

Introduction

Introduction: Following their independence from the Soviet Union, the agricultural landscape in the Baltic nations has undergone notable shifts. Initially emphasizing productivity and self-reliance, agricultural policies in the region have now pivoted towards prioritizing environmental sustainability and resilience to climate pressures, aligning with the overarching objectives of the European Green Deal. This shift underscores a concerted effort towards sustainable land management practices in the Baltic region. However, transitioning from conventional farming practices to more sustainable methods presents a unique set of challenges for policymakers and farmers alike. These challenges necessitate a thorough examination of existing regulations and strategies to promote environmentally friendly practices while ensuring the economic viability of the agricultural sector. This study **aims** to address **two main objectives**: firstly, to analyze the strategic aspects of sustainable agriculture in the Baltic countries, with a focus on understanding the policies and frameworks in place to promote sustainability. Secondly, it seeks to identify and assess the practical challenges faced in implementing these strategies on the ground, exploring the barriers hindering the adoption of sustainable practices by farmers and stakeholders. By delving into both the strategic and practical dimensions of sustainable agriculture, this study provides valuable insights into the current state of agricultural sustainability in the Baltic region.

Theoretical background: The Baltic countries, comprising Estonia, Latvia, and Lithuania, boast a thriving agricultural sector despite facing challenges posed by their temperate climate and short vegetation season. Agriculture holds a prominent position in the region, occupying roughly half of the total land area, with Latvia leading in GDP contribution among EU countries at 5%. While there's been a slight decline in overall agricultural land in Estonia and Lithuania, there's a notable uptick in arable land areas, indicating active land acquisition for production purposes. Arable crop cultivation, particularly cereals like wheat, barley, and oats, dominates the agricultural landscape, with a growing trend in oilseed rape cultivation. However, environmental concerns loom large, as agricultural activities, including livestock farming and soil management, contribute significantly to greenhouse gas emissions. Understanding emission factors and implementing sustainable land management practices are critical for mitigating environmental impact and ensuring the long-term sustainability of the agricultural sector in the Baltic region. In the examination of the European Union's approach to sustainable land management, the European Green Deal emerges as a significant strategy introduced by the European Commission in 2019. This initiative aims to guide the EU towards climate neutrality and sustainable development by prioritizing environmental protection, social equity, and economic growth. The Green Deal focuses on reducing greenhouse gas emissions, promoting renewable energy, transitioning to a circular economy, conserving biodiversity, and encouraging sustainable practices in agriculture and food systems. Within agriculture, the Common Agricultural Policy (CAP) plays a central role, integrating mandatory regulations and voluntary measures to advance sustainability goals across Member States. While CAP includes practices such as biodiversity promotion, soil conservation, and agroecological approaches, the Baltic States struggle with low adoption rates of these sustainable land management practices.

Methodology

The methodology for this study involved a *two-step approach*. Firstly, an assessment was conducted to identify and analyze the main strategic and legal aspects affecting sustainable agriculture in the Baltic States. This analysis included a comprehensive examination of existing strategies, supplemented by a case study that scrutinized the implementation of these strategies within the national Common Agricultural Policies (CAPs) of each Baltic country. Through this dual approach, the study aimed to provide insights into the theoretical framework and intended objectives of sustainable agricultural practices in the region. Secondly, the study delved into exploring the challenges encountered in implementing these practices. This exploration relied solely on a thorough review of existing literature, encompassing academic studies, reports, and policy documents. By synthesizing findings from strategy analysis, CAP case studies, and literature review, this methodology aimed to offer a nuanced understanding of the current landscape of sustainable agriculture in the Baltics, illuminating both the theoretical foundations and practical realities shaping agricultural sustainability efforts in the region.

Results

Strategies for sustainable land management practices were assessed, where the key documents include several strategies like Farm to Fork Strategy and the Biodiversity Strategy, aiming to achieve climate neutrality by 2050 while promoting biodiversity conservation and resilient agricultural systems. These and the mentioned initiatives below aim to reduce greenhouse gas emissions, enhance soil health, and foster ecosystem resilience, ensuring the long-term sustainability of European agriculture. Outlining the common aims, also promoted practices, relevant to sustainable land management, were gathered.

Main strategies for Sustainable land management



Common aims

- achieve an EU net greenhouse gas removal of 310 million tonnes CO₂ equivalent per year for the land use, land use change and forestry (LULUCF) sector
- EU countries must cut greenhouse gas emissions by at least 55% by 2030
- by 2030 reduce 50% of the overall use of – and risk from – chemical pesticides and the use of more hazardous pesticides
- bring back at least 10% of agricultural area under high-diversity landscape features
- significant areas of degraded and carbon-rich ecosystems, including soils, are restored
- at least 25% of the EU's agricultural land must be organically farmed by 2030
- 50% reduction of nutrient losses by 2030, ensuring that there is no deterioration in soil fertility and will lead to 20% reduction of the use of fertilisers
- by 2030 the number of land and freshwater ecosystems where air pollution-related eutrophication threatens biodiversity is reduced by 25%

Promoted practices

- agroforestry
- avoiding heavy machinery
- carbon farming
- continuous soil cover
- contour farming in slopes
- cover cropping
- conversion to grassland
- crop rotation
- incorporation of crop residues
- integrated pest management
- low-intensive permanent grassland
- organic farming
- organic fertilizers
- precision agriculture
- preventing grassland conversion to arable land
- reduced tillage
- restoration of carbon-rich habitats - wetlands, peatlands

Results

Cross-country analysis of CAPs revealed common measures to address environmental goals, including restrictions on fertilizer use and measures to promote grassland preservation. While all Baltic States set ambitious goals for organic agriculture, differences were noted in support measures for conversion and maintenance of organic areas. Sustainable soil management practices are integral to most Ecoschemes and agri-environment measures, although there's room for improvement in precision agricultural technology support and restoration of wetlands and peatlands. Overall, Estonia's measures align well with identified risks, while Lithuania focuses more on Ecoschemes, and Latvia adopts a moderate approach but may need to further align measures with Commission recommendations.

Despite the stated positive impact of soil management practices on soil quality, integrating these practices into Baltic farms poses significant challenges in implementing them.

One major obstacle observed is the scarcity of *qualitative method studies* in Baltics *examining farmers' attitudes toward sustainable practices*, with existing research focusing primarily on productivity and economic factors rather than psychological considerations.

Consequently, a *lack of knowledge* and understanding among farmers impedes the adoption of sustainable practices. Additionally, *soil conditions and yield variability* present concerns for farmers considering no-till operations, although research suggests potential long-term benefits. Pest, weed, and fertilizer management also pose challenges, as no-till farming may require increased inputs without alternative management strategies. Furthermore, *equipment and material costs* serve as a deterrent to adoption, particularly due to high implementation costs and the prioritization of cash crops over cover crops. Addressing these obstacles requires effective knowledge exchange and the creation of appropriate solutions tailored to Baltic farming contexts. By bridging the gap between research findings and practical application, the Baltic countries can overcome these challenges and realize the benefits of sustainable land management practices.

Main conclusions

The agricultural sector significantly contributes to the economies of the Baltic countries, reaching up to 5% of the total GDP, highlighting its importance within the region. Even though there has been a slight decrease in emissions since 2015, it is forecasted that with productivity increase, emissions from the agricultural sector, particularly methane, ammonia, and nitrous oxide, will remain a concern and will continue to increase, contributing to climate change and environmental degradation. The implementation of sustainable land management practices is defined as one of the most essential approaches for mitigating environmental impact and fostering agricultural resilience, with a focus on reducing emissions, enhancing biodiversity, and improving soil health.

The European Green Deal and the Common Agricultural Policy (CAP) serve as crucial frameworks for guiding sustainability efforts in the Baltic countries, emphasizing the need for alignment between national agricultural policies and EU regulations to achieve long-term sustainability goals.

When evaluating the natural risks related to soil cultivation and agricultural production in four different sectors - soil, water, air and biodiversity, Estonia has an average to good rating in all factors, while in Latvia weaknesses are soil condition and biodiversity, and in Lithuania – soil condition and air pollution.

While progress has been made in integrating sustainability measures into agricultural policies, there is a need for further evaluation and adaptation to address specific challenges, such as soil degradation, biodiversity loss, and emissions reduction, which has a negative tendency to increase especially from agricultural land management.

Currently, the implementation of such practices is in the process, as it has been observed that it is affected by both technical and financial problems, where it is expected that with the actualization of climate change and the implementation of relevant political strategies, adoption of these practices will increase.