Received: 1 October 2025 | Revised: 26 March 2026 | Accepted: 30 April 2026 | Published online: 12 June 2026

RESEARCH ARTICLE

Green and Low-Carbon Economy
2026, Vol. 00(00) 1–20
DOI: 10.47852/bonviewGLCE62027808

BON VIEW PUBLISHING

Low-Carbon Transition in Irish Agriculture: Organic Sector Growth and Structural Change Under Policy Support

Alfred Afeku[1, 3,*], Cathal O'Donoghue[1, 2] and Kevin Kilcline[3]

[1] *J.E. Cairnes School of Business & Economics, University of Galway, Ireland*

[2] *School of Geography, Archaeology and Irish Studies, University of Galway, Ireland*

[3] *Department of Agricultural Economics and Farm Surveys, Teagasc – The Agriculture and Food Development Authority, Ireland*

Abstract: Low-carbon transition in European agriculture requires evidence on how sectoral structures adjust under policy support. In Ireland, fiscal investment through the Organic Farming Scheme has increased over the period 2020–2023 as part of national and EU commitments to sustainable production. The study provides a descriptive economic analysis of growth and structural change in the organic farming sector over this period, with particular attention to the organic beef subsector. The analysis uses data from the Central Statistics Office Census of Agriculture 2020 and the Farm Structure Survey 2023. Growth is measured through volume-based rates of change in conformity with Eurostat farm structure reporting. The results show growth in the number of organic farms by +147%, while certified organic land area expanded by +144%. Growth occurred primarily in beef systems in absolute terms and in sheep systems in relative terms, with smaller increases in dairy, tillage, and mixed farms. Expansion was concentrated among small and medium-sized holdings and in the Northern and Western regions. At the same time, average standard output on organic farms declined by 24% and median output by 16%, reflecting the entry of smaller and more extensive farms with lower economic scale. The study documents the structural adjustment in Ireland's organic beef sector during a period of expanded support, without inferring causation. The findings provide new evidence on how policy-supported expansion is associated with sectoral structural change and transition toward lower-carbon production systems in a region with historically low levels of organic adoption.

Keywords: low-carbon transition, organic agriculture, structural change, policy support, Ireland

1. Introduction

The low-carbon transition in European agriculture is a central component of EU policy aimed at decarbonizing the agrifood sector. Achieving this transition requires structural changes in farm production systems, farm organization, and land use toward more sustainable, lower-input, and less carbon-intensive production systems [1]. At the EU level, the European Green Deal and Climate Law establish a binding target of at least a 55% reduction in greenhouse gas emissions by 2030 and climate neutrality by 2050 [2]. Within this policy framework, organic farming is promoted as a key instrument to support the transition.

Under the EU Common Agriculture Policy (CAP), Member States allocate fiscal support to incentivize conversion to organic production systems [3]. These supports are designed to facilitate structural adjustment in agricultural production toward lower-input systems. However, adoption rates differ substantially across Member States due to variation in production structures, market dynamics, and policy design [4, 5]. This heterogeneity highlights the need for country-specific evidence on how organic expansion translates into sectoral structural change. The analysis focuses in particular on the organic beef sector over the period 2020–2023.

Against this background, this paper provides a descriptive sector-level analysis of organic farming development in Ireland, a Member State that has recently experienced one of the highest relative increases in organic area in the EU. Using official statistics, the study examines policy support, sectoral growth, farm structural change, and economic size. Growth in organic participation and certified land is interpreted as observable sectoral adjustment under a policy-supported low-carbon transition, without direct measurement of emissions outcomes.

In Ireland, organic farming supports are co-financed by the EU and national fiscal supports under the CAP and are aligned with the broader EU sustainability objectives.

*Corresponding author: Alfred Afeku, J.E. Cairnes School of Business & Economics, University of Galway, Ireland and Department of Agricultural Economics and Farm Surveys, Teagasc – The Agriculture and Food Development Authority, Ireland. Email: a.afeku1@universityofgalway.ie

The economic rationale for these supports includes the internalization of environmental externalities [6, 7], the reduction of information asymmetries in product quality and safety not directly observable to consumers [8–10], and support for rural development and diversification [11, 12]. Across the EU, organic farming is implemented as a voluntary agri-environmental and climate measure within CAP Strategic Plans supported through conversion payments and annual premia. European Commission data indicate that over €12 billion was allocated to organic supports between 2014 and 2022, supporting substantial growth in certified organic area, albeit with uptake rates differing across Member States [13, 14].

Ireland's agricultural production is predominantly pasture-based, with ruminant production systems playing a central role in land use and output [15]. The Organic Farming Scheme (OFS) is the primary policy instrument publicly supporting organic conversion operating through per-hectare annual payments and upfront conversion support payments [16]. Given the importance of beef cattle production in Irish agriculture and its contribution to national GHG emissions, the Irish organic beef sector provides a particularly relevant case for examining sectoral adjustment under low-carbon transition policies.

The literature on organic farming has primarily focused on farm-level adoption behavior, technical performance, and the evaluation of agri-environment measures. A review by Möhring et al. [5] shows that conversion decisions are shaped by financial incentives, institutional conditions, and peer effects, while comparative studies highlight trade-offs between yields and environmental outcomes [17–19]. Evaluations of agri-environmental schemes show heterogeneous impacts across farm types and regions [20–22]. Said et al. [23] reviewed climate and carbon policy for food systems and discussed carbon pricing and related instruments in terms of supply-chain costs, food prices, and affordability. Using spatial econometric methods, Marasteanu and Jaenicke [24] show that rural regions with organic farming activity report higher household incomes and lower poverty rates relative to comparable non-organic areas. Studies by Pépin et al. [25] show that structural attributes such as farm size are linked to adoption patterns and sectoral routes. This body of work treats organic farming as a policy-supported production system within the agricultural low-carbon transition.

Beyond farm-level adoption and outcome studies, more recent studies have focused on cross-country evidence on differences in the pace and scale of organic area expansion in the EU. Rees et al. [26] used country-level panel analysis and showed that national organic action plans are associated with heterogeneous changes in organic farmland area, with impacts varying across countries and policy regimes. The findings indicate that policy instruments do not translate into uniform area growth. Comparative diffusion dynamics likewise show variation across European systems. Verburg et al. [27] show that organic dairy adoption pathways differ across the Netherlands, Denmark, and Austria, reflecting differences in sectoral structure and market organization. Eurostat-based cross-EU analyses further characterize persistent dispersion in organic land shares across Member States in the early 2020s, with some countries exceeding 20% of utilized agricultural area under organic management while others remain well below the EU average [28, 29]. This evidence implies that recent organic expansion in Ireland, where participation has historically been low, reflects a different stage of sectoral adjustment than in high adoption systems such as Austria and Denmark. The literature shows that the pace and scale of adjustment in low-carbon organic production differ across national agricultural systems.

While there is a growing body of literature, evidence remains limited at the sector level, particularly in countries with historically low levels of organic adoption undergoing rapid expansion. In Ireland, existing research has largely focused on behavioral and farm-level analyses, emphasizing the roles of farm structure, advisory services, and information networks in shaping organic conversion [4, 30]. Related work has examined broader socio-institutional dimensions, including just transition perspectives in Irish beef farming [31] and farmer attitudes toward emissions mitigation and technology adoption [32]. However, this body of evidence remains largely confined to farm-level or regional analysis. Sector-level analyses of structural change and organic adoption are scarce particularly in regions where organic adoption has been historically low. For Ireland, despite recent descriptive publications from the Central Statistics Office (CSO), peer-reviewed economic analysis of sector-level growth, structural composition, and economic size remains limited. In particular, there is little evidence on how recent expansion in organic participation and certified land has been distributed across farm sizes, regions, and production structures within the beef sector during the agricultural low-carbon transition.

This paper addresses this gap by providing a descriptive sector-level analysis of growth and structural transformation in Ireland's organic beef sector between 2020 and 2023. Using data from the Census of Agriculture 2020 and Farm Structure Survey 2023, the study quantifies growth in organic participation and certified land using volume-change indicators. Structural compositional change is examined across farm typologies, regions, land size classes, and standard output (SO) size classes. The analysis focuses on documenting the pace, scale, and distribution of growth under policy expansion.

The study aims to (i) quantify changes in participation and certified land in Ireland's organic beef sector between 2020 and 2023; (ii) describe changes in farm structure by farm size, typology, and region; and (iii) examine sectoral economic change using the mean and median SO per farm. Growth is summarized through volume-change rate analysis consistent with Eurostat practice. SO is used as a harmonized indicator of economic size, a proxy for farm-gate economic activity. The analysis is descriptive and does not attempt causal identification. The remainder of the paper is structured as follows: Section 2 sets out policy context and related literature; Section 3 describes data and methods; Section 4 presents results on growth, structure, and SO; Section 5 discusses implications; and Section 6 concludes.

2. Policy Context: The Organic Farming Scheme

The OFS is Ireland's principal policy instrument for supporting organic agriculture. The scheme was first established in 2007 under the Rural Development Programme [33], replacing previous organic measures embedded within the Rural Environment Protection Scheme [34]. This marked the establishment of the first dedicated framework for organic conversion and maintenance in Ireland. The scheme has since been renewed in successive CAP programs and is co-financed by the European Agricultural Fund for Rural Development and the Irish exchequer. Earlier iterations of the OFS were relatively limited in scale, with lower payment levels and correspondingly low participation rates [35].

The OFS was significantly expanded and restructured under the Organic Sector Strategy 2019–2025 and the Common Agricultural Policy Strategic Plan 2023–2027 [16, 36]. Payment rates were increased and differentiated by enterprise type. Since 2022, beef and sheep systems have been eligible for annual payment rates of €300/ha during the first two years of conversion and

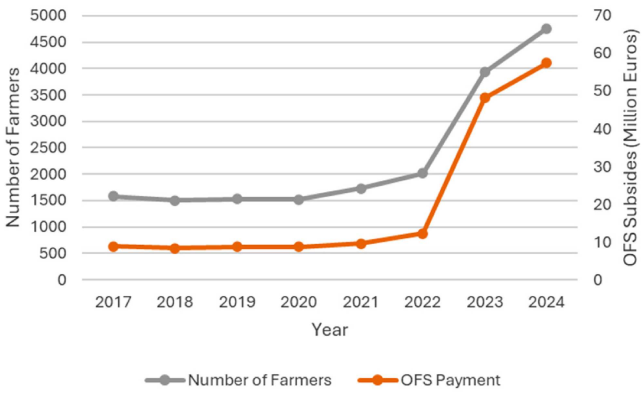
€250/ha thereafter as part of a 5-year scheme. In comparison, rates are applied to other farming systems: dairy, €350/€300; tillage, €320/€270; and horticulture, €800/€600 [37]. In addition, participation payment of €2,000 in the first year and €1,400 annually thereafter was introduced in 2022 to further incentivize entry.

These enhanced incentives are aligned with national and EU-level targets for organic expansion. Ireland's CAP Strategic Plan sets a target of 7.5% of national utilizable agricultural area (UAA) under organic management by 2027, with a further ambition of reaching 10% by 2030 as outlined in Ireland's Climate Action Plan and the National Organic Strategy 2024–2030 [38]. At the EU level, the Farm to Fork Strategy sets a target of 25% of UAA under organic management by 2030 [39].

The design of the OFS, particularly its reliance on per-hectare payments, creates differential incentives across farming systems, favoring more extensive, land-based enterprises. This is particularly relevant in the Irish context, where pasture-based livestock systems dominate the agricultural sector.

Against this context, the period 2020–2023 witnessed an unprecedented expansion of organic farming in Ireland. The evolution of OFS payments and participation is presented in Figure 1 below, providing the institutional context for the descriptive analysis that follows.

Figure 1
Evolution of OFS payments and farmer participation from 2017 to 2024



3. Theoretical Framework

The study conceptualizes the organic farming sector as a system influenced by policy and structural drivers [40]. The framework is organized along three analytical dimensions: time, space, and population [41]. This builds on structural transformation theory, which emphasizes how agriculture evolves through resource reallocation across activities, regions, and farm units over time [42, 43]. Situating organic beef farming within this framework, the analysis of Figure 2 shows how sectoral change is shaped by incentives, structural conditions, and the composition of the farm population.

Policy and institutional drivers define the external environment in which farms operate [44, 45]. The OFS, relative opportunity costs of conversion, market and regulatory conditions, and advisory networks constitute the principal mechanisms influencing adoption [4, 46, 47]. In the Irish case, the OFS support payments favor extensive ruminant systems, where gross margins per hectare are relatively low, and thus, the opportunity cost of conversion is lower. This reflects the economic logic of agri-environmental schemes, in which farm-level responses are mediated by relative returns, transaction costs, and structural constraints [47].

The framework is organized along three analytical dimensions. The time captures temporal dynamics, which include changes in farm numbers, land use, and sectoral scale over the period 2020–2023. The space dimension captures spatial heterogeneity measured through regional distribution and land allocation. The farm population dimension treats farms as statistical units, serving as a proxy for farmers, and captures variation in farm typology, economic size, and livestock composition. In the end, the dimensions reflect variation in the propensity to adopt organic practices.

Drawing on adoption theory, conversion decisions here are mediated by farm-level attributes, institutional and social factors [48, 49]. Public support interacts with these characteristics, influencing the pace and distribution of adoption. While this study does not estimate adoption probabilities directly, observed changes in the farm population are interpreted as a sectoral proxy for aggregated adoption and structural adjustment.

The outcomes considered are volume growth, structural transformation, and economic performance measured through changes in farm numbers, land use, and SO. These are treated as descriptive sectoral indicators rather than causal measures.

Given flat per-hectare payments and heterogeneity in land productivity and opportunity costs, expansion would be expected to occur disproportionately among extensive production systems and in regions with lower conversion costs. This suggests that policy-supported growth will be associated with compositional changes in farm size, typology, and economic scale, providing a basis for interpreting the empirical results.

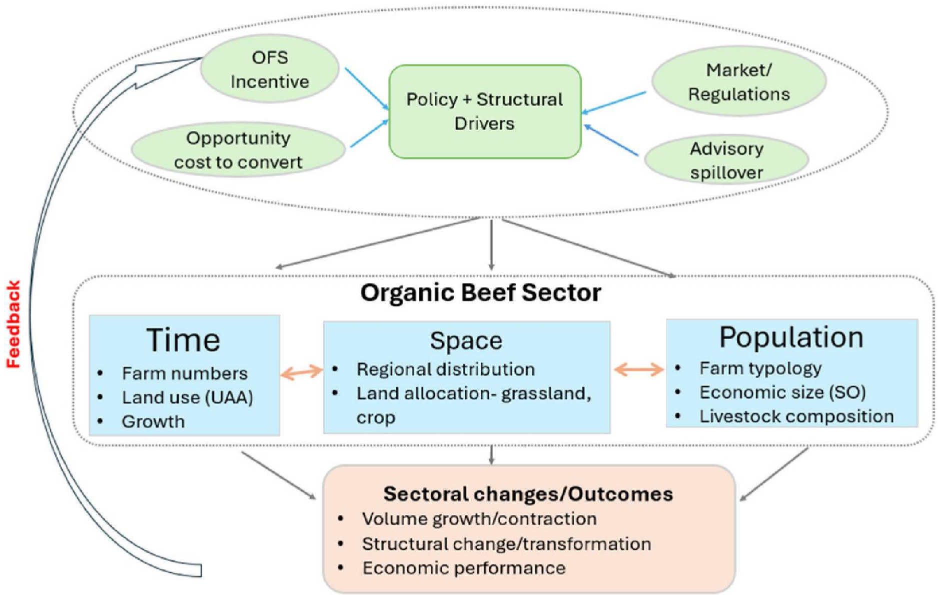
4. Methodology

4.1. Study design and data

The paper measures sectoral growth and structural change in Irish organic agriculture between 2020 and 2023 using a descriptive accounting approach consistent with national accounting practice. Structural change is examined through changes in sectoral scale and internal composition, measured by farm numbers, farm size, and allocation of land and livestock across production systems. The analysis relies on official farm structure statistics to trace changes in sectoral aggregates and distributions over time, without recourse to behavioral modeling or causal identification [41]. Accordingly, the results are interpreted as descriptive evidence of structural adjustment rather than causal effects of policy interventions. The empirical comparison was between the 2020 Census of Agriculture benchmark and the 2023 intercensal Farm Structure Survey, which provides updated estimates.

The analysis is grounded in official national statistical datasets of the CSO. The principal dataset is the Farm Structure Survey, which provides harmonized information on farm numbers, land use, SO, and livestock composition. Baseline data for 2020 were drawn from the Census of Agriculture [50]. Supplementary information on farm incomes and system-level characteristics was drawn from the Teagasc National Farm Survey and was used solely for contextual interpretation. Policy-related data on subsidies were drawn from administrative reports of the Department of Agriculture, Food and the Marine.

Figure 2
Conceptual framework for the analysis of sectoral growth and structural transformation in Ireland's organic beef sector



The principal datasets comprised nationally representative data from the Census of Agriculture 2020 [50] and the intercensal Farm Structure Survey 2023 [51], produced by the CSO. The Census provides the base-year benchmark, while the Farm Structure Survey provides official intercensal population estimates for the same structural variables in 2023, based on a stratified survey expanded using sampling weights.

Both datasets form part of a single farm structure statistical system and apply consistent definitions of the agricultural holding, land use categories, livestock classifications, SO, and farm typology. This ensures consistency and comparability across the two reference years. Sectoral growth and structural change are assessed by comparing published aggregates and category-specific breakdowns between the two periods.

The analysis is conducted at an aggregate level. Individual holdings are not linked across datasets, and no longitudinal panel is constructed. The datasets are not merged at the farm level; analysis relies exclusively on published CSO aggregates. The 2023 estimates incorporate the survey weighting and expansion procedures applied by the CSO, and the analysis is based on these published point estimates.

Sampling uncertainty and confidence intervals were not reported in the source tables and are therefore not estimated in this paper. No additional weights, post-stratification adjustments, or size class corrections are introduced in the data processing.

Organic holdings are identified based on certification status in CSO outputs. Farm typology and economic size are assigned using the EU SO framework, which values crop areas and livestock numbers using standard coefficients to determine both total SO and dominant production systems. Accordingly, in this study, the organic beef sector is defined as those certified organic holdings classified under the CSO farm typology.

4.2. Analysis

Sectoral growth and structural change between 2020 and 2023 are measured using percentage volume changes applied to key structural indicators. Consistent with Eurostat farm structure reporting, four core indicators are reported: (i) farm numbers; (ii) utilized agricultural area (UAA); (iii) SO; and (iv) livestock composition.

Growth is measured as the percentage change in sectoral aggregates between 2020 and 2023. The volume-change metric [52] is defined as:

$$Volume\ Change\ (\%) = \left(\frac{Q_t}{Q_0} - 1\right) \times 100 \tag{1}$$

Where:

Q_t represents the quantity in 2023 and Q_1 represents the quantity in the base year, 2020. This measure expresses growth relative to the base year and captures changes in the scale of sectoral aggregates over the intercensal period.

The growth measure is applied to the published totals for farm numbers by farm typology, region, physical land size class, and SO size class; land use measured in terms of farm numbers and hectares by category and region; and livestock structure measured in terms of farm numbers and livestock numbers by species and region. Differences in growth rates across categories capture changes in overall sectoral scale and shifts in the internal composition of farms, land use, and livestock within the organic sector.

SO is used as a proxy indicator of farm-gate economic activity, consistent with Eurostat methodology. However, it does not measure income, margins, or profitability and is interpreted accordingly.

The analysis is descriptive and does not attempt to estimate causal effects. While the study period coincides with the expansion of the OFS, the approach does not incorporate counterfactual analysis or behavioral modeling.

5. Results

This section presents a descriptive analysis of Ireland's organic farming sector, focusing on structural changes observed between 2020 and 2023. Results are reported using volume rates of change to capture patterns of sectoral growth over the period.

The analysis follows the structure of the empirical tables and is organized thematically by farm numbers, land use, economic size, specialization, livestock, and regional distribution.

5.1. Structural change

5.1.1. Sector scale: farm numbers and land area

Table 1 and Figure 3 present key indicators of sectoral growth between 2020 and 2023, showing a rapid expansion in farm numbers and land area under organic systems. Over this period, the number of certified organic farms increased from 1686 to 4168 holdings, an absolute gain of 2482 farms (+147%). Organic land area (UAA) grew in parallel, rising from 73,799 to 179,992 hectares (+106,193 ha, +144%). These shifts indicate expansion along the extensive margin driven by increases in both farm participation and land conversion. This pattern is consistent with the expansion of the OFS, which provided enhanced incentives for entry during this period.

5.1.2. Economic size: standard output per farm

While farm numbers and land area expanded, the average economic size of organic holdings declined over the same period. As shown in Table 1 and Figure 3, the mean SO declined from €34,414 to €26,294, a reduction of €8,120 (−24%), while the median SO also fell from €21,246 to €17,853 (−16%). These reductions reflect a composition effect, whereby expansion was concentrated among smaller holdings, lowering average economic size despite overall sectoral growth. This pattern suggests that new entrants to the scheme were, on average, smaller and less commercially oriented than existing participants [53]. The decline in SO also reflects transitional effects, as farms in conversion may not yet market produce under organic certification and, as such, do not avail of potential organic price premiums.

5.2. Farm typology and livestock systems

Farm specialization describes the dominant activity on the farm according to farm income, whereby an agricultural holding is specialized when a particular activity provides at least two-thirds of the SO of an agricultural holding [54]. Expansion in farm numbers was evident across all farm typologies, although growth varied in both absolute and relative terms (Table 2 and Figure 4).

Specialist beef farms recorded the largest absolute increase, rising from 1008 to 2297 holdings (+1289 farms, +128%), showing that beef remained the dominant organic subsector. In contrast, specialist sheep farms experienced the most rapid relative growth, increasing from 233 to 1105 holdings (+ 872 farms, + 374%). Mixed grazing systems also expanded rapidly, doubling from 148 to 300 farms (+152 farms, +103%).

Crop-based systems grew from a smaller base. Specialist tillage farms increased from 66 to 110 holdings (+44, +67%), while mixed field crops systems rose from 40 to 100 (+60, +150%). Specialist dairying increased modestly from 41 to 66 farms (+25, +61%). Mixed crops and livestock grew from 79 to 102 farms (+23, +29%), while other farm types showed limited growth, from 71 to 88 farms (+17, +24%).

Overall, organic farms grew by 2482 holdings (+147%). While beef farming remains dominant in absolute terms, sheep enterprises experienced rapid growth in farm numbers. Growth was therefore concentrated in extensive ruminant systems, reflecting

Table 1
Principal organic totals of organic sector growth 2020–2023

Principal organic totals	2020	2023	Change 2020–2023 (decimal)
Total organic farms	1,686	4,168	1.47
Total UAA (ha)	73,798.8	179,992.4	1.44
Mean standard output	€34,414	€26,294	–0.24
Median standard output	€19,552	€16,444	–0.16

Figure 3
Sectoral change in Irish organic agriculture, 2020−2023

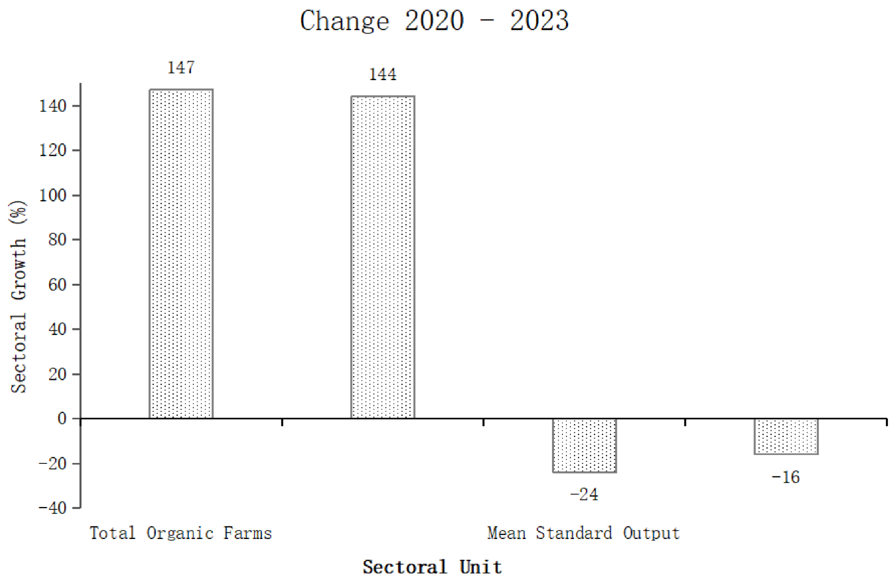
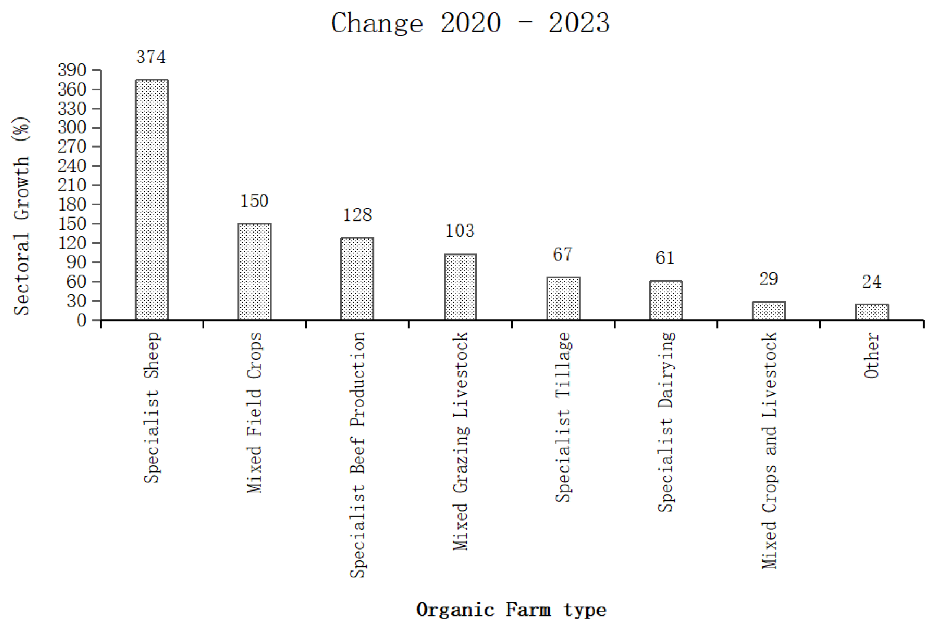


Table 2
Organic farms by farm type, change 2020–2023

Farm type	Number of organic farms 2020	Number of organic farms 2023	Number of all farms	Change 2020–2023 (decimal)
Specialist tillage	66	110	4,903	0.67
Specialist dairying	41	66	15,219	0.61
Specialist beef production	1,008	2,297	74,666	1.28
Specialist sheep	233	1105	17495	3.74
Mixed grazing livestock	148	300	7,429	1.03
Mixed crops and livestock	79	102	1,832	0.29
Mixed field crops	40	100	9,758	1.50
Other	71	88	1,872	0.24
All organics	1,686	4,168	133,174	1.47

Figure 4
Distribution of organic farms growth by farm type, 2020 and 2023



Ireland's production structure and the design of the OFS, which provides per-hectare payments that favor lower-intensity grazing enterprises. Poultry and tillage systems remained comparatively marginal.

5.3. Structural distribution: Farm class size

Table 3 and Figure 5 show that growth occurred across all farm size classes, though the balance between absolute and relative change varied. The largest absolute increase was observed among farms of 30–50 hectares, which grew from 575 to 1183 holdings (+608 farms, +106%). In contrast, the most rapid relative growth was observed among the smallest holdings. Farms under 10 ha expanded from 86 to 311 holdings (+225 farms, +262%), while farms in the 10–20 ha category rose from 197 to 668 (+471 farms, +239%).

Medium-sized holdings (20–30 ha) grew from 282 to 686 farms (+404, +143%), while larger farms between 50 and 100 ha rose from 453 to 1014 (+561, +124%). The number of farms over 100 ha rose substantially, from 93 to 306 (+213, +229%).

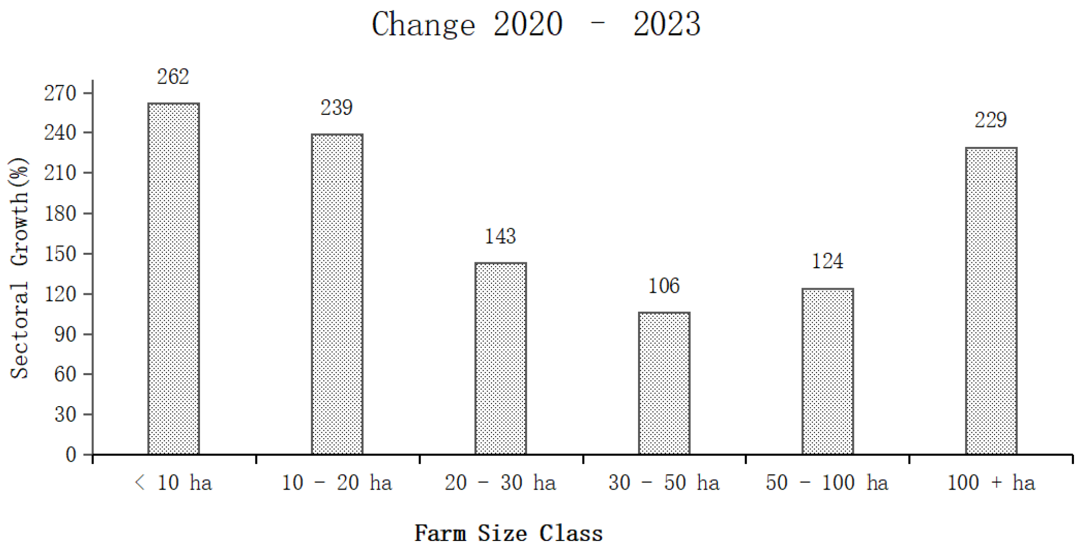
Overall, the distribution of growth shows a dual pattern where smaller farms experienced the rapid relative expansion, while medium-sized farms accounted for the largest absolute increase. This indicates increased participation across the farm size distribution. However, the expansion of larger holdings should be interpreted with caution, as a significant proportion of these farms are likely to reflect extensive upland and hill sheep systems, characterized by large land areas but relatively low production intensity.

These results suggest that organic expansion has been driven mostly by extensive production systems across both small and large farm sizes, rather than by intensification or scaling within more commercially intensive enterprises. While smallholder participation may contribute to environmental and social outcomes, including biodiversity and rural livelihoods [55, 56], the growth of larger-area holdings in this context likely reflects lower opportunity costs of conversion in marginal land systems. This is consistent with the design of the OFS, where per-hectare payments favor participation by extensive grazing systems.

Table 3
Number of organic farms by farm size, change 2020–2023

Farm size	Number of organic farms 2020	Number of organic farms 2023	Number of all farms	Change 2020–2023 (decimal)
<10 ha	86	311	34,410	2.62
10–20 ha	197	668	28,994	2.39
20–30 ha	282	686	20,024	1.43
30–50 ha	575	1,183	23,480	1.06
50–100 ha	453	1,014	18,845	1.24
100 + ha	93	306	7,421	2.29
Total	1,686	4,168	133,174	1.47

Figure 5
Distribution of organic farms growth by farm size class, 2020 and 2023



5.4. Economic size distribution

SO is used to classify agricultural holdings by type of farming and economic size [41]. The distribution of farms by SO class shifted markedly between 2020 and 2023 (Table 4), with the highest relative growth occurring among the smallest economic categories. Farms with SO below €4,000 grew from 102 to 397 holdings (n = +295, +289%), and those in the €4,000–€8,000 class expanded from 155 to 548 (+393, +254%). The €8,000–€15,000 category also expanded from 369 to 988 (+619, +168%).

Growth was also evident in mid-sized categories of holdings. Farms in the €15,000–€25,000 range increased from 423 to 896 (+473, +112%), while those in the €25,000–€50,000 class grew from 396 to 898 (+502, +127%). Farms in the €50,000–€100,000 category more than doubled, with numbers rising from 157 to 319 (+162, +103%), although this expansion was modest in absolute values relative to smaller classes.

In contrast, the number of farms with SO of over €100,000 only grew from 84 to 122 holdings (+38, +45%), well below the sector average. This indicates that expansion was disproportionately concentrated among lower output holdings, contributing to the decline in mean and median SO observed earlier (Table 1).

This pattern is consistent with a compositional shift toward more extensive production systems, where lower output per farm reflects lower production intensity rather than necessarily lower efficiency. In the Irish context, this is likely associated with the expansion of grass-based livestock systems, including upland and hill farming, where large land areas are combined with relatively low output per hectare. The result thus highlights the potential importance of market integration in supporting the economic performance of the sector and may warrant consideration of how policy instruments interact with production incentives and value chain outcomes.

5.5. Land use and crop area expansion

Organic land use diversified and expanded between 2020 and 2023, as shown in Table 5 and Figure 6 below. The results show land use changes were largely driven by grassland expansion over this period. Permanent grasslands expanded from 56,733 to 167,835 hectares (+111,102 ha, +196%), while the number of farms increased from 1,459 to 3,349 (+1,890 farms, +130%). This accounted for the bulk of the increase in organic land. Cereal area also expanded meaningfully in area, from 2,616 to 5,137 hectares (+96%), although the number of farms increased only modestly from 209 to 273 (+64, +31%). Legumes including peas and beans rose from 247 to 761 hectares (+209%). Industrial crops, however, expanded from 55 to 148 hectares (+169%) as small number of farms (17 farms, +55%).

In contrast, temporary grasslands contracted sharply, falling from 13,823 to 3,940 hectares (−71%) and from 612 to 502 farms (−18%). Root crops also declined, with farm numbers dropping

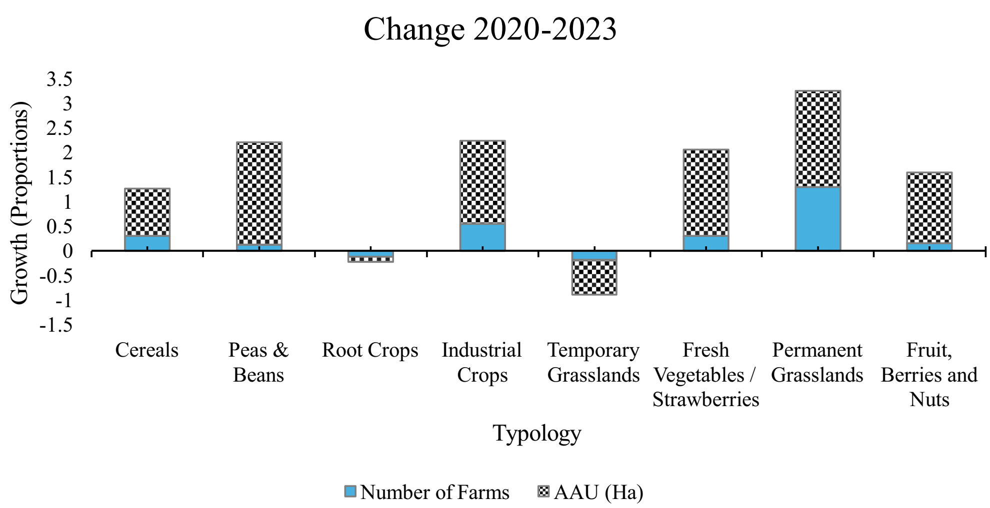
Table 4
Organic farms by economic size, change 2020–2023

Standard output	Number of organic farms 2020	Number of organic farms 2023	Number of all farms	Number of organic farms, change 2020–2023 (decimal)
Less than €4,000	102	397	25,264	2.89
€4,000–€8,000	155	548	17,914	2.54
€8,000–€15,000	369	988	22,406	1.68
€15,000–€25,000	423	896	18,855	1.12
€25,000–€50,000	396	898	19,406	1.27
€50,000–€100,000	157	319	10,570	1.03
€100,000 +	84	122	18,759	0.45
All Organics	1,686	4,168	13,3174	1.47

Table 5
Crop type and area under selected organic crops, change 2020–2023

	Number of farms	AAU (ha)	Number of farms	AAU (ha)3	Number of farms	AAU (ha)5
Organic farms	2020	2020	2023	2023	Change 2020–2023 (decimal)	Change 2020–2023 (decimal)
Cereals	209	2,615.78	273	5,136.7	0.31	0.96
Peas and beans	25	246.56	28	761.3	0.12	2.09
Root crops	68	161.67	60	145	–0.12	–0.10
Industrial crops	11	54.98	17	147.8	0.55	1.69
Temporary grasslands	612	13,823.12	502	3,940.3	–0.18	–0.71
Fresh vegetables/ strawberries	29	124.87	38	343	0.31	1.75
Permanent grasslands	1,459	56,732.6	3,349	167,834.8	1.30	1.96
Fruit, berries, and nuts	91	39.24	106	95.9	0.16	1.44

Figure 6
Distribution land use showing organic farm growth and UAA growth by land use typology, 2020 and 2023



from 68 to 60 (−12%) and area from 162 to 145 hectares (−10%). Horticulture remained small but expanded, with vegetables and strawberries increasing from 125 to 343 hectares (+175%) and from 29 to 38 farms (+31%), respectively. Fruit, berries, and nuts more than doubled in area (from 39 to 96 ha, +144%) across 106 farms (+16%).

Overall, the results show that organic expansion was largely grassland-driven, consistent with the dominance of ruminant systems. While cereals and legumes expanded, they continue to represent only a small share of the overall organic area. Horticulture and fruit crops also remain niche, despite recording relative growth. Scope for further diversification of organic production, particularly in relation to domestic supply development, import substitution, and the strengthening of local market integration.

5.6. Livestock dynamics and intensification

Livestock expansion was concentrated in beef cattle and sheep systems, although structural patterns diverged between the two (Table 6). Organic suckler beef farms more than doubled from 1,157 to 2,773 (+140%), while total cattle numbers rose from 51,685 to 103,684 (+101%). Average herd size declined (from 45 to 37 animals per farm), suggesting that growth was driven primarily by the entry of smaller holdings.

Sheep systems in contrast displayed a high growth in both farm and sheep numbers. Farm numbers grew from 378 to 1,728 (+357%), while the national organic flock size rose from 74,870 to 495,743 head (+562%). Average flock size therefore also increased from 198 to 287 sheep per farm.

The number of other livestock systems grew but remained small in number. Poultry farms expanded from 101 to 340 (+237%), and bird numbers tripled from 161,471 to 506,493 (+214%). Structural differences remain evident in poultry systems; broiler farms increased in number but with smaller flock sizes, while laying hen systems maintained relatively larger flocks, although average sizes declined.

The patterns in the result confirm that organic expansion was ruminant led, with beef and sheep as the dominant systems. The contrasting dynamics between cattle and sheep further suggest that expansion occurred through both the entry of smaller producers and scaling within extensive grazing systems.

5.7. Regional growth variation-livestock systems

Figure 7 shows spatial variation in the number of farms and livestock numbers across three organic livestock sectors from 2020 to 2023, disaggregated by region. Ireland is subdivided into three NUTS2 and eight NUTS3 regional units for the purposes of EU statistical reporting. The Northern and Western regions experienced the largest share of expansion. In this region, sheep farms grew more than sixfold (from 146 to 963) while flock size increased eightfold (from 28,013 to 252,364). Cattle farms grew from 468 to 1,251 (+167%) although herd size grew more modestly (+19%). Poultry also expanded significantly, with farms doubling and bird numbers tripling.

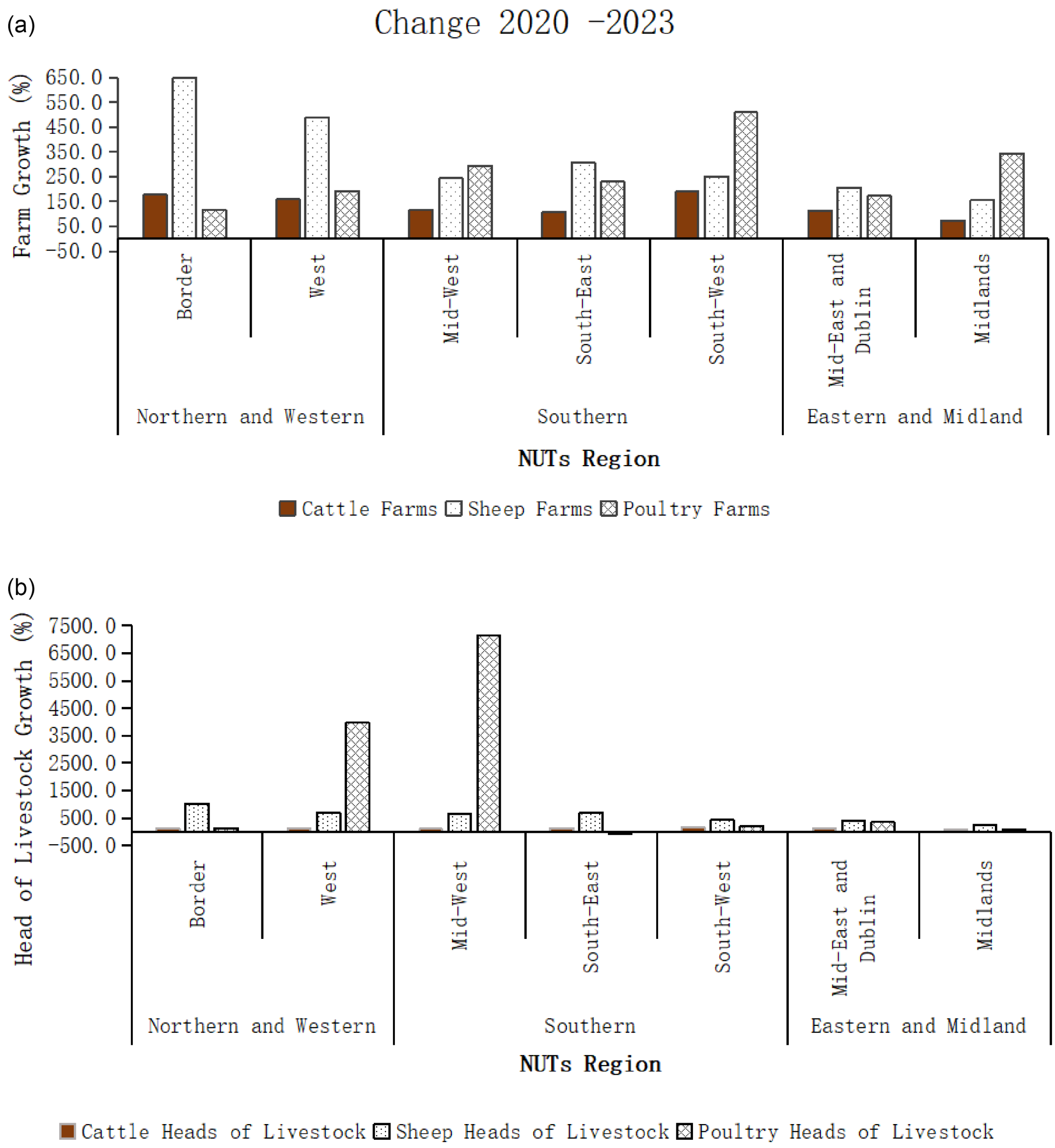
The Southern region also recorded substantial growth. Cattle farm numbers more than doubled, and herd sizes increased by 117%. Sheep flocks expanded fourfold, while poultry enterprises also grew rapidly, particularly in the South-West.

By contrast, the Eastern and Midland regions showed weaker growth. Cattle farm numbers rose by +85% with herd sizes increasing by just +56%, well below the national average. Sheep

Table 6
Organic livestock farms, change 2020–2023

Type of animal		Number of farms	Heads of livestock	Number of farms	Heads of livestock	Animals/farm	Animals/farm	Change 2020–2023 (decimal)	Change 2020–2023 (decimal)	Change 2020–2023 (decimal)
		2020	2020	2023	2023	2020	2023	Farms	Livestock	Animals/farm
Cattle		1,157	51,685	2,773	103,684	44.67	37.39	1.40	1.01	−0.16
	Dairy cows	46	2,825	409	8,263	61.41	20.20	7.89	1.92	−0.67
	Other cows	960	17,640	2,754	95,421	18.38	34.65	1.87	4.41	0.89
Sheep		378	74,870	1,728	495,743	198.07	286.89	3.57	5.62	0.45
Goats		18	78	44	332	4.33	7.55	1.44	3.26	0.74
		18	402							
Poultry		101	161,471	340	506,493	1,598.72	1,489.69	2.37	2.14	−0.07
	Broilers	10	30,543	334	116,498	3,054.30	348.80	32.40	2.81	−0.89
	Laying hens	92	130,928	340	389,995	1,423.13	1,147.04	2.70	1.98	−0.19

Figure 7
Structural growth in organic production by NUTS 3 region in Ireland, 2020–2023. (a) shows percentage growth in the number of organic farms (extensive margin), while (b) shows percentage growth in the number of livestock heads (intensive margin), disaggregated by cattle, sheep, and poultry across NUTS 3 regions



farms expanded from 78 to 217 (+178%) and poultry farms from 27 to 89 farms (+230%), but from smaller bases. Within this region, the Midlands recorded the weakest performance, with cattle herd growth of just 38% and almost no expansion in poultry flocks.

These results confirm that organic livestock expansion was geographically concentrated in the Northern, Western, and Southern regions. This reflects the predominance of extensive ruminant systems and lower opportunity costs to conversion in that area, consistent with the broader structural trends identified in earlier sections. Furthers detail is provided in Appendix Table A1.

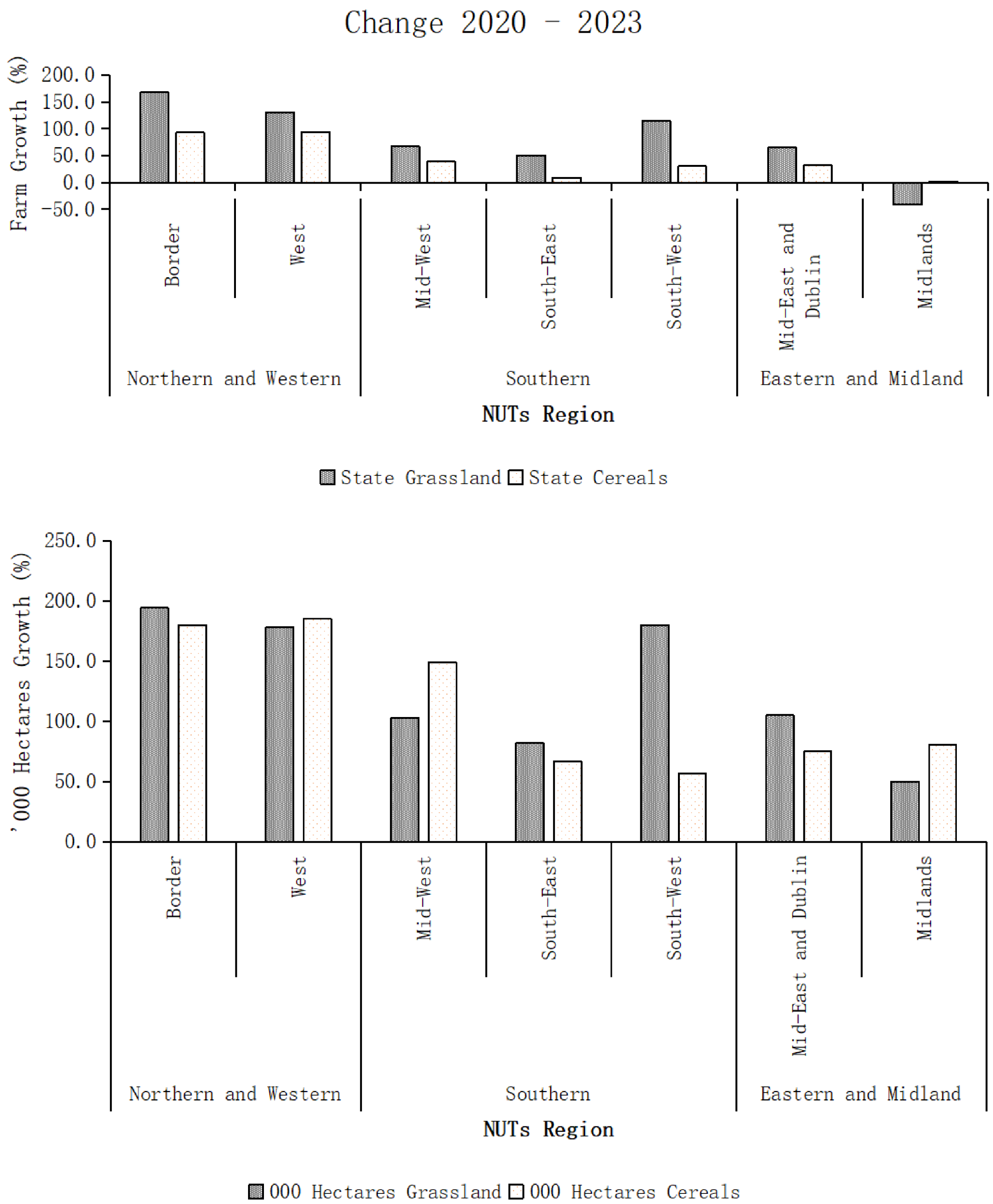
5.8. Regional distribution of grassland and cereals

Appendix Table A2 shows spatial variation in the distribution of grassland and cereals from 2020 to 2023, disaggregated by region. Figure 8 shows grassland remained the dominant land use across all regions, with the most pronounced growth occurring in the Northern and Western regions. Here the number of grassland farms more than doubled (+149%), while grassland area increased from 28,537 to 81,277 ha (+186%). The number of cereal farms nearly doubled (+94%), and the cereal area expanded substantially (+183%).

The Southern region also experienced strong growth, with grassland area increasing by 137% and cereal area by 94%. Growth was broadly distributed across subregions, though the South-West recorded the most pronounced grassland increase (+180%).

By contrast, the Eastern and Midland regions showed smaller growth. Grassland area grew by just 69%, while cereal area grew by 78%, both below the level experienced in other regions. Generally, the results confirm regional disparities in organic expansion. Growth was concentrated in the Northern and Western regions, with Southern regions showing a similar pattern, while the Eastern and Midland regions lagged. Expansion was

Figure 8
Regional growth in organic farm numbers and land use broken down by grassland and cereal production in Ireland, 2020–2023



largely grassland-driven, reinforcing the ruminant livestock-based structure of the organic sector.

5.9. Status and prospects of decarbonization

Table 7 situates the expansion of organic farming within the broader set of agricultural decarbonization measures in Ireland by summarizing the current status and prospects of key policy interventions. It highlights the role of organic adoption as a structural mitigation pathway relative to other measures, including nutrient management, slurry application technologies, livestock efficiency, and renewable energy deployment. The measures and associated targets are derived from national policy frameworks and implementation reports, including the Climate Action Plan, CAP Strategic Plan, National Biomethane Strategy, and the National Organic Strategy, and are supplemented by administrative statistics and peer-reviewed literature. These measures reflect a combination of structural, technological, and behavioral mitigation pathways within Irish agricultural policy.

The results highlight variation in implementation across measures. Chemical nitrogen use is reported close to the stated ceiling, while low-emission slurry spreading accounts for a large share of applications on dairy farms. Certified organic area, as highlighted in the analysis of administrative data, has expanded rapidly in recent years. In contrast, grid-injection biomethane capacity remains low relative to policy targets, reflecting the early stage of sector deployment, while feed-based methane mitigation technologies are largely at pilot scale. While microgeneration capacity of renewables expanded rapidly at the national level, farm-level adoption remains low.

Table 7 is presented as an institutional context for the structural results presented in earlier sections. It reports policy

Table 7
Status and prospects of agricultural decarbonization measures in Ireland: policy targets, current implementation, and prospects

Decarbonization measure	Pathway type	Policy framework (Ireland)	Target	Current status in Ireland	Prospects for Ireland	Key sources
Shift to organic production systems	Structural change	Organic Farming Scheme; Food Vision 2030; National Organic Strategy 2024-2030	10% of UAA under organic management by 2030	Organic area expanded from 2.2% in 2022 to c. 5% agricultural land in 2024 placing Ireland around halfway to the 2030 target	Further expansion contingent on processing capacity, market development, and integration into organic value chains	[57–59]
Chemical nitrogen reduction and fertilizer substitution	Efficiency improvement	Climate Action Plan; Nitrates Action Programme 2022–2025; CAP Strategic Plan	≤300 kt chemical N use by 2030	Chemical nitrogen use declined to c. 281 kt in 2023 but rebounded to 310 kt in 2024, remaining above the 2030 policy ceiling	High abatement potential but recent increase suggests further reductions via substitution, improved nutrient-use efficiency, advisory support, and regulatory adjustment	[60–63]
Low-emission slurry spreading (LESS)	Efficiency improvement	Climate Action Plan; TAMS (CAP investment support)	90% of slurry applied using LESS by 2027	~85% of slurry on dairy farms applied using LESS technologies (2024)	Continued uptake through regulation and capital investment support	[64–66]
Genetic improvement for emissions efficiency	Efficiency improvement	Climate Action Plan; ICBF breeding programs	≥10% methane reduction by 2030	Genetic improvement and breeding measures widely embedded through national breeding and genotyping programs	Incremental gains from breeding; scalability of feed technologies remains uncertain	[67–69]
Feed additives for enteric methane reduction	Technological innovation	Climate Action Plan; Teagasc research and pilot programs	≥10% methane reduction by 2030	Feed additives measures remain at pilot and pre-commercial stage within Irish systems	Scalability remains uncertain in pasture-based production systems	[70–72]
Reduced age at slaughter (beef finishing age)	Efficiency improvement	Climate Action Plan; Teagasc beef mitigation pathway	Reduce average slaughter age to 22–23 months by 2030	Average slaughter age remains at c.26.5 months	Improvements dependent on herd management, system efficiency, and supply-chain coordination	[73, 74]

(*Continued*)

Table 7
(*Continued*)

Decarbonization measure	Pathway type	Policy framework (Ireland)	Target	Current status in Ireland	Prospects for Ireland	Key sources
Biomethane and anaerobic digestion (AD)	Technological/ energy substitution	National Biomethane Strategy; Renewable Energy Policy	5.7 TWh biomethane by 2030	Early-stage development, with limited grid-injection plants operational (2024)	Significant scale-up required; dependent on infrastructure, investment, and regulatory support	[75–77]
On-farm renewable energy (microgeneration)	Energy substitution	Microgeneration Support Scheme: SEAI and CAP supports	c. 1.6 GW microgeneration capacity by 2030	>400 MW installed nationally by 2024; c. 4.7% of farms reported renewable energy installations in 2023	Expansion remains constrained by capital costs, grid access, and planning barriers. Improvements through simplified permitting, incentives, and electrification	[78, 79]

Note: Measures are grouped into structural, efficiency, and technological pathways. Organic farming represents a structural adjustment pathway, while other measures focus on input efficiency and technological mitigation. Data are drawn from national policy documents, administrative statistics, and recent literature.

targets and implementation indicators but does not estimate emissions outcomes or causal policy effects. The heterogeneity in implementation across measures highlights that structural adjustment through organic expansion represents one pathway within a broader and varying decarbonization transition.

6. Discussion and Conclusion

6.1. Discussion

The results show that Ireland's organic sector underwent rapid expansion between 2020 and 2023, with farm numbers increasing rapidly by +147% and land under organic management increasing by +144%. Growth however varied across farm types, with beef systems accounting for the largest absolute increase and sheep systems recording the fastest relative expansion. Dairy and tillage enterprises grew moderately, while poultry and horticulture remained marginal. Expansion was concentrated among small and medium-sized holdings, while larger farms contributed proportionately less. At the same time, mean and median SO contracted, indicating that growth was driven by smaller or more extensive farms.

The expansion coincided with increased public investment under the OFSs, suggesting that financial incentives play an important role in shaping adoption decisions. While causality is not established, this pattern is consistent with evidence that subsidy-based programs can encourage uptake of environmentally sustainable practices, particularly where they improve short-term economic returns [80]. The evidence from this study reflects this pattern. Uniform per-hectare supports appear to have altered relative profitability, encouraging conversion among extensive beef and sheep systems [81].

These findings are consistent with previous studies showing that conversion to organic farming is more likely among farms with lower opportunity costs, particularly extensive livestock enterprises [4]. Wąs et al. [53] found similar patterns in Poland, where financial incentives influence participation in agri-environmental schemes particularly at the extensive margin. At the sectoral level, this suggests that policy design shapes not only the scale of adoption but also its structural composition.

At the European level, literature highlights the complex relationships between subsidies, productivity, and structural change. Rizov et al. [82] shows that CAP subsidies have been associated with reductions in total factor productivity in some contexts, while impacts on farm profitability are often modest and driven by entry effects rather than efficiency gains [83, 84]. Although agri-environmental schemes support ecological outcomes, their effects on technical efficiency remain limited without complementary innovation.

The Irish case reflects these dynamics. Rapid organic expansion accompanied by a decline in average SO, suggesting a compositional shift toward more extensive systems rather than productivity improvements. This highlights the importance of distinguishing between participation and performance outcomes. It also points to the need for further research on the relative technical efficiency of organic and conventional systems in line with comparable studies in Finland and France [85, 86].

These structural changes have implications for market development. Where expansion is driven by lower-intensity systems with limited market integration, there may be an increased risk of "organic leakage," whereby certified output is sold through conventional channels, limiting the realization of organic price premiums [87]. While leakage is not directly measured in this study, this highlights the importance of value chain development alongside production incentives.

The results also show regional asymmetries in growth, with expansion more pronounced in the Northern and Western regions, where extensive systems dominate, while uptake in the Eastern and Midland regions was more limited. This spatial heterogeneity mirrors comparative studies, which show that regional context such as land quality, production systems, and opportunity costs mediates the effectiveness of subsidy schemes [88, 89].

From a policy perspective, the findings suggest that while the OFS has been effective in scaling participation, its impact on economic performance is less clear. Flat-rate payments appear well suited to encouraging entry but may be less effective in supporting productivity gains or market integration [90, 91]. This raises broader questions about the balance between participation-based and performance-based policy design. At the same time, extensive growth is not inherently problematic and may align with environmental objectives [92].

Our findings therefore highlight that while the sector is broadly growing, policy is focused on supporting farmer entry but is disconnected from market dynamics. This is concerning in Ireland, where there is already a substantial market leakage and loss of value to conventional value chains [93]. Addressing this gap requires further research into the impacts of rapid, policy-driven expansion supported through co-financed public investment.

Environmental implications of the studied expansion are similarly mixed. The growth of permanent grassland under organic management is associated with biodiversity and soil benefits [94, 95], while reduced input use and stocking intensity may contribute to lower emissions at the system level. However, the continued dominance of ruminant systems and limited diversification into crops constrain the potential for broader emissions reductions. This highlights the importance of considering both structural and compositional change when evaluating the role of organic farming in climate mitigation.

This paper makes three contributions through empirical evidence. First, it provides the first nationally representative evidence of structural change in Ireland's organic beef sector, based on CSO's Farm Structures Survey data. Second, it situates descriptive results within an economic framework of public investment and adoption theory, showing how subsidies reshape incentives and structural outcomes. Third, it highlights emerging challenges related to market integration and structural performance, pointing to the need for further research on the interaction between policy design, farm structure, and value chain development.

6.2. Conclusion

The study documents the rapid expansion in Ireland's organic sector that occurred during the period 2020–2023, coinciding with increased public investment under the OFS. Growth was concentrated in beef and sheep systems, smaller farms, and regions with extensive grassland systems.

These findings highlight an important distinction between participation and performance outcomes. While policy support has successfully increased uptake, the implications for long-term efficiency, competitiveness, and value realization remain uncertain. In particular, limited integration with value chains may constrain the ability of the sector to capture organic price premiums, with potential implications for market development.

From a policy perspective, three implications arise. First, supporting transition efficiency is critical, particularly through advisory services, technical training, and improved access to organic markets, to enhance the viability of new entrants. Second, there may be a role for evolving support mechanisms beyond flat-rate payments toward performance-based incentives that reward both environmental outcomes and market engagement. Third, the spatial heterogeneity in adoption suggests the need for more regionally differentiated approaches that reflect differences in production systems, opportunity costs, and institutional capacity.

The findings also point to several priorities for future research. These include the assessment of technical and economic efficiency of organic farms relative to conventional systems, the role of value chains in determining farm-level returns, and the application of environmentally extended bioeconomic and input–output modeling to evaluate the broader economic and emissions impacts of organic sector expansion.

Several limitations should be acknowledged. The analysis is descriptive and does not establish causal relationships between policy instruments and observed structural changes. It relies on aggregated national-level data, which do not capture farm-level heterogeneity in management strategies or market engagement. SO is used as a proxy for economic size and does not measure income or profitability, particularly beyond the farm gate. Finally, the study does not quantify greenhouse gas emissions, as this would require detailed biophysical data not available within farm structure statistics.

Acknowledgment

I thank Prof. Cathal O'Donoghue and Dr. Kevin Kilcline for their guidance and valuable comments on this work. I am grateful to Prof. Stephen Hynes for comments on earlier drafts. I also thank seminar participants in the Discipline of Economics at the University of Galway for helpful feedback. This research was supported by the Teagasc Walsh Scholars Programme. I acknowledge the study leave granted by the National Agricultural Research Organisation, Uganda.

Funding Support

This research was supported by the Teagasc Walsh Scholarship Programme, Ireland. The University allocation/reference number is ROG1548.

Ethical Statement

The authors declare that this study uses publicly available secondary data from the Central Statistics Office Farm Structure Survey 2023 and the Census of Agriculture 2020. The datasets are available at: https://www.cso.ie/en/releasesandpublications/ep/p-fss/farmstructuresurvey2023/data/ and https://www.cso.ie/en/releasesandpublications/ep/p-coa/censusofagriculture2020detailedresults/organics/. As the study relied on publicly available secondary data, ethical approval was not required.

Conflicts of Interest

The authors declare no conflict of interest to this work. This research was supported by the Teagasc Walsh Scholars Programme, Ireland, and the funder had no role in the study design, analysis or interpretation of the findings, or the decision to submit the manuscript for publication.

Data Availability Statement

The data used in this study are publicly available from the Central Statistics Office of Ireland Farm Structure Survey 2023 and Census of Agriculture 2020. Farm Structure Survey 2023 data are available at https://www.cso.ie/en/releasesandpublications/ep/p-fss/farmstructuresurvey2023/data/, and Census of Agriculture 2020 data are available at https://www.cso.ie/en/releasesandpublications/ep/p-coa/censusofagriculture2020detailedresults/organics/.

Author Contribution Statement

Alfred Afeku: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Data curation, Writing – original draft, Writing – review & editing, Visualization. **Cathal O'Donoghue:** Conceptualization, Methodology, Validation, Resources, Writing – review & editing, Supervision, Project administration, Funding acquisition. **Kevin Kilcline:** Conceptualization, Methodology, Validation, Resources, Writing – Review & Editing, Supervision, Project administration, Funding acquisition.

References

[1] Frank, S., Beach, R., Havlík, P., Valin, H., Herrero, M., Mosnier, A., . . . , & Obersteiner, M. (2018). Structural change as a key component for agricultural non-CO_2 mitigation efforts. *Nature Communications*, *9*(1), 1060. https://doi.org/10.1038/s41467-018-03489-1

[2] Kulovesi, K., Oberthür, S., van Asselt, H., & Savaresi, A. (2024). The european climate law: Strengthening EU procedural climate governance? *Journal of Environmental Law*, *36*(1), 23–42. https://doi.org/10.1093/jel/eqad034

[3] Kremmydas, D., Beber, C., Baldoni, E., Ciaian, P., Fellmann, T., Gocht, A., . . . , & Tillie, P. (2025). The EU target for organic farming: Potential economic and environmental impacts of two alternative pathways. *Applied Economic Perspectives and Policy*, *47*(2), 602–623. https://doi.org/10.1002/aepp.13470

[4] Läpple, D., & Kelley, H. (2013). Understanding the uptake of organic farming: Accounting for heterogeneities among Irish farmers. *Ecological Economics*, *88*, 11–19. https://doi.org/10.1016/j.ecolecon.2012.12.025

[5] Möhring, N., Muller, A., & Schaub, S. (2024). Farmers' adoption of organic agriculture—A systematic global literature review. *European Review of Agricultural Economics*, *51*(4), 1012–1044. https://doi.org/10.1093/erae/jbae025

[6] Khanna, M., Zilberman, D., Hochman, G., & Basso, B. (2024). An economic perspective of the circular bioeconomy in the food and agricultural sector. *Communications Earth & Environment*, *5*(1), 507. https://doi.org/10.1038/s43247-024-01663-6

[7] Mehrabi, S., & Giagnocavo, C. (2024). Business models and strategies for the internalization of externalities in agri-food value chains. *Agricultural and Food Economics*, *12*(1), 46. https://doi.org/10.1186/s40100-024-00338-2

[8] Giannakas, K. (2002). Information asymmetries and consumption decisions in organic food product markets. *Canadian Journal of Agricultural Economics*, *50*(1), 35–50. https://doi.org/10.1111/j.1744-7976.2002.tb00380.x

[9] Macedoni, L. (2022). Asymmetric information, quality, and regulations. *Review of International Economics*, *30*(4), 1180–1198. https://doi.org/10.1111/roie.12599

[10] Zhao, J., Gerasimova, K., Peng, Y., & Sheng, J. (2020). Information asymmetry, third party certification and the integration of organic food value chain in China. *China Agricultural Economic Review*, *12*(1), 20–38. https://doi.org/10.1108/CAER-05-2018-0111

[11] Lobley, M., Butler, A., & Reed, M. (2009). The contribution of organic farming to rural development: An exploration of the socio-economic linkages of organic and non-organic farms in England. *Land Use Policy*, *26*(3), 723–735. https://doi.org/10.1016/j.landusepol.2008.09.007

[12] Terziev, V. (2016). Entrepreneurship in organic production – An incentive for sustainable rural development. *Agricultural and Resource Economics: International Scientific E-Journal*, *2*(4), 30–42. https://doi.org/10.22004/ag.econ.256862

[13] Komor, A., Pawlak, J., Wróblewska, W., Białoskurski, S., & Czernyszewicz, E. (2025). Spatial differentiation of the competitiveness of organic farming in EU countries in 2014–2023: An input–output approach. *Sustainability*, *17*(17), 7614. https://doi.org/10.3390/su17177614

[14] Sidemo-Holm, W., Brady, M. V., Carrié, R., Ekroos, J., & Smith, H. G. (2024). Cost-effective biodiversity conservation with organic farming—Spatial allocation is key. *Biological Conservation*, *294*, 110624. https://doi.org/10.1016/j.biocon.2024.110624

[15] O'Mara, F., Richards, K. G., Shalloo, L., Donnellan, T., Finn, J. A., & Lanigan, G. (2021). Sustainability of ruminant livestock production in Ireland. *Animal Frontiers*, *11*(4), 32–43. https://doi.org/10.1093/af/vfab037

[16] Farrell, M., Murtagh, A., Weir, L., Conway, S. F., McDonagh, J., & Mahon, M. (2022). Irish organics, innovation and farm collaboration: A pathway to farm viability and generational renewal. *Sustainability*, *14*(1), 93. https://doi.org/10.3390/su14010093

[17] Meemken, E.-M., & Qaim, M. (2018). Organic agriculture, food security, and the environment. *Annual Review of Resource Economics*, *10*(1), 39–63. https://doi.org/10.1146/annurev-resource-100517-023252

[18] Michalke, A., Köhler, S., Messmann, L., Thorenz, A., Tuma, A., & Gaugler, T. (2023). True cost accounting of organic and conventional food production. *Journal of Cleaner Production*, *408*, 137134. https://doi.org/10.1016/j.jclepro.2023.137134

[19] Reganold, J. P., & Wachter, J. M. (2016). Organic agriculture in the twenty-first century. *Nature Plants*, *2*(2), 15221. https://doi.org/10.1038/nplants.2015.221

[20] Ait Sidhoum, A., Canessa, C., & Sauer, J. (2023). Effects of agri-environment schemes on farm-level eco-efficiency measures: Empirical evidence from EU countries. *Journal of Agricultural Economics*, *74*(2), 551–569. https://doi.org/10.1111/1477-9552.12520

[21] Mantino, F., & Vanni, F. (2019). Policy mixes as a strategy to provide more effective social and environmental benefits: Evidence from six rural areas in Europe. *Sustainability*, *11*(23), 6632. https://doi.org/10.3390/su11236632

[22] Villanueva, A. J., Gómez-Limón, J. A., Arriaza, M., & Rodríguez-Entrena, M. (2015). The design of agri-environmental schemes: Farmers' preferences in southern Spain. *Land Use Policy*, *46*, 142–154. https://doi.org/10.1016/j.landusepol.2015.02.009

[23] Said, Z., Vigneshwaran, P., Shaik, S., Rauf, A., & Ahmad, Z. (2025). Climate and carbon policy pathways for sustainable food systems. *Environmental and Sustainability Indicators*, *27*, 100730. https://doi.org/10.1016/j.indic.2025.100730

[24] Marasteanu, I. J., & Jaenicke, E. C. (2019). Economic impact of organic agriculture hotspots in the United States. *Renewable Agriculture and Food Systems*, *34*(6), 501–522. https://doi.org/10.1017/S1742170518000066

[25] Pépin, A., Morel, K., & van der Werf, H. M. G. (2021). Conventionalised vs. agroecological practices on organic vegetable farms: Investigating the influence of farm structure in a bifurcation perspective. *Agricultural Systems*, *190*, 103129. https://doi.org/10.1016/j.agsy.2021.103129

[26] Rees, C., Grovermann, C., & Finger, R. (2023). National organic action plans and organic farmland area growth in Europe. *Food Policy*, *121*, 102531. https://doi.org/10.1016/j.foodpol.2023.102531

[27] Verburg, R. W., Verberne, E., & Negro, S. O. (2022). Accelerating the transition towards sustainable agriculture: The case of organic dairy farming in the Netherlands. *Agricultural Systems*, *198*, 103368. https://doi.org/10.1016/j.agsy.2022.103368

[28] Calabro, G., & Vieri, S. (2024). Limits and potential of organic farming towards a more sustainable European agri-food system. *British Food Journal*, *126*(1), 223–236. https://doi.org/10.1108/BFJ-12-2022-1067

[29] Muska, A., Pilvere, I., Viira, A.-H., Muska, K., & Nipers, A. (2025). European green deal objective: Potential expansion of organic farming areas. *Agriculture*, *15*(15), 1633. https://doi.org/10.3390/agriculture15151633

[30] Cawley, A., Heanue, K., Hilliard, R., O'Donoghue, C., & Sheehan, M. (2023). How knowledge transfer impact happens at the farm level: Insights from advisers and farmers in the Irish agricultural sector. *Sustainability*, *15*(4), 3226. https://doi.org/10.3390/su15043226

[31] Murphy, S. P., Cannon, S. M., & Walsh, L. (2022). Just transition frames: Recognition, representation, and distribution in Irish beef farming. *Journal of Rural Studies*, *94*, 150–160. https://doi.org/10.1016/j.jrurstud.2022.06.009

[32] Otieno, F., Nalakurthi, S.-R. N. V., Raji, M., Tiwari, A., Anton, I., & Gharbia, S. (2024). Farmer's attitudes towards GHG emissions and adoption to low-cost sensor-driven smart farming for mitigation: The case of Ireland tillage and horticultural farmers. *Smart Agricultural Technology*, *9*, 100622. https://doi.org/10.1016/j.atech.2024.100622

[33] Stolze, M., & Lampkin, N. (2009). Policy for organic farming: Rationale and concepts. *Food Policy*, *34*(3), 237–244. https://doi.org/10.1016/j.foodpol.2009.03.005

[34] Cisilino, F., Bodini, A., & Zanoli, A. (2019). Rural development programs' impact on environment: An ex-post evaluation of organic farming. *Land Use Policy*, *85*, 454–462. https://doi.org/10.1016/j.landusepol.2019.04.016

[35] Läpple, D. (2010). Adoption and abandonment of organic farming: An empirical investigation of the Irish drystock sector. *Journal of Agricultural Economics*, *61*(3), 697–714. https://doi.org/10.1111/j.1477-9552.2010.00260.x

[36] Ayala, M. C., Groot, J. C. J., Kilcline, K., Grace, C., Kennedy, J., Moran, B., . . . , & Ripoll-Bosch, R. (2024). Characterizing beef and sheep farming systems to customize sustainability interventions and policy implementation. *Journal of Environmental Management*, *366*, 121900. https://doi.org/10.1016/j.jenvman.2024.121900

[37] Department of Agriculture, Food and the Marine. (2022). *Terms and Conditions of the ORGANIC FARMING SCHEME (OFS) 2024*. https://assets.gov.ie/static/documents/2242694b/TermsandConditionsoftheOrganicFarmingSchemeOFS2024111125.pdf
[38] Markiewicz-Keszycka, M., Macken-Walsh, Á., Carter, A., Mooney, S., Devereux, E. J., Henchion, M., & Hynds, P. (2025). Farmers' experiences of transitioning towards agroecology: Narratives of change in Western Europe. *Agriculture*, *15*(6), 625. https://doi.org/10.3390/agriculture15060625
[39] Wesseler, J. (2022). The EU's farm-to-fork strategy: An assessment from the perspective of agricultural economics. *Applied Economic Perspectives and Policy*, *44*(4), 1826–1843. https://doi.org/10.1002/aepp.13239
[40] Sapbamrer, R., & Thammachai, A. (2021). A systematic review of factors influencing farmers' adoption of organic farming. *Sustainability*, *13*(7), 3842. https://doi.org/10.3390/su13073842
[41] Neuenfeldt, S., Gocht, A., Heckelei, T., & Ciaian, P. (2019). Explaining farm structural change in the European agriculture: A novel analytical framework. *European Review of Agricultural Economics*, *46*(5), 713–768. https://doi.org/10.1093/erae/jby037
[42] Barrett, C. B., Ortiz-Bobea, A., & Pham, T. (2023). Structural transformation, agriculture, climate, and the environment. *Review of Environmental Economics and Policy*, *17*(2), 195–216. https://doi.org/10.1086/725319
[43] Bustos, P., Garber, G., & Ponticelli, J. (2020). Capital accumulation and structural transformation. *The Quarterly Journal of Economics*, *135*(2), 1037–1094. https://doi.org/10.1093/qje/qjz044
[44] Hanim Mohamad Zailani, S., Eltayeb, T. K., Hsu, C., & Choon Tan, K. (2012). The impact of external institutional drivers and internal strategy on environmental performance. *International Journal of Operations & Production Management*, *32*(6), 721–745. https://doi.org/10.1108/01443571211230943
[45] Stobbelaar, D. J., Groot, J. C. J., Bishop, C., Hall, J., & Pretty, J. (2009). Internalization of agri-environmental policies and the role of institutions. *Journal of Environmental Management*, *90*, S175–S184. https://doi.org/10.1016/j.jenvman.2008.11.019
[46] Dessart, F. J., Barreiro-Hurlé, J., & van Bavel, R. (2019). Behavioural factors affecting the adoption of sustainable farming practices: A policy-oriented review. *European Review of Agricultural Economics*, *46*(3), 417–471. https://doi.org/10.1093/erae/jbz019
[47] Karipidis, P., & Karypidou, S. (2021). Factors that impact farmers' organic conversion decisions. *Sustainability*, *13*(9), 4715. https://doi.org/10.3390/su13094715
[48] Burton, M., Rigby, D., & Young, T. (2003). Modelling the adoption of organic horticultural technology in the UK using Duration Analysis. *Australian Journal of Agricultural and Resource Economics*, *47*(1), 29–54. https://doi.org/10.1111/1467-8489.00202
[49] Genius, M., Pantzios, C. J., & Tzouvelekas, V. (2006). Information acquisition and adoption of organic farming practices. *Journal of Agricultural and Resource Economics*, *31*(1), 93–113. https://doi.org/10.22004/ag.econ.10150
[50] Central Statistics Office. (2020). *Census of agriculture 2020 - Preliminary results*. https://www.cso.ie/en/releasesandpublications/ep/p-coa/censusofagriculture2020-preliminaryresults/landutilisation/
[51] Central Statistics Office. (2024). *Farm structure survey 2023*. https://www.cso.ie/en/releasesandpublications/ep/p-fss/farmstructuresurvey2023/organicfarming/
[52] Foley, D. K., Michl, T. R., & Tavani, D. (2019). *Growth and distribution* (2nd ed.). UK: Harvard University Press. https://doi.org/10.4159/9780674239395
[53] Wąs, A., Malak-Rawlikowska, A., Zavalloni, M., Viaggi, D., Kobus, P., & Sulewski, P. (2021). In search of factors determining the participation of farmers in agri-environmental schemes – Does only money matter in Poland? *Land Use Policy*, *101*, 105190. https://doi.org/10.1016/j.landusepol.2020.105190
[54] Duluins, O., Riera, A., Schuster, M., Baret, P. V., & van den Broeck, G. (2022). Economic implications of a protein transition: Evidence from Walloon beef and dairy farms. *Frontiers in Sustainable Food Systems*, *6*, 803872. https://doi.org/10.3389/fsufs.2022.803872
[55] Amalia, G. A., & Nigh, R. (2005). Smallholder participation and certification of organic farm products in Mexico. *Journal of Rural Studies*, *21*(4), 449–460. https://doi.org/10.1016/j.jrurstud.2005.08.004
[56] Jouzi, Z., Azadi, H., Taheri, F., Zarafshani, K., Gebrehiwot, K., van Passel, S., & Lebailly, P. (2017). Organic farming and small-scale farmers: Main opportunities and challenges. *Ecological Economics*, *132*, 144–154. https://doi.org/10.1016/j.ecolecon.2016.10.016
[57] Bocean, C. G. (2025). The role of organic farming in reducing greenhouse gas emissions from agriculture in the European Union. *Agronomy*, *15*(1), 198. https://doi.org/10.3390/agronomy15010198
[58] Kuzmanović, D. (2023). Sustainable development in agriculture with a focus on decarbonization. *Western Balkan Journal of Agricultural Economics and Rural Development*, *5*(2), 163–177. https://doi.org/10.5937/WBJAE2302163K
[59] Rey Vicario, D., Kremmydas, D., Baldoni, E., Ciaian, P., & Tillie, P. (2025). Do organic farming policies need to be more target-oriented to achieve sustainability? *Journal of Environmental Management*, *394*, 127342. https://doi.org/10.1016/j.jenvman.2025.127342
[60] Ashekuzzaman, S. M., Forrestal, P., Richards, K. G., Daly, K., & Fenton, O. (2021). Grassland phosphorus and nitrogen fertiliser replacement value of dairy processing dewatered sludge. *Sustainable Production and Consumption*, *25*, 363–373. https://doi.org/10.1016/j.spc.2020.11.017
[61] Buckley, C., Krol, D., Lanigan, G. J., Donnellan, T., Spink, J., Hanrahan, K., . . . , & S, Waters. (2020). *An analysis of the cost of the abatement of ammonia emissions in Irish agriculture to 2030*. Ireland: Teagasc.
[62] Murphy, D. J., Dillon, P., O'Donovan, M., Shalloo, L., & Ruelle, E. (2024). Nitrate leaching on Irish grassland dairy farms: A review. *European Journal of Agronomy*, *153*, 127042. https://doi.org/10.1016/j.eja.2023.127042
[63] Murray, Á., Gilliland, T. J., Delaby, L., Patton, D., Creighton, P., Forrestal, P. J., & McCarthy, B. (2023). Can a urease inhibitor improve the efficacy of nitrogen use under perennial ryegrass temperate grazing conditions? *The Journal of Agricultural Science*, *161*(2), 230–240. https://doi.org/10.1017/S0021859623000126
[64] Amrago, E. C., Loughrey, J., Ryan, G., Crowley, F., & Doran, J. (2026). Environmental innovation adoption: The role of environmental policy, agricultural education and advi-

sory services. *Environmental and Sustainability Indicators*, *29*, 101064. https://doi.org/10.1016/j.indic.2025.101064

[65] Cantillon, M., Hennessy, T., Amon, B., Dragoni, F., & O'Brien, D. (2024). Mitigation of gaseous emissions from dairy livestock: A farm-level method to examine the financial implications. *Journal of Environmental Management*, *352*, 119904. https://doi.org/10.1016/j.jenvman.2023.119904

[66] Francisco-Cruz, C. A., Buckley, C., & Breen, J. (2025). Economic and environmental impacts of mitigation technologies on dairy and cattle farms in the Republic of Ireland. *Q Open*, *5*(2), qoaf021. https://doi.org/10.1093/qopen/qoaf021

[67] Lahart, B., Buckley, F., Herron, J., Fitzgerald, R., Fitzpatrick, E., Galvin, N., & Shalloo, L. (2024). Evaluating enteric methane emissions within a herd of genetically divergent grazing dairy cows. *Journal of Dairy Science*, *107*(1), 383–397. https://doi.org/https://doi.org/10.3168/jds.2022-22646

[68] Roskam, E., O'Donnell, C., Hayes, M., Kirwan, S. F., Kenny, D. A., O'Flaherty, V., . . . , & Waters, S. M. (2024). Enteric methane emission reduction potential of natural feed supplements in ewe diets. *Journal of Animal Science*, *102*, skad421. https://doi.org/10.1093/jas/skad421

[69] Ryan, C. V., Pabiou, T., Purfield, D. C., Berry, D. P., Conroy, S., Murphy, C. P., & Evans, R. D. (2024). Exploring definitions of daily enteric methane emission phenotypes for genetic evaluations using a population of indoor-fed multi-breed growing cattle with feed intake data. *Journal of Animal Science*, *102*, skae034. https://doi.org/10.1093/jas/skae034

[70] Costigan, H., Shalloo, L., Egan, M., Kennedy, M., Dwan, C., Walsh, S., . . . , & Lahart, B. (2024). The effect of twice daily 3-nitroxypropanol supplementation on enteric methane emissions in grazing dairy cows. *Journal of Dairy Science*, *107*(11), 9197–9208. https://doi.org/https://doi.org/10.3168/jds.2024-24772

[71] Kelly, L., & Kebreab, E. (2023). Recent advances in feed additives with the potential to mitigate enteric methane emissions from ruminant livestock. *Journal of Soil and Water Conservation*, *78*(2), 111–123. https://doi.org/10.2489/jswc.2023.00070

[72] Tricarico, J. M., Garcia, F., Bannink, A., Lee, S.-S., Miguel, M. A., Newbold, J. R., . . . , & Yáñez-Ruiz, D. R. (2025). Feed additives for methane mitigation: Regulatory frameworks and scientific evidence requirements for the authorization of feed additives to mitigate ruminant methane emissions. *Journal of Dairy Science*, *108*(1), 395–410. https://doi.org/10.3168/jds.2024-25051

[73] Kearney, M., O'Riordan, E. G., Byrne, N., Breen, J., & Crosson, P. (2023). Mitigation of greenhouse gas emissions in pasture-based dairy-beef production systems. *Agricultural Systems*, *211*, 103748. https://doi.org/10.1016/j.agsy.2023.103748

[74] Kearney, M., O'Riordan, E. G., McGee, M., Breen, J., & Crosson, P. (2022). Farm-level modelling of bioeconomic, greenhouse gas emissions and feed-food performance of pasture-based dairy-beef systems. *Agricultural Systems*, *203*, 103530. https://doi.org/10.1016/j.agsy.2022.103530

[75] Martínez-Arce, A., Kargupta, W., Domínguez, C. G., Odey, E. A., McMahon, H., Huerta, J. D., . . . , & Styles, D. (2025). An integrated technoeconomic and environmental assessment of biomethane production via anaerobic digestion of food waste in Ireland: Updated insights under market volatility. *Sustainable Energy Technologies and Assessments*, *82*, 104563. https://doi.org/10.1016/j.seta.2025.104563

[76] Tisocco, S., Lenehan, J. J., Zhan, X., & Crosson, P. (2025). Financial assessment of integrating anaerobic digestion with cattle farming for biomethane production – Implications for farm economics and the supply chain. *Biomass and Bioenergy*, *195*, 107702. https://doi.org/10.1016/j.biombioe.2025.107702

[77] de Tommasi, L., & Lyons, P. (2023). Towards the integration of flexible green hydrogen demand and production in Ireland: Opportunities, barriers, and recommendations. *Energies*, *16*(1), 352. https://doi.org/10.3390/en16010352

[78] Breen, M., Upton, J., & Murphy, M. D. (2020). Photovoltaic systems on dairy farms: Financial and renewable multi-objective optimization (FARMOO) analysis. *Applied Energy*, *278*, 115534. https://doi.org/10.1016/j.apenergy.2020.115534

[79] Geoghegan, C., & O'Donoghue, C. (2023). An analysis of the social and private return to land use change from agriculture to renewable energy production in Ireland. *Journal of Cleaner Production*, *385*, 135698. https://doi.org/10.1016/j.jclepro.2022.135698

[80] Bernini, C., & Galli, F. (2024). Economic and environmental efficiency, subsidies and spatio-temporal effects in agriculture. *Ecological Economics*, *218*, 108120. https://doi.org/10.1016/j.ecolecon.2024.108120

[81] Dillon, E., Donnellan, T., Moran, B., & Lennon, J. (2025). *Teagasc national farm survey 2024*. Teagasc. https://teagasc.ie/wp-content/uploads/uploads/media/website/publications/2025/NFSReport2024.pdf

[82] Rizov, M., Pokrivcak, J., & Ciaian, P. (2013). CAP subsidies and productivity of the EU farms. *Journal of Agricultural Economics*, *64*(3), 537–557. https://doi.org/10.1111/1477-9552.12030

[83] Kumbhakar, S. C., & Lien, G. (2010). Impact of subsidies on farm productivity and efficiency. In V. E. Ball, R. Fanfani, & L. Gutierrez (Eds.), *The economic impact of public support to agriculture: An international perspective* (pp. 109–124). Springer. https://doi.org/10.1007/978-1-4419-6385-7_6

[84] Vigani, M., & Dwyer, J. (2020). Profitability and efficiency of high nature value marginal farming in England. *Journal of Agricultural Economics*, *71*(2), 439–464. https://doi.org/10.1111/1477-9552.12351

[85] Kumbhakar, S. C., Tsionas, E. G., & Sipiläinen, T. (2009). Joint estimation of technology choice and technical efficiency: An application to organic and conventional dairy farming. *Journal of Productivity Analysis*, *31*(3), 151–161. https://doi.org/10.1007/s11123-008-0081-y

[86] Latruffe, L., & Nauges, C. (2014). Technical efficiency and conversion to organic farming: The case of France. *European Review of Agricultural Economics*, *41*(2), 227–253. https://doi.org/10.1093/erae/jbt024

[87] Jin, Y. (2023). Loss of organic cattle to the conventional value chains in Ireland: What are the economic and environmental impacts? *China Agricultural Economic Review*, *15*(4), 727–757. https://doi.org/10.1108/CAER-04-2023-0066

[88] Kujala, S., Hakala, O., & Viitaharju, L. (2022). Factors affecting the regional distribution of organic farming. *Journal of Rural Studies*, *92*, 226–236. https://doi.org/10.1016/j.jrurstud.2022.04.001

[89] Sander, A., Ghazoul, J., Finger, R., & Schaub, S. (2024). Participation in individual and collective agri-environmental

schemes: A synthesis using the Theory of Planned Behaviour. *Journal of Rural Studies*, *107*, 103255. https://doi.org/10.1016/j.jrurstud.2024.103255

[90] Durham, T. C., & Mizik, T. (2021). Comparative economics of conventional, organic, and alternative agricultural production systems. *Economies*, *9*(2), 64. https://doi.org/10.3390/economies9020064

[91] Pe'er, G., Bonn, A., Bruelheide, H., Dieker, P., Eisenhauer, N., Feindt, P. H., . . . , & S, Lakner. (2020). Action needed for the EU Common Agricultural Policy to address sustainability challenges. *People and Nature*, *2*(2), 305–316. https://doi.org/10.1002/pan3.10080

[92] Randall, A., & Taylor, M. A. (2000). Incentive-based solutions to agricultural environmental problems: Recent developments in theory and practice. *Journal of Agricultural and Applied Economics*, *32*(2), 221–234. https://doi.org/10.1017/S1074070800020319

[93] Das, N. K., & Roy, A. (2025). Systematic mapping study of literature in organic food value chain (1990–2021). *Journal of Agribusiness in Developing and Emerging Economies*, *15*(4), 675–694. https://doi.org/10.1108/JADEE-01-2023-0022

[94] Elliott, J., Tindale, S., Outhwaite, S., Nicholson, F., Newell-Price, P., Sari, N. H., . . . , & Frewer, L. J. (2024). European permanent grasslands: A systematic review of economic drivers of change, including a detailed analysis of the Czech Republic, Spain, Sweden, and UK. *Land*, *13*(1), 116. https://doi.org/10.3390/land13010116

[95] Moran, J., Byrne, D., Carlier, J., Dunford, B., Finn, J. A., hUallacháin, Ó., . . . , & D. (2021). Management of high nature value farmland in the Republic of Ireland: 25 years evolving toward locally adapted results-orientated solutions and payments. *Ecology and Society*, *26*(1), 20. https://doi.org/10.5751/ES-12180-260120

How to Cite: Afeku, A., O'Donoghue, C., & Kilcline, K. (2026). Low-Carbon Transition in Irish Agriculture: Organic Sector Growth and Structural Change Under Policy Support. *Green and Low-Carbon Economy*. https://doi.org/10.47852/bonviewGLCE62027808

Appendix

Table A1
Organic livestock on farms by region, change 2020–2023

Region	Cattle						Sheep						Poultry					
	Number of farms			Heads of Livestock			Number of farms			Heads of Livestock			Number of farms			Heads of Livestock		
	2020	2023	Change 2020–2023	2020	2023	Change 2020–2023	2020	2023	Change 2020–2023	2020	2023	Change 2020–2023	2020	2023	Change 2020–2023	2020	2023	Change 2020–2023
State	1157	2773	1.40	51685	103684	1.01	378	1728	3.57	74870	495743	5.62	101	340	2.37	161471	506493	2.14
Northern and Western	468	1251	1.67	17415	38073	1.19	146	963	5.60	28013	252364	8.01	39	96	1.46	121598	339609	1.79
Border	216	598	1.77	7583	16243	1.14	65	486	6.48	9341	104943	10.23	24	52	1.17	119682	261773	1.19
West	252	653	1.59	9832	21830	1.22	81	477	4.89	18672	147421	6.90	15	44	1.93	1916	77836	39.62
Southern	457	1092	1.39	19967	43300	1.17	154	548	2.56	30532	172891	4.66	35	155	3.43	29062	120882	3.16
Mid-West	234	506	1.16	10732	20911	0.95	23	79	2.43	2065	15025	6.28	14	55	2.93	1585	114636	71.33
South-East	74	154	1.08	3868	8709	1.25	16	65	3.06	2942	23405	6.96	10	33	2.30	26351	2931	-0.89
South-West	149	432	1.90	5367	13680	1.55	115	404	2.51	25525	134461	4.27	11	67	5.09	1126	3315	1.94
Eastern and Midland	232	430	0.85	14303	22311	0.56	78	217	1.78	16325	70488	3.32	27	89	2.30	10811	46002	3.26
Mid-East and Dublin	72	153	1.13	4001	8113	1.03	36	110	2.06	8533	43433	4.09	18	49	1.72	10090	45015	3.46
Midlands	160	277	0.73	10302	14198	0.38	42	107	1.55	7792	27055	2.47	9	40	3.44	721	987	0.37

Table A2
Organic livestock on farms by region, change 2020–2023

Region	Number of Farms						’000 hectares											
	Grassland			Cereals			Grassland			Cereals			Total Area					
	2020	2023	Change 2020–2023	2020	2023	Change 2020–2023	2020	2023	Change 2020–2023	2020	2023	Change 2020–2023	2020	2023	Change 2020–2023			
State	1957	3353	0.71	209	273	0.31	70555.7	171775	1.43	2615.78	5136.5	0.96	73798.82	179992.4	1.44			
Northern and Western	633	1575	1.49	32	62	0.94	28536.64	81276.7	1.85	287.42	814.4	1.83	28908.09	82810	1.86			
Border	301	807	1.68	14	27	0.93	12477.64	36654.3	1.94	121.19	339.9	1.80	12629.88	37243.9	1.95			
West	332	768	1.31	18	35	0.94	16059	44622.4	1.78	166.23	474.5	1.85	16278.21	45566.1	1.80			
Southern	695	1275	0.83	91	112	0.23	28625.79	67914.3	1.37	1100.31	2138.4	0.94	29950.04	71181	1.38			
Mid-West	289	483	0.67	28	39	0.39	10644.76	21560.4	1.03	395.83	984.6	1.49	11081.77	22973.5	1.07			
South-East	118	177	0.50	40	43	0.08	4004.48	7275.2	0.82	484.14	807.6	0.67	4616.52	8548.4	0.85			
South-West	288	615	1.14	23	30	0.30	13976.55	39078.7	1.80	220.34	346.2	0.57	14251.75	39659.1	1.78			
Eastern and Midland	629	503	–0.20	86	99	0.15	13393.27	22584	0.69	1228.05	346.2	0.78	14940.69	26001.3	0.74			
Mid-East and Dublin	125	206	0.65	37	49	0.32	4565.19	9344.5	1.05	659.81	1157.7	0.75	5381.92	11170.3	1.08			
Midlands	504	297	–0.41	49	50	0.02	8828.08	13239.5	0.50	568.24	1026	0.81	9558.77	14831	0.55			