The costs and benefits of transitioning to sustainable agriculture in the EU

A synthesis of existing knowledge

This brief summarises the main findings of a literature review of 60 studies on the financial impacts at farm level of transitioning towards sustainable agriculture:

- Adopting sustainable agricultural practices induces both upfront investments and maintenance costs.
- During the transition period, farmers benefit from reduced input costs, but might be faced with yield uncertainty and an increase in labour costs.
- Evidence suggests that sustainable farming practices do not necessarily negatively affect profitability when compared to conventional farming, and are likely to increase resilience to extreme weather events and market disruptions.
- Additional transitional aid is needed to boost the uptake of sustainable practices.

Publication date:
July 2024

Authors:
Shiraz Moret-Bailly
Melanie Muro

Photo by Glenn Carstens-Peters on Unsplash

As an increase in extreme weather events, soil degradation and conflicts over water uses pose crucial challenges to European agriculture, **a wider uptake of sustainable practices is needed** (Baldock & Bradley, 2023; van Dijk et al., 2024; Midler, 2022; Nadeu, 2022). Sustainable practices can be defined as sets of changes implemented at farm level, aiming to deliver the following long-term goals: diversified, biodiverse landscapes; increased soil health; reduced GHG emissions; reduced intensity of livestock, increased extensification, and animal welfare; reduced input dependency (agrochemicals, fuel, water); and increased circularity and resource efficiency.

It is widely acknowledged that the financial benefits of moving towards sustainable agriculture more than outweigh the costs of the transition at global level (FAO, 2023, FSEC, 2023) and at European level (SYSTEMIQ & Soil Capital, 2019). At farm level, there is substantial evidence that **sustainable farming can be profitable** and provide decent revenues to European farmers, and even fare better economically than conventional farms despite lower gross output, because of much lower operational costs (Mouratiadou, Wezel et al., 2024; Van der Ploeg et al., 2019; Sanchez et al., 2022).

However, the financial benefits of sustainable agriculture at farm level are usually accounted for after the transition to sustainable practices, that is after sustainable practices have been trialled out and fully integrated into the farm's system. The financial impacts during the transition itself are less known, although it seems that there are **significant economic barriers to change**: implementing sustainable practices can at first decrease profitability and requires investments which farmers often struggle to finance due to limited resources or difficulties in securing grants and loans (FoodDrinkEurope, 2023; Fi-compass, 2020). Indeed, the unmet demand of farmers for financing by banks reached EUR 62 billion in 2022: young, innovative farmers are particularly affected[1]. Lack of technical support and agronomic advice also impedes change and innovative solutions (Baldock & Bradley, 2023).

Few studies focus on the costs and benefits of the transition within a European context. At EU level, the upfront cost of implementing reduced tillage and cover crops (in the first year of implementation alone) could reach 6.9 to 16.7 billion euros (FoodDrinkEurope, 2023)[2]. However, costs for individual farms are likely to vary widely depending on their size, farming type, and location, pointing at the need to further identify and quantify costs at farm level as a basis for estimating aggregate figures.

Aim and scope of this brief

This brief aims to contribute to a better understanding of the financial impacts of the transition period on European farms. Drawing from a review of 60 studies, it indicates the magnitude of transition costs at farm level for different types of transitions, farms and stages of the transition process[3].The studies consulted focus on the adoption of sustainable practices and its economic implications at farm level. Systemic changes in market conditions (like a future potential increase in fertiliser prices) are not taken into account. Albeit simplistic, this framework allows a review of sustainable practices' costs in the current conditions experienced by farmers trialling them across Europe.

---

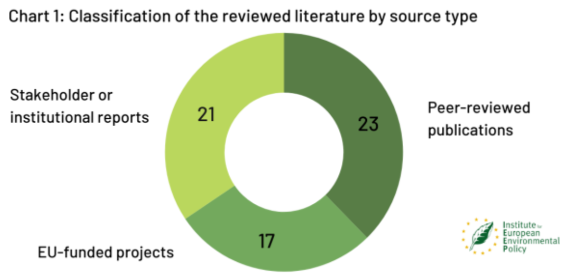
[1] https://agriculture.ec.europa.eu/news/access-finance-remains-insufficient-farmers-and-agri-food-smes-2023-10-12_en

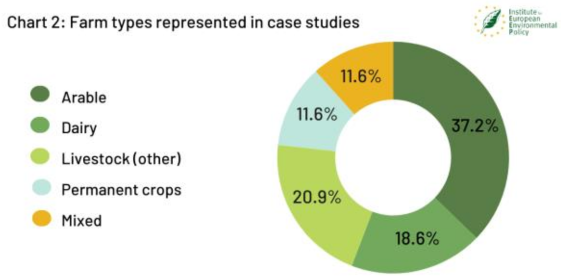
[2] This figure is based on the level of compensation farmers would need to adopt sustainable practices (per ha), as estimated by surveyed farmers – this is called willingness-to-adopt (WTA). The total cost of implementing these practices on all EU utilized agricultural area with indicators of erosion and nitrogen surplus above certain levels (respectively 2 ton/ha/year and 50 kg/ha) is then computed.

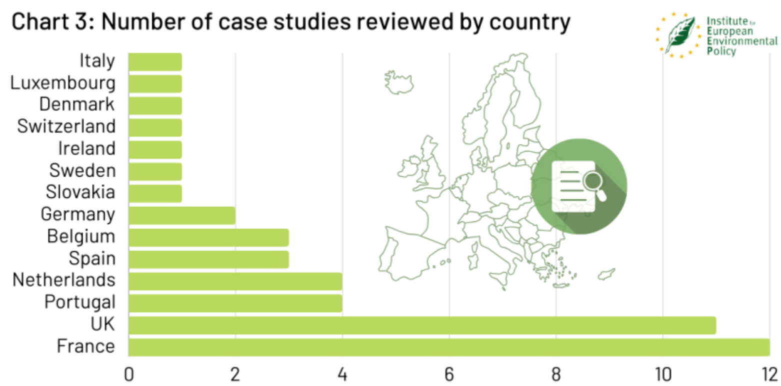
[3] The full analysis will be published in October 2024,

The sources include both **peer-reviewed publications**, reports from **institutional actors and stakeholders**, and case studies of **EU-funded projects** (Chart 1) which were mainly found through a search of the WOCAT SLM database[4]. The projects LIFT[5] and FABulous Farmers[6], and the Climate Farmers testimonies[7] provided a substantial amount of data. Chart 2 provides an overview of the farm types covered in the reviewed literature and Chart 3 details the number of papers per country.

Overall, **49 case studies**, including **45 providing quantitative data** (of those, five were based on modelling exercises) were analysed, along with **11 publications** on average potential or perceived costs and benefits, and several qualitative analyses of the impact of the transition on farmers' bottom-line. Studies often cover multiple practices or bundles of practices (like organic farming or agroecology), which makes a per-practice analysis challenging.







[4] World Overview of Conservation Approaches and Technologies (WOCAT), Sustainable Land Management (SLM) database
[5] Horizon 2020 Low-Input Farming and Territories (LIFT) project
[6] INTERREG project reporting on measures increasing the farms' Functional AgroBiodiversity (FAB)
[7] Climate Farmers Website

Table 1: List of the sustainable practices found in reviewed literature[8]

Sustainable practices reviewed	Number of studies	Characteristics
Cover crops	8	In arable farms and between rows on permanent crop farms. Covered extensively by a JRC report (Smit et al., 2019)
Reduced tillage	10	In arable farms. Mostly mentioned in stakeholder reports championing "regenerative agriculture", along with cover crops.
Biodiversity-enhancing features	10	Hedgerows, ponds, flowering strips, or agroforestry. Implemented across all farm types and sizes, often along measures deemed easier to implement by famers.
Reducing water consumption	1	Barely mentioned as a direct action (cost only quantified for one farm in Portugal).
Organic fertilisation	3	Either with green manure (cover crops left on soil) or compost, produced on farm or bought. Manure from livestock is not explicitly mentioned.
Extensive grassland grazing	13	Implemented in dairy/beef meat farms, often coupled with reducing feed and fodder inputs. Mainly from stakeholder reports with information on benefits, not costs.
Diversified crop rotations	3	Rotations of 4 to 5 years and 3 to 6 crops were reviewed, especially for their potential positive impact on crop yield
Animal welfare	2	Lower animal density on intensive livestock farms
Organic agriculture	x	Enjoys price premium after conversion period. There is a lot of literature on the subject, but the costs and benefits of specific practices are hard to pinpoint.
Regenerative agriculture	x	More often used in stakeholder reports on arable farming than in peer-reviewed sources. Usually defined as cover cropping, reduced tillage, and often reduced fertiliser use.
Agroecology	x	Mentioned chiefly in peer-reviewed articles, as bundles of practices enhancing agroecosystems' ecological functions and using natural resources efficiently at farm level to reduce external inputs consumption.

Source: authors' own compilation based on reviewed case studies.

While these studies provide a substantial amount of data on farm-level costs and benefits of transitioning to sustainable farming practices, we note the following information gaps:

- Some practices are not covered by the literature review, like pesticide reduction, sustainable manure management, or practices specifically aiming at climate change adaptation. Little analysis is provided of the restructuring or repurposing of livestock farms to face cattle reduction imperatives.

- Little data was found from Central and Eastern Europe on the subject (see Rovny, 2023, and Dudek & Rosa, 2023): more research is needed on the specific needs of transitioning farms in this geographic area.

- Sampled farms are in majority above 50 ha in size, with only four case studies on farms below 5 ha. In 2020, EU farms above 50 ha accounted for 68,2% of the EU's Utilized Agricultural Area (UAA) despite representing 7,5% of farms (Eurostat, 2022). The sample overrepresents the farms with the biggest impact on land management because of the large area they cover but provides limited insights on the specificities of transitioning smallholder farms, that are usually less profitable and technology-intensive.

[8] The shaded rows describe comprehensive farming approaches rather than single practices.

Quantifying the costs farmers face

Transition-induced costs can be divided in two categories[9]: **upfront investments, or implementation costs**, requiring a substantial amount of initial capital, and **running or maintenance costs**, that is yearly expenses. **Error! Reference source not found.** below summarises the quantified costs, aggregating costs expressed in EUR from the year during which data was collected (mostly from 2019 to 2022); year-on-year inflation is therefore not accounted for. For some practices, such as intercropping or changing livestock breeds, the case studies failed to provide cost quantifications.

Most quantitative findings relate to arable and permanent crops. Permanent crops are overrepresented in the number of cases reporting the implementation of biodiversity-enhancing features, compared to their share in the total number of sampled cases. Quantitative data on costs for livestock extensification is scarce and disparate. Concerning geographical location, Northwestern Europe, France, and the Iberian Peninsula are well covered in quantitative studies, usually focusing on the dominant farming system in each area.

Going beyond the aggregate costs presented in the data table below, transition pathways vary across farms:

- Larger farms have lower upfront investments per hectare, but also seem more likely to undertake substantial changes in agricultural practices, because they often have more spare money to invest in them.
- There is little information on the influence of biophysical conditions on transition pathways, except for Soil Organic Matter (SOM): low-SOM areas are successful in implementing some practices, but more time than average is needed for soil restoration before the benefits of increased soil health manifest themselves.

Table 2: Estimates of the costs associated with 10 sustainable practices
*- **Costs** are expressed in euros, not deflated.*
*- **Transition timeframe**: time needed for the practice to be fully implemented and integrated into the farm system and for profitability indicators to stabilise/go back to pre-transition levels. Time needed for full benefits from the practice to show up is also indicated when known.*
*- **Benefits**: financial benefits resulting from the practice.*
*- **Running cost:** additional maintenance cost from the practice.*
*- **Implementation cost**: upfront investment needed to adopt the practice. When the data was too disparate, only costs ranges, and not averages, were computed.*
*- **Investment level** categorisation is based on the upfront cost of implementation, not running costs. Investments are considered high when average upfront costs are above 300 EUR/ha, medium when they lie between 0 and 300 EUR/ha, and low when there are no upfront costs.*
Source: authors' own compilation based on reviewed case studies.

[9] The consulted literature often explicitly distinguished between these two categories when reporting costs. Where this information was missing, we classified the reported costs based on the descriptions provided in the respective paper.

Sustainable practice	Average implementation cost (EUR/ha) [range in brackets]	Average running cost (EUR/ha/y) [range in brackets]	Investment level	Range of action	Benefits	Transition Timeframe
reduced tillage	**961 [25-2833]** **336** without one 4ha farm	**50 [18-126]**	**high**	purchase of new machinery for no-till and direct drilling (upfront cost); increased labour costs (e.g. for mechanical weeding); potential lower yields at first	less fuel consumption and savings on machinery; less input consumption if coupled with cover crops; increased soil health leads to better yields usually after 5 years	**3 years** (5 to 10 years for full benefits; down to 1-2 years if pooled purchases)
cover crops	x	**144 [94-347]**	**low**	buying seeds and additional inputs, sowing, growing, and harvesting/terminating crops	less input consumption (fertiliser, pesticides, fuel if mulching); better yield mid-term (especially if legumes are used)	**5 years**
regenerative agriculture	**[385-2833]**	**125 [100-150]**	x	higher upfront investments for reduced tillage; running costs for cover crops.	lower input costs (fuel, fertiliser, water)	**5-10 years**
creating biodiversity-enhancing features	**591 [20-1277]** 200-300 for most	**134 [22-410]**	**high**	tree planting/ponds/hedges/flowering strips = upfront investments (including for equipment like brush cutters and seeds); income forgone from sparing land	savings in inputs (water/fertiliser/pesticides) more than outweigh initial costs after timeframe; new revenue streams (public money, wood).	**5-10 years** (up to 20 years for full benefits)
reducing water consumption	**[431-2500]**	x	**high**	new equipment e.g. drip irrigation	less input costs; more resilience against droughts	x
organic fertilisation	**200 [90-361]**	**294 [222-365]**	**medium**	equipment (manure spreader); cover crops if green manure; buying organic fertiliser; increased labour	lower input costs (fertiliser); increased soil health leads to better yields in mid-term.	5-10 years
grassland grazing – extensification	x	x	x	more management charges, more space needed, material and seed cost if no existing grassland	less feed and fodder costs; less slightly less veterinary and machinery costs; more profitable although less output	**3-4 years**
diversified crop rotations	**300 [200-400]**	**585 [545-625]**	**medium**	increased labour, equipment, and material (upfront costs); seed cost depends on crop mix	lower input (fertiliser) costs and better yield mid-term (especially if legumes in crop rotation)	**3 to 5-10 years**; 3-4 years to trial longer rotations
increased animal welfare	x	**+10-16% [10%-31%]**	**low**	new materials (straw for bedding) and building arrangements; increased labour	lower AMR	x
grouped transition, knowledge and training	x	**20**	**low**	agronomic advice and pooled purchases (cost = hub fee)	transition better planned; less trialling; lower upfront investment	x

It is hard to quantify the short- and long-term financial returns associated with these investments. According to data from WOCAT files of the FABulous farmers[10] project, economic outcomes and long-term returns are mixed to positive, with negative experiences mainly related to increased workload and land management complexity. This is why the next section of this brief further investigates the changing financials of transitioning farms.

The financials of transitioning farms – there is a business case for the transition

While looking at implementation and maintenance costs provides valuable insights into the economics of the transition at farm level, they do not tell the full story of the financial impacts of adopting sustainable practices. Beyond initial and additional costs, there seems to be an economic rationale behind moving towards sustainable practices: new regulatory or market standards and higher market prices can provide a revenue uplift, while a lower and more sustainable consumption of resources decreases operational costs even during the transition period (Van der Ploeg et al. 2019; Zandersen et al., 2015). These benefits increase further when multiple practices and diversified production systems are adopted.

The reviewed evidence suggests that **a reduction in input costs materialises quickly,** usually in the year following the uptake of sustainable practices, such as cover crops, reduced tillage, biodiversity-enhancing features, organic fertilisation, water-saving infrastructure, grassland grazing extensification, and diversified crop rotations. This most commonly stems from a reduction in synthetic fertiliser needs, triggered by the use of less costly (on a yearly basis) means of fertilisation, and increased soil health and biodiversity. The latter also reduces pesticides use and water needs. Lower fuel costs are immediately observed on farms that adopt reduced tillage. For livestock, a reduction in feed and concentrates consumption in extensive grassland grazing reduces operational costs. Lower input costs also decrease dependence bought inputs, which implies **increased resilience against input price volatility**.

Labour costs, however, almost systematically increase, both during and after the transition, and range from 20% to two-thirds of additional yearly costs. Although farmers mention a more fulfilling work (Duval et al., 2021), land management becomes more complex, and there is a subsequent increase in workload even if it does not translate in financial costs. In agroecological farms, however, a greater share of the profit goes to labour income, because of lower capital investments and fixed costs than in conventional farms, which can have a positive impact on agricultural workers and rural communities (Devienne et al. 2017).

Although temporary lower yields can be observed in the first years, maintained or increased yields do occur, especially when integrating legumes in crop rotations and when pooling resources and knowledge with other farmers (Smit et al., 2019; SYSTEMIQ & Soil Capital, 2019; Dudek & Rosa, 2023). A constant feature, however, is **yield uncertainty**, as new practices are

[10] https://qcat.wocat.net/en/wocat/list/?type=wocat&filter__qg_funding_project__funding_project=1059

being tried out in the fields. This can hinder investments, as farmers struggle to get enough financing for projects deemed too risky (Fi-compass, 2020). After a while - five years, usually - **greater yield stability** is achieved, as farms become less sensitive to extreme weather events and changing market conditions (France Stratégie, 2020; Dudek & Rosa, 2023; Dik, Van Egmond and Barbieri, 2022).

Finally, despite common trends and patterns across transitioning farms, their financial stability is dependent on practices adopted, farm size and most importantly initial economic performance. For instance, one study found that while using compost increased farm revenue, it decreased with the adoption of no-tillage and green manure practices (De Leijster et al., 2020).

Box 1: Selected case studies from the literature review

Introducing landscape features and agroforestry on an extensive livestock farm in Portugal

Source: Climate farmers

A 94-ha pig farm in Barrancos, Alentejo, a drought-prone region of southern Portugal, engaged in a deep restructuring in 2018 to introduce biodiversity islands, agroforestry, and water-saving infrastructure onto the farm. The owner plans on investing 120,000 euros over 15 years, with steep upfront costs to plant trees, build up a pond and swales, and introduce a drip irrigation system, but also maintenance costs.

Organic fertilisation on arable land in Zeeland, Netherlands

In 2019, a farm in Kamperland started applying mushroom compost and green manure (cover crops cut and shallow tilled into the soil) on 40 ha of arable land. Better soil fertility, nutrient availability and water holding capacity increased crop yield and quality, while enabling savings on synthetic fertiliser inputs. Organic fertilisation, however, entails machinery costs for tilling, and yearly cover crop seed costs (1,200 EUR), compost costs (1,200 EUR), and labour costs (2,100 EUR). Mushroom compost seems to be less expensive than other types of bought composts. can thus either be done once (with a lower effect on soil health), or yearly, as long as costs outweigh benefits.

Source: WOCAT SLM database, FABulous Farmers Project. *Image Credit: Evelyn Simak*

De-risking the transition: Conclusions and recommendations

Although the available data is still limited, existing knowledge suggests that **some practices entail low or moderate transition costs** (e.g. cover crops, organic fertilization) **while others need higher investments** (e.g. biodiversity-enhancing features or water-saving infrastructure). **The time needed for the financial benefits stemming from sustainable practices to materialize varies from one year to over 10 years**. Both costs and benefits vary depending on the sustainable practice adopted and on the implementation process. But overall, **the literature suggests that sustainable farming practices do not necessarily negatively affect profitability when compared to conventional farming and are likely to increase resilience to extreme weather events and market disruptions.** Indeed, beyond economic benefits, these practices have shown to protect and restore ecosystems, which in turn increases resilience to climate risks (Van Dijk et al., 2024).

Looking both at the costs of sustainable practices and at the changing financial structure of transitioning farms provides valuable insights into farmers' funding needs, and the subsequent financing schemes necessary to boost the uptake of sustainable practices in Europe. But the total cost of the transition to sustainable agriculture at European level remains uncertain, since it will depend on the type of practices farmers adopt, on geographical location, and on scale of uptake.

Nonetheless, **both public and private support is needed** and should fund the practices with the highest short- and long-term environmental benefits. One useful strategy in times of high interest rates and strained public budgets could be to **prioritise financial support for a large uptake of practices with a low to medium cost**, that enhance ecosystem functions and increase the resilience of agriculture **to keep producing in changing climate conditions**. The Common Agricultural Policy (CAP) already provides financial support to farmers taking up most of the sustainable practices covered by this review; direct (conditional) payments are tied to compliance with a set of agri-environmental requirements, the so-called GAECs (Good Agricultural and Environmental Conditions) and voluntary eco- and agri-environmental schemes compensate for costs and income foregone. However, with the recent CAP simplification tabled by the European Commission in March 2024, six of the nine mandatory GAECs were removed or weakened (Nadeu & Godfroy, 2024). To increase the uptake of some low-cost practices, like cover cropping, all CAP direct payments need to be made truly conditional on implementing a minimum set of clearly defined practices benefitting the environment. These should be tailored to the environmental and climatic conditions and needs of the farm location.

In parallel, **funding for costly practices could at first focus on particularly degraded or vulnerable agricultural land**. Support schemes for investments already exist under the European Agricultural Fund for Rural Development (EAFRD). Some support "non-productive" investments favouring biodiversity, although they represent a minor share of the investments funded (European Commission, 2023): that share could be increased.

More generally, payment rates need to be attractive enough for farmers to change their farming practices as evidenced by a significant undersubscription of eco-schemes during the first year of CAP implementation in some EU Member States (Nadeu & Godfroy, 2024).

Due to the inherently experimental nature of sustainable practices adoption, enabling farmers to trial them out without suffering financial losses from yield uncertainty is essential. **Insurance schemes or multi-annual conversion support can help de-risk the transition**, especially for smaller, less profitable farms. For instance, national public insurance funds, financed by taxes on fertiliser and phytopharmaceutical companies, could generate public income to support farmers during their transition period (Meunier & Ott, 2024).

Lastly, **more research is needed** on the impacts of the transition on farms based on their location, size, and initial profitability, as these factors seem to influence the financial impacts of moving toward sustainable agriculture. For the knowledge to translate into effective policy and interventions at local level, national authorities should rely more heavily on available expertise, from researchers, environmental agencies, and farmers, when designing and implementing CAP Strategic Plans (CSPs).

References

Baldock, D. and Bradley, H. (2023) 'Transforming EU land use and the CAP: a post-2024 vision', Policy Paper, Institute for European Environmental Policy, Brussels.

De Leijster V., Santos M.J., Wassen M., Ramos-Font M.E., Belén Robles A., Mario Díaz, Staal M., Verweij P. (2019). Agroecological management improves ecosystem services in almond orchards within one year, https://doi.org/10.1016/j.ecoser.2019.100948.

Devienne, S., Garambois, N., Dieulot, R., Le Bahers, G. (2017). Les systèmes de production économes et autonomes pour répondre aux enjeux agricoles d'aujourd'hui, Ministère de la Transition Ecologique, Paris.

Dik, P, van Egmond, F and Barbieri, L (2022) Exploration of the simulation of crop growth and water holding capacity for regenerative agriculture: Soil Heroes Foundation - Hoeksche Waard case study. Wageningen Environmental Research, no. 3216, https://doi.org/10.18174/582324

Dudek, M.; Rosa, A. Regenerative Agriculture as a Sustainable System of Food Production: Concepts, Conditions, Perceptions and Initial Implementations in Poland, Czechia and Slovakia. Sustainability 2023, 15, 15721. https://doi.org/10.3390/ su152215721

Duval J.E., Blanchonnet A., Hostiou N. (2021). How agroecological farming practices reshape cattle farmers' working conditions. Agroecology and Sustainable Food Systems, 45(10), 1480-1499. https://doi.org/10.1080/21683565.2021.1957062

European Commission Directorate-General for Agriculture and Rural Development, Folkeson Lillo, C, Chartier, O, Valli, C and et al. (2023) Mapping and analysis of CAP strategic plans – Assessment of joint efforts for 2023-2027. Folkeson Lillo, C. (editor), Chartier, O. (editor), Publications Office of the European Union, https://data.europa.eu/doi/10.2762/71556.

Eurostat (2022). Farms and farmland in the European Union – statistics.

FAO. (2023) The State of Food and Agriculture 2023 – Revealing the true cost of food to transform agrifood systems. Rome. https://doi.org/10.4060/cc7724en

fi-compass (2020), Financial needs in the agriculture and agri-food sectors in the European Union, Summary report, 94 pages. https://www.fi-compass.eu/sites/default/files/publications/financial_needs_agriculture_agrifood_sectors_eu_summary.pdf

Food and Land Use Coalition (2019) "Growing Better: Ten Critical transitions to transform food and land use", https://www.foodandlandusecoalition.org/wp-content/uploads/2019/09/FOLU-GrowingBetter-GlobalReport.pdf

FoodDrinkEurope and Anthesis (2023) Funding the EU transition to more sustainable agriculture: discussion paper. https://www.fooddrinkeurope.eu/wp-content/uploads/2023/12/231205-Discussion-Paper-on-funding-the-EU-transition-to-more-sustainable-agriculture.pdf

Fosse J. et Grémillet A., France Stratégie (2020), Améliorer les performances économiques et environnementales de l'agriculture : les coûts et bénéfices de l'agroécologie https://www.strategie.gouv.fr/sites/strategie.gouv.fr/files/atoms/files/fs-2020-dt-agroecologie-aout.pdf

Meunier M. & Ott, H. (2024), Rapport d'information n°2113 sur les dynamiques de la biodiversité dans les paysages agricoles et l'évaluation des politiques publiques associées, Assemblée nationale, Paris, France. https://www.assemblee-nationale.fr/dyn/16/rapports/cion-dvp/l16b2113_rapport-information#_ftn1

Midler, E. (2022) Environmental degradation: impacts on agricultural production. Institute for European Environmental Policy, Brussels.

Mouratiadou I., Wezel A., Kamilia K., Marchetti A., Paracchini M.L., Bàrberi P. (2024) The socio-economic performance of agroecology. A review. Agron. Sustain. Dev. 44, 19 (2024). https://doi.org/10.1007/s13593-024-00945-9

Nadeu, E. (2022) Nature restoration as a driver for resilient food systems. Institute for European Environmental Policy, Brussels.

Nadeu, E, and Godfroy, A. (2024) CAP implementation and delivery on sustainability challenges. Policy Report. Institute for European Environmental Policy, Brussels.

Rovny P. (2023), Economic view on regenerative agriculture in condition of the Slovak republic, https://doi.org/10.15544/RD.2023.021

Ruggeri Laderchi, C., et al. (2024). The Economics of the Food System Transformation. Food System Economics Commission (FSEC), Global Policy Report https://foodsystemeconomics.org/wp-content/uploads/FSEC-Global_Policy_Report.pdf

Sánchez A.C., Hannah N. Kamau, Francesca Grazioli, Sarah K. Jones, Financial profitability of diversified farming systems: A global meta-analysis, Ecological Economics, https://doi.org/10.1016/j.ecolecon.2022.107595.

Smit, B., Janssens, B., Haagsma, W., Hennen, W., Adrados, J. and Kathage, J., Adoption of cover crops for climate change mitigation in the EU, Kathage, J. and Perez Dominguez, I. editor(s), EUR 29863 EN, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-76-11312-6, doi:10.2760/638382, JRC116730.

SYSTEMIQ and Soil Capital (2019) Regenerating Europe's Soils: Making the economics work. https://www.systemiq.earth/wp-content/uploads/2020/01/RegeneratingEuropessoilsFINAL.pdf

Van der Ploeg J.D. et al. (2019). The economic potential of agroecology: Empirical evidence from Europe, Journal of Rural Studies, https://doi.org/10.1016/j.jrurstud.2019.09.003

Van Dijk, R., Godfroy, A., Nadeu, E., and M. Muro (2024) 'Increasing climate change resilience through sustainable agricultural practices: evidence for wheat, potatoes and olives', Research Report, Institute for European Environmental Policy, Brussels.

World Economic Forum (2022) Transforming food systems with farmers: a pathway for the EU. https://www3.weforum.org/docs/WEF_Transforming_Food_Systems_with_Farmers_A_Pathway_for_the_EU_2022.pdf

Zandersen M. et al., (2016) Potential and economic efficiency of using reduced tillage to mitigate climate effects in Danish agriculture, Ecological Economics, Volume 123, Pages 14-22, ISSN 0921-8009, https://doi.org/10.1016/j.ecolecon.2015.12.002

This work has been produced with the financial support of the LIFE Programme of the European Union. The paper reflects only the views of its authors and not the donors.