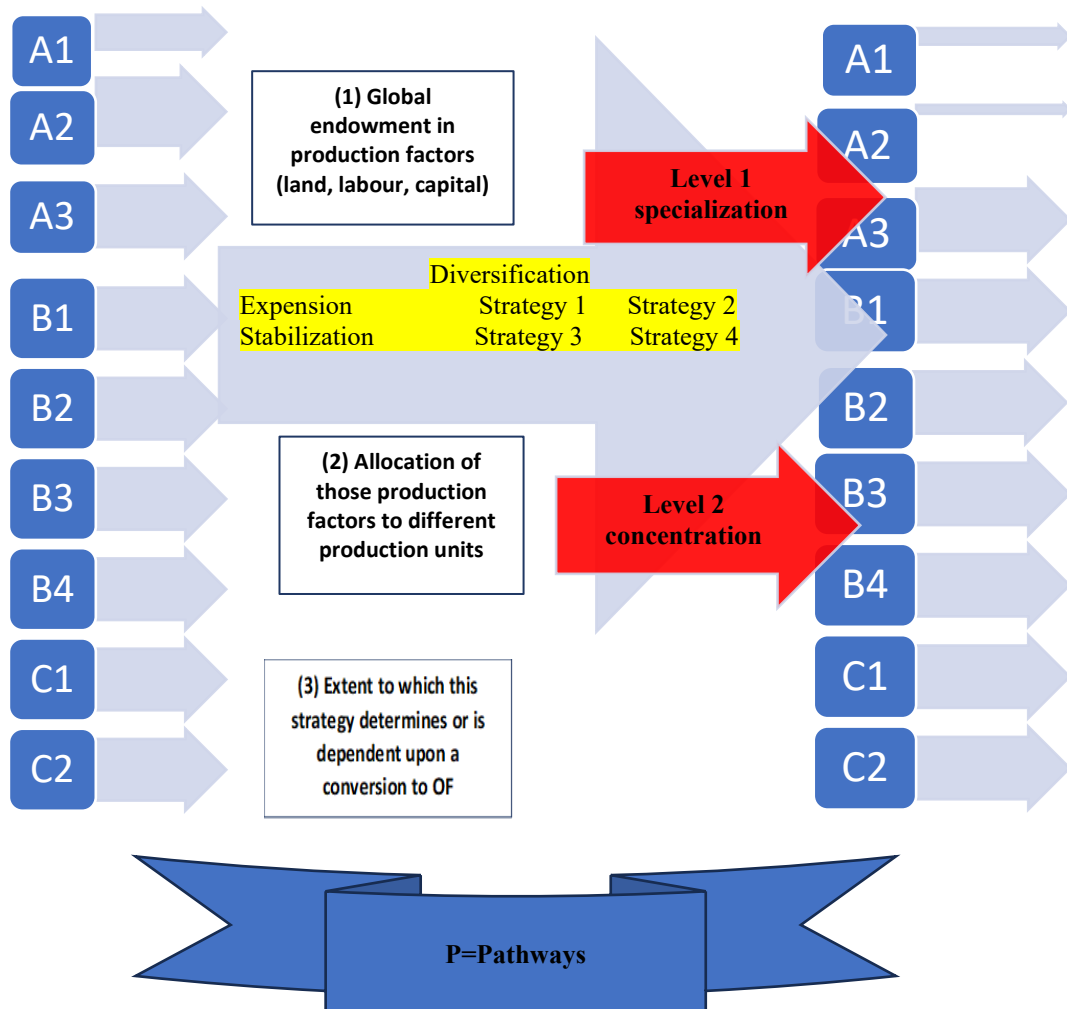


Fig. 1. Framework for Farm Typology Transformation and Strategic Development Pathways

4.1. Strategic Pathways

To explore the potential evolution of farm typologies towards 2035, four strategic development pathways were identified and discussed with stakeholders.

Strategy 1: Expansion through specialization

This pathway is characterized by the expansion of farm operations primarily through increases in land area and labour resources, with limited diversification into higher value-added activities. Farms following this strategy focus on scaling production and strengthening their core agricultural activities, while maintaining a relatively specialized business model. This pathway is considered particularly relevant for large-scale organic structures that benefit from economies of scale and established market positions.

Strategy 2: Expansion through diversification and value chain integration

Under this strategy, farms expand not only in terms of production capacity but also through diversification along the value chain. Growth is driven by investments in capital, technological innovation, processing activities, and the development of higher value-added products and services. This pathway reflects a transition towards more integrated and resilient business models capable of capturing a larger share of value creation within the organic sector.

Strategy 3: Business stabilization at current scale

This pathway assumes the maintenance of the existing farm structure and business size. Farms prioritize operational stability, preserving their current endowment of production factors, including land, labour, and capital, while seeking incremental improvements in efficiency and profitability. The objective is not substantial growth but rather the consolidation of existing market positions and resources.

Strategy 4: Resilience-oriented stabilization and sustainable growth

This strategy combines farm stabilization with selective growth opportunities, emphasizing soil conservation, drought resilience, and climate adaptation. Farms adopting this pathway invest in innovative technologies and sustainable management practices to enhance long-term resilience and productivity. The strategy is particularly relevant for farm types characterized by regional concentration patterns (e.g., C1 and C2), where environmental constraints and climate-related risks play a significant role in shaping future development trajectories.

The most significant transformation pathway identified concerns intensive organic farms (Type C), which may evolve toward an “organic-plus” model. This concept extends beyond compliance with European organic regulations and integrates broader agroecological principles, including multi-species cover crops, living mulches, reduced tillage, biodiversity conservation, and climate adaptation practices.

Because Type C farms are relatively small, their long-term viability depends on territorial cooperation and value-chain integration. In this context, biodistricts emerge as an important organizational model. Biodistricts combine organic production, local food systems, eco-tourism, cultural heritage, and territorial branding, creating synergies that improve economic resilience while preserving ecological integrity.

The organic-plus model therefore represents not only a technical transition but also a socio-economic and territorial transformation, where sustainability is achieved through cooperation, innovation, and place-based development strategies.

Together, these four strategies provide a framework for analysing the alternative pathways through which Romanian organic arable farms may adapt to evolving market conditions, technological advances, environmental challenges, and policy developments by 2035.



Fig. 2. Projected Transformation of Farm Types between 2020 and 2035

4.2. Validation of the 2020 Farm Typology

The baseline farm typology for 2020 was presented and discussed during the stakeholder workshop. The presentation included both qualitative descriptions and quantitative indicators for each farm type, highlighting their structural, production, and socio-economic characteristics. Prior to the workshop, a summary of the typology was distributed to selected stakeholders, including representatives of public authorities, farmer associations and clusters, researchers, and practitioners active in the organic farming sector. The expert consultation process resulted in the validation of the proposed classification and confirmed the relevance of focusing the analysis on three major farm categories: large cereal structures (Type A), medium-sized cereal structures (Type B), and intensive organic arable farms (Type C). Participants agreed that these categories adequately capture the diversity of arable farming systems in Romania and provide a suitable basis for exploring future transition pathways.

During the discussions, experts estimated that approximately 250,000 people are employed across the farm types included in the analysis, underlining the sector's socio-economic importance. Additional updates were incorporated regarding certified organic livestock based on the most recent data provided by the Ministry of Agriculture.

Particular attention was given to the relationship between crop and livestock production within organic farming systems. Experts noted that poultry production exhibits the strongest integration with arable farming due to its dependence on feed crops, followed by cattle and pig production. Furthermore, participants highlighted the limited number of certified organic processors in Romania, estimated at fewer than 50 enterprises nationwide. These processors are distributed across the three farm categories and play a critical role in supporting value-chain development and the expansion of the organic sector.

4.3. Stakeholder Assessment of Transition Pathways and Future Farm Development

Following the validation of the baseline typology, participants engaged in a structured discussion aimed at exploring potential transition pathways for Romanian arable farming systems towards 2035. Drawing on their experience regarding current farming strategies, market opportunities, labour availability, technological developments, and policy trends, stakeholders assessed the likelihood of different evolutionary trajectories for each farm type.

A broad consensus emerged that all three farm categories identified in the baseline typology - large cereal structures (Type A), medium-sized cereal structures (Type B), and intensive organic arable farms (Type C) - are likely to remain relevant in 2035. However, differences were observed regarding their preferred development pathways and adaptation strategies.

Experts considered Type A farms to be particularly well-positioned under the market-driven scenario, characterized by stronger consumer demand and increased integration into organic value chains. For this category, expansion-oriented strategies based on specialization and scale economies were perceived as the most plausible. In contrast, Type B and Type C farms were considered more likely to follow stabilization and resilience-oriented strategies, focusing on technological upgrading, diversification, and improved resource management. While the possibility of maintaining current business size was regarded as realistic for many medium-sized farms, substantial downsizing or stagnation of large farms was considered unlikely.

Participants identified several key structural factors influencing future transitions, including the adoption of digital technologies, innovative organic inputs, precision agriculture tools, and climate-smart farming practices. These elements were consistently viewed as essential for enhancing productivity, improving resilience, and facilitating conversion to organic production systems. Stakeholders estimated that the probability of conversion to organic farming could exceed 60–70%, particularly under favourable market and policy conditions.

Regarding long-term sectoral dynamics, respondents anticipated continued increases in labour productivity and farm specialization, accompanied by a gradual reduction in the number of smaller farms, particularly those below 50 hectares. At the same time, diversification, technological innovation, and the adoption of new production practices were identified as emerging trends likely to gain importance over the coming decade.

Part of characterization of the future farming systems with quantitative data was done based on assumptions on the evolution of the system compared to current farms.

Table 1. Comparative Characteristics of Future Organic Farm Typologies

Characteristics	Farm type A	Farm type B	Farm type C
Qualitative description of farming system	large structures (A) 10000 to 58000 ha 12 farms / average 15000 ha total 180 000 ha Organic/total arable 14% organic	Cereal medium structures (B) 70 to 9999 ha 18000 farms / average 500 ha Sporadic organic/total arable Less than national average 4.4% 20% of organic operators Average size of existing farms in organic 70 – 500 ha	Intensive organic arable (C) 70 to 9999 ha 12378 farms / average 45.6 ha Organic/total arable More than 4.4% national average 45% of organic operators Average size of existing farms in organic 70 – 500 ha
Region the farms are located in	South and South-East low land	South and South-East low land, Moldova, High hill	South-East, Moldova and West
Total farm area	180 000 ha	3417812 ha	4083761 ha
Area usage in percentage, plus estimated yields	+30%	+10%	+20%
Number and type of livestock	+20%	+30%	+20%
Number of workers (AWU)	-10%	-10%	-10%
Gross sales (€/year)	1-3 million Euros	0,2-1 mil Euros	0.2-1 mil Euros

Table 1 (cont.)

Total value assets (€)	2 million Euro	200 000 Euri	200 000 Euros
Subsidies (€/year)	+20%	+20%	+20%
Operating costs (€/year) (e.g. fertilizer, fuel, pesticides, etc.)	+15%	+15%	+15%
Needed investments for the transition (which kind of investments and approximate costs)	Green and digital technologies Organic inputs	Green and digital technologies Organic inputs	Green and digital technologies Organic inputs
Does this farm type evolve out of a current farming system or is it a new type of farm?	Is a current type	Is a current type	Is a current type

4.4. Expert Assessment of Future Farm Typologies and Scenario Application

4.4.1. Presentation and validation of the 2035 farm typologies

Following the development of the prospective farm typologies, participants discussed the assumptions underlying the proposed transition pathways and assessed their plausibility in the context of future market, technological, and policy developments.

Experts considered *Strategy 1 (Expansion through specialization)* to be the most credible pathway for large-scale cereal farms (Type A). These farms are expected to continue expanding their land base and production capacity while maintaining a relatively specialized business model. This trajectory reflects their strong orientation toward export markets, where competitiveness is largely determined by the ability to supply large volumes of standardized bulk cereals. Consequently, diversification into higher value-added activities was considered less likely for this category.

In contrast, *Strategy 2 (Expansion through diversification and value chain integration)* was viewed as particularly suitable for medium-sized cereal farms (Type B) and intensive organic farms (Type C). Participants argued that these farm types possess more flexible and adaptable business models, allowing them to diversify production, integrate processing activities, adopt advanced technologies, and capture greater value within the organic supply chain. Investments in innovation, technology, and product differentiation were identified as key drivers of this pathway.

Strategy 3 (Business stabilization at current scale) was considered a realistic option for a significant proportion of Type B farms. These farms often operate mixed production systems that combine conventional and organic activities, making the preservation of their current scale and resource allocation a viable long-term strategy. Under this pathway, farmers focus on maintaining economic viability and improving operational efficiency rather than pursuing substantial expansion.

Finally, *Strategy 4 (Resilience-oriented stabilization and sustainable growth)* was regarded as the most appropriate pathway for Type C farms. As these farms already operate at relatively high levels of organic intensity, participants expected them to prioritize soil health, climate adaptation, drought resilience, and agroecological practices. Nevertheless, experts acknowledged that favourable market conditions could also encourage some of these farms to pursue expansion strategies. In this context, participants envisaged the emergence of an

“organic-plus” model, combining certified organic production with broader agroecological and climate-change mitigation practices.

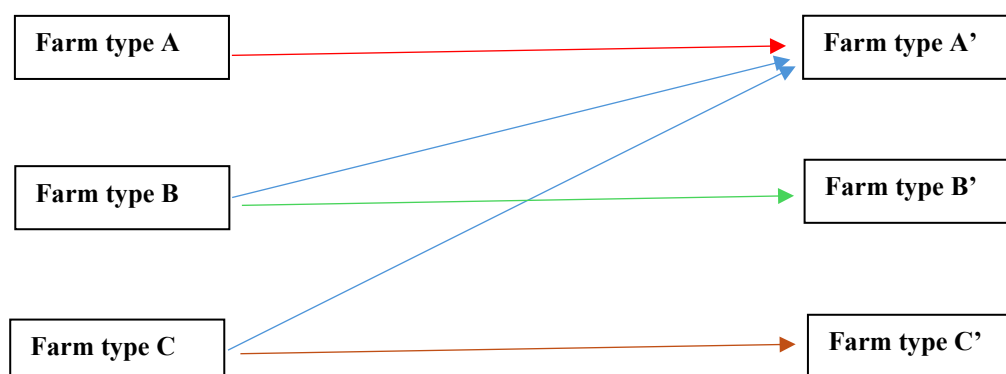


Fig. 3. Transition Pathways from Current to Future (2035) Organic Farm Typologies under Alternative Development Strategies

For Type A farms, the majority of participants considered Scenario 2 to be more likely. Fifteen out of twenty respondents assigned a higher probability to the market-driven scenario (40% Scenario 1 versus 60% Scenario 2), indicating that large cereal farms are expected to benefit primarily from growing consumer demand, stronger value chains, and increased private investment. This finding reflects the export orientation and scale advantages characterizing this farm category.

Table 2. Stakeholder Evaluation of Scenario Likelihood across Farm Categories

Farm Type	Scenario 1 (%)	Scenario 2 (%)	Main Expert Assessment
Type A	40	60	Scenario 2 more likely
Type B	50	50	Both scenarios equally likely
Type C	50	50	Both scenarios equally likely

In contrast, opinions regarding Type B and Type C farms were more balanced. Most participants assigned equal probabilities to both scenarios, suggesting that these farm types could successfully develop under either policy-driven or market-driven conditions. For Type B farms, fifteen respondents considered the two scenarios equally plausible, while sixteen respondents expressed the same view for Type C farms. These results indicate that medium-sized and intensive organic farms possess greater strategic flexibility and are capable of adapting to different institutional and market environments.

Overall, the scenario analysis suggests that future organic farm development in Romania will depend on a combination of public policy support, market demand, technological innovation, and farm-level strategic choices. While large-scale farms appear more responsive to demand-driven growth, medium-sized and intensive organic farms demonstrate greater resilience across alternative development scenarios.

4.5. Expert Perspectives on the Future Development of Organic Farming

The stakeholder discussions highlighted several factors considered critical for the future development of organic farming in Romania. A recurring theme was the importance of strengthening short supply chains and improving direct linkages between producers and consumers. Experts emphasized that local consumption and regional food systems could play an increasingly important role, particularly for medium-sized farms seeking to increase value capture and reduce dependence on intermediaries.

Participants also identified significant opportunities for integrating organic farming into broader rural development initiatives. The concept of biodistricts, combining organic production with cultural heritage, tourism, and local community development, was viewed as a promising strategy for enhancing the economic viability of organic farming while generating additional social and environmental benefits. Such territorial approaches could contribute to stronger regional identities and stimulate demand for local organic products.

Profitability emerged as a key prerequisite for the expansion of organic farming. Experts argued that long-term growth will depend on the ability of organic farms to generate sufficient economic returns while simultaneously delivering environmental and social benefits. In this regard, sustainable development was perceived as requiring a balanced integration of economic performance, environmental stewardship, and social value creation. Several participants suggested that large farms may continue to expand in scale while also pursuing greater diversification in response to evolving market opportunities.

The discussions further highlighted the existence of considerable natural and human potential for organic agriculture in Romania. Nevertheless, participants identified several barriers that continue to limit sector development, including insufficient political commitment, limited consumer awareness, fragmented communication efforts, and weak market promotion. Experts stressed the need for coordinated communication strategies, involving public institutions, producer organizations, media actors, and regional stakeholders, to increase public understanding of the environmental, health, and economic benefits associated with organic products.

Finally, stakeholders considered both future scenarios - policy-driven growth and demand-driven expansion - to be plausible development pathways. Participants argued that each scenario reflects powerful drivers of change and that the future trajectory of the sector will likely depend on the interaction between supportive public policies, consumer preferences, market development, and broader societal attitudes toward sustainability. Consequently, both scenarios were regarded as having comparable potential to shape the future of Romanian organic farming.

5. Conclusions

This study developed a foresight-based typology of current and future organic arable farm systems in Romania, integrating empirical farm data with expert knowledge and stakeholder perspectives. Three major farm categories were identified—large cereal structures (Type A), medium-sized cereal structures (Type B), and intensive organic arable farms (Type C)—and their potential development trajectories were explored through alternative transition pathways and scenario analysis.

The findings indicate that all three farm types are likely to remain relevant by 2035, although they are expected to follow distinct adaptation strategies. Large cereal farms are more likely to pursue expansion through specialization and to benefit from market-driven growth, while medium-sized and intensive organic farms show greater potential for diversification, value-chain integration, and resilience-oriented development. The results also highlight the growing importance of technological innovation, digitalization, climate adaptation measures, and organic inputs in shaping future farm competitiveness.

Stakeholder consultations emphasized that profitability, market development, short supply chains, and consumer awareness are critical determinants of future organic sector growth. Experts also identified biodistricts, territorial branding, and stronger coordination among value-chain actors as promising mechanisms for increasing the economic and social benefits of organic agriculture.

The scenario analysis suggests that both policy-driven and demand-driven futures remain plausible. Consequently, the future development of Romanian organic farming will depend on the interaction between supportive public policies, market opportunities, technological innovation, and the capacity of stakeholders to cooperate in promoting sustainable food systems.

More broadly, the future resilience of Romanian organic agriculture depends not only on policy support and market development but also on the capacity of regional innovation ecosystems to manage dynamic trade-offs among productivity, biodiversity, climate adaptation, and socio-economic viability. This study demonstrates that future farm typologies should not be interpreted as static categories but as evolving socio-ecological systems shaped by technological innovation, institutional support, and stakeholder collaboration. Regional innovation ecosystems, exemplified by IH Bio Danubius, together with dynamic assessment frameworks such as Agroecology-TRANSECT and STREAM-T, provide promising mechanisms for facilitating this transition.

The findings further suggest that multiple development trajectories may coexist by 2035, ranging from large-scale specialized farms to territorially integrated Organic-Plus biodistricts. Ultimately, the success of these trajectories will depend on the ability of farmers, researchers, policymakers, and innovation ecosystems to co-create adaptive and resilient agricultural systems capable of simultaneously delivering economic viability, environmental sustainability, and social resilience.

Future research should focus on developing quantitative simulation models capable of estimating the economic, environmental, and social impacts of the proposed transition pathways under different policy and market conditions.

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